UNIVERSITY OF CALIFORNIA

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Online courses: A framework

Dissertation submitted in partial fulfillment for Degree of
Doctor of Philosophy in Education

By

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September 2016

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June 2016

Online courses: A framework

By Mark S. Grimes

DEDICATION

This dissertation is dedicated to Mom and Dad

My success has been possible because of your love and support

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Thank you to all of you that have supported me before and during graduate school. I know that I am standing on the shoulders of giants. I particularly appreciate those that gave support that I did not recognize at the time. My family has always been the greatest source of strength over the years. All of you have provided me with not only support and love, but also an enriched and happy life. Thank you Dad and Mom and my siblings: Joe, Tess, Chris, Mike, and Matt.

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ABSTRACT

This dissertation has two main purposes: 1) the introduction and application of a framework of online education that includes both the student and instructional perspectives during course implementation 2) to find validation for the framework using three separate studies: a detailed study of variables in online education and higher education literature; a course case study; and 15 student cases. In addition to addressing the experiences of four main actors (institution, instructor, media, and student) in the course, the theory proposed here makes a connection between many areas of online education literature that had previously been somewhat disparate. This connection is important because it allows for a broader perspective for a more holistic understanding of the issues in online courses. This broader perspective should help researchers and educators communicate not only what they are focusing their research and instruction on but also what is periphery. The studies analyzed whether the proposed f ramework accurately reflects the literature, a course case study, and 15 student cases. When it does not, this dissertation modified the framework to better reflect the results of these studies.

VITA OF MARK GRIMES

September 2016

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University of California, Santa Barbara
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University of San Francisco
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Publications

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Yun, J. T., **Grimes, M.**, Dang, M., Grimm, R., Wittington, R., Espinosa, J. E., Hunt, E., & DiGuilio, L. (2013). Online Instruction Pilot Project (OIPP): Final Evaluation Report. Report submitted to the University of California, Office of the President.

Nylund-Gibson, K. & **Grimes, M.** (2010). Online statistics courses at community colleges in California: Pilot evaluation report. Report submitted to California Virtual Campus.

Presentations

Grimes, M. (2011). Networked online statistics courses: A metaevaluation. Poster presentation at the American Evaluation Association Annual Conference, Anaheim, CA.

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Grimes, M. (2007). Using Blackboard LMS as an internal program assessment website. Presentation at the "Campus Conversations on Assessment" at California Polytechnic State University, San Luis Obispo

Research Experience

Graduate Student Researcher (2009-2013)
University of California Education Evaluation Center (UCEC)
Supervisors: Dr. John T. Yun and Dr. Patricia Marin

Graduate Student Researcher (2009-2010)
Sponsored Research of Online Courses at Community Colleges in California
Supervisor: Dr. Karen Nylund-Gibson

Professional Experience

Head Graduate Researcher and Lab Manager — November 2009 – September 2013
University of California Educational Evaluation Center (UCEC) • University of California, Santa Barbara

Managed evaluations including the evaluation of UC Online Instructional Pilot Project. This included developing research design, instrument design (including interview questions and protocol; survey writing and management; school data retrieval; and case document acquirement), report writing, project management, training, and assigning roles and work to more than 12 graduate students and five undergraduate students

Head graduate researcher in charge of the operations of the lab and the training of graduate and undergraduate students. This included the creation of operations protocol, conventions for confidentiality, and educating graduate students on evaluation. Created resources and documents including an internal website of evaluation resources. Assisted in strategic planning and set-up of seven-campus center. Assisted in the coordination of the UCEC sites at the six other University of California campuses.

Coordinator of Learning Assessment System — July 2006 – August 2008

Orfalea College of Business • California Polytechnic State University, San Luis Obispo

Worked with the Dean, Associate Deans, and over 100 faculty to design, build, and implement the Learning Assessment System for the Orfalea College of Business.
Developed a web-based assessment resource using the campus Blackboard LMS
Primary author of Undergraduate and Graduate Assessment Reports resulting in a successful AACSB accreditation
Acted as a consultant to other departments on campus
Served on the campus-wide assessment committee led by the assistant vice provost with a total of 12 members and included the associate dean for each college

Graduate Researcher – Program Evaluator — August 2009 – June 2010

University of California, Santa Barbara

Developed and implemented an evaluation of online courses taught at community colleges in California.
Created a survey, focus group protocol, instructor interview questions and protocol, and videotape of in-person and online course instruction.

Academic Department Manager — August 2005 – July 2006

Industrial Technology • Orfalea College of Business • California Polytechnic State University, San Luis Obispo

Managed Industrial Technology department in absence of permanent department chair, which included scheduling classes for the department; advising students on classes, resources, developmental issues, and career choices; and facilitating the restructuring of the curriculum within the department (official creation and deletion of courses and academic minors, creation of new academic minors, and the creation of new guidelines for student graduation).

Open Learning Environment Technician — June 2013 – March 2016

Collaborate Faculty Support • University of California, Santa Barbara

Worked to assist faculty with the setup of online course material for GauchoSpace (Moodle). Assisted with the development of online support center. Developed a survey for the evaluation of the new iteration of the campus learning management system.

Other Experience

Store and Shift Manager — April 1997 – September 1998

McDonalds • Foothill Blvd, San Luis Obispo, CA
Worked my way up to shift manager and was tasked to run most operations in the store in the absence of an official store manager. Supervised and scheduled employees, ordered food and supplies, conducted inventories, opened the store, ran productivity reports, handled complaints.

Supervisor of Student Assistants — June 2005 – August 2005

Summer Advising Program • California Polytechnic State University, San Luis Obispo
Supervised upper division undergraduate students that worked as coordinators of the Summer Advising Program for incoming freshman.

Merchant Teller — March 2003 – December 2004

SESLOC Federal Credit Union • San Luis Obispo, CA
Worked in the merchant bank account division and processed large and small in-person monetary transactions.

Resident Advisor — August 2012 – August 2013

Housing • University of California, Santa Barbara
Resident advisor for undergraduate and graduate students.

Resident Advisor — August 2000 – June 2002

Housing • University of San Francisco
Resident advisor for undergraduate and graduate students.

Student Library Assistant — September 1998 – December 2000 and Fall 2002

Gleeson Library • University of San Francisco
Filed books and assisted patrons with library services, such as book checkout, reserves checkout, and locating library texts and resources.

Handyman and Maintenance — Summers of 1995, 1996, 1999, 2000, 2001, and 2002

Old Mission Elementary School • San Luis Obispo, California
Preparation for new school year: cleaned classroom tables and floors; painted walls; general repairs, such as water pipes, tables, and desks

Professional Skills

Management
Project Management
Program Evaluation
Interviewing
Survey Development and Analysis
Case Studies
Textual Analysis
Academic and Career Advising

Professional Interests

Online Education
Higher Education
Learning and Decisions
Faculty Development
Course Creation Processes
Program Evaluation
Learning Assessment
Quantitative Methods
Qualitative Methods

Software Proficiency

Microsoft Word and Excel
Adobe Acrobat Pro
Blackboard and Moodle
SPSS Statistical Software
Dedoose Qualitative Software
Stata
M-Plus
Transana

Table of Contents

CHAPTER 1: INTRODUCTION

When taking into account the entire known history of education, the field of online education has been around for a very short time. While it has roots in other areas of education, such as distance and media-based education, the short history of online education has also meant a short history of online education research. During this time, there has been laid an unstable foundation of mixed terms, problematic definitions, holes in the concepts, and a lack of a cohesive framework for how online courses work. Further, the field has failed to heed the warnings from researchers of media-based education to move away from comparison studies and as a result has produced literature reviews and meta-analyses that have conflicting conclusions for whether online education is the same, better, or worse than in-person courses. This dissertation offers some stability to the field by explaining the state of online education, explaining terms, providing definitions, sorting out important concepts, introducing important new concepts, producing a framework of online education, testing that framework, and demonstrating how the framework can be used and how different aspects of online education fit the framework. The three studies in this dissertation served to validate the framework by examining the literature, using the framework as a means for analyzing a course, and using the framework to analyze student cases.

Brief Overview of the Dissertation

This dissertation begins with an extensive literature review. The literature review identified a problem in online education research; namely, there is a possibility of so much variation in online courses, that meta-analyses or broad findings across online courses will ultimately have problems with confounding variables that makes

generalizations difficult. After the literature review, a conceptualization of a framework of online courses was built using prior models of online education and systems of higher education. The conceptualization used evidence from the literature to develop the theory in detail. The Methods chapter explains how the three following studies that tested/validated and finalized the framework were conducted.

Study 1 used literature as a source of data to examine whether the main sections of the framework held up and then a more detailed review searched for specific variables that related to the different areas of the framework. Study 2 then analyzes a case study of a specific course. This case study examines student surveys, course descriptions, and the instructor interviews to further test and develop the framework. Open-ended student survey questions were analyzed using a coding scheme based on the framework. The instructor interview used a different coding scheme based on the framework but one that was focused more on the instructor portion. In both the review of student surveys and instructor interviews, the coding scheme covered the entire framework, however, the framework predicted that the instructor would be more aware of the various parts of the course and would be connected to sections that students would probably give not thought to. The third study examined 15 student case studies. These student case studies provide an examination of the framework in more detail and demonstrate how fragile an online course can be. The general finding of these case studies was that each student had a very different experience and the framework explains why. Study 3 walked through general information about the students; their favorite and least favorite aspects of the course; their regular participation in different component-activities; their primary sources of information in the course; an analysis of the framework using data from their interviews;

a detailed analysis of their decision to participate in the course that demonstrates connections to other areas in the framework; a detailed analysis of their decision to participate in the component-activities that demonstrates connections to other areas in the framework; a detailed analysis of their decision of how to participate in the course that demonstrates connections to other areas in the framework; and finally, an analysis of their sequencing cycles in the course that demonstrates the decisions they made regarding course sequencing and how that was influenced by internal and external variables. The Discussion then reviewed these findings and placed them in the larger context. Finally, concluding remarks leave the reader with a better sense of what can be done with this framework and further steps that could be taken in research and practice.

Dissertation Extended Overview

This dissertation provides new insights and structure to a field in need of clarity and structure. The first half of the dissertation (Chapters 2 and 3) lays out some of the issues related to online education and then describes a framework that was conceptualized in order to provide an easily comprehensible guide that can be presented in visual form. The second half of the dissertation (Chapters 4, 5, 6, and 7) focuses on the validation of the framework through three studies. The following provides a more precise description of each chapter.

This dissertation is broken up into seven chapters and multiple appendices. A brief review of each of these chapters is provided in this paragraph, which is then followed by a more detailed description of each of the chapters. This first chapter provides an introduction and overview to the dissertation. Chapter 2 reviewed the literature and laid out many of the contextual properties and processes of online courses.

Chapter 3 provided a description of the framework. Chapter 4 describes the methods for the studies that provide validation for the framework. Chapter 5 gives an analysis of each of the three studies that were used as validation for the framework. Chapter 6 discusses the findings from these studies. And Chapter 7 concludes the dissertation with implications for future research and practice. Below is a more detailed description of each of these chapters.

After this introductory chapter, Chapter 2 reviews the literature and explores the following issues related to online education: 1) the State of Online Education; 2) A New Educational Format; 3) A Problem with the Definition of Terms; 4) Key Characteristics of Online Education; 5) Control Source and Type; 6) Media Features in Online Education; 7) Determining Success of Online Education; 8) Obstacles in Online Education Research; 9) Theoretical Framework; 10) Why Research in Online Education Matters. The sections of Chapter 2 are briefly reviewed in the following paragraphs.

A brief overview of the history of online education was explored in the review of the *State of Online Education* and concluded with the finding that there is need for a comprehensive framework for online education. *A New Educational Format* examines how online education has emerged from other non-traditional instructional formats, such as distance education, computer-based instruction, and prior modern technology movements in education (e.g. radio, film, and television) through the introduction of new technologies. The section goes on to explain that online educational formats have an exponential advantage over non-traditional formats that came before. However, online education has retained the negative reputation and expectations for what can be

accomplished and that has been influencing the practice, the research, and the reputation of online education.

The section, *A Problem with the Definition of Terms,* explains how research in the field of online education has been unable to use consistent terms. Further, articles often fail to define what they mean when using particular words related to online education even though that same term has been used in very different ways in other articles. The diversity in which terms are used can be attributed to both differing interests and the increasingly murky boundary between online education and in-person courses. This is problematic for the interpretation of research findings, as it would be difficult to determine what type of intervention actually occurred. This section then explored how types online education can be defined by the extent to which a course or instructional experience involve computer enhancements, Internet enhancements, and distance. However, even with an understanding of what these terms mean, there is still a problem with subjectively applying them based on how much material is online/in-person.

In the section *Key Characteristics of Online Education* explores what an online course does that is different and it does this by taking a closer look at the characteristics mentioned in the last section: computer enhancements, Internet enhancements, and distance. An extensive literature review was conducted and there seems to be three main characteristics added to online courses as a result of these computer and Internet enhancements: Communication; Organization and Distribution of Content; and Content Interaction and Assessment. These characteristics and instruction at a distance are discussed in terms of what they add to online course instruction and what that means for online courses.

The next section, *Control Source and Type*, explores issues of control. Before this dissertation, a distinction between Control Source and Control Type has not been made clear in the literature. What this means for instruction is explained in this section. Different sources of control and types of control are identified and explained in this section. The studies conducted in this dissertation, used control and found it to be important in the ability of students to make certain decisions. The studies also found additional sources and types of control and hints there could be even more sources and types waiting to be discovered. From the studies, an important aspect of control was discovered, termed here as *Meta-Control*, this refers an instructional entity's control over control. Also, the studies found a process related to *Meta-Control*, called *Negotiated Control.* Thus, while this section provided an important summarization and reconceptualization of *Control* there are still important related properties and concepts to discover, some of which were found through the studies in this dissertation.

The section, *Media in Online Education* explores how advancements in technology has democratized media and what this means for online education and research of online education. After providing a definition of media, the many features of media are defined an examined individually: media form; media structure; synchronicity; symmetry; anytime and anywhere; multiplicity; and non-linearity. These features are used in the coding schemes the student surveys in Study 2, the student interviews in Study 3, and a condensed code was used for the instructor interviews in Study 2. These studies confirmed the need for this area to be included in both future research and instructor training.

The section *Determining the Success of Online Education* explores two main ways success can be measured. While most studies in online look at *effectiveness* (measures of gain, such as content learning or satisfaction), future studies can use the concept of *efficiency* (the comparison of cost with gain) as it has been used in other areas of educational research. It was then discussed how these measures of success could be used to look at stakeholders beyond the student. In the section *Obstacles in Online Education Research* the discussion turns problems with research, particularly with extensive confounding variables such as: research design, study features, measurement features, year of publication, the instructor as author of the paper, teacher influences, student differences, the curriculum of the course, issues related to assessment, changes in technology, course media, and descriptions of course and context. Additionally, the lack of ability to control variables has made the experimental research of full courses in online education difficult. Further, many researchers have argued against studies that compare between media-based instruction and traditional instruction. This argument only becomes more enhanced when considering the enhancements and vast amount of instructional possibilities that the combination of computers and Internet bring to online education. Because of the potential for confounding variables, it is important that researchers describe as much of the context of the course as possible, which is something that has not occurred frequently in online education research.

In the section *Towards Understanding What Works in Online Education*, it was determined that the question, "What Works?" was too broad. This question was then broken down into three separate questions: "*Does it work?*"; "*How does it work?*"; and "*When does it work?*". After breaking down the main question into these three questions,

it was easier to identify the needed evidence, variables, and type of data. However, even after identifying variables and types of data, it was concluded that framework would be needed for understanding how all of this pieces that make up online courses work together.

In the section titled, *Decision Theory Guiding this Dissertation*, a theoretical foundation for the decision portion of the framework was proposed. This theory provided a basis for the proposed framework by identifying the difference between internal and external variables and then placing these types of variables in the context of choice and circumstance. This separation helps researchers and educators decide what can be changed in a course or program and how it can be changed.

The next two sections move from the theoretical foundations of the framework into how the framework can be used. The sections *Uses for the Framework* and *Uses for Framework Connections* described how research in online education has often been conducted without reference to other related variables or contextual variables. It was proposed that this framework would provide a way of pulling the various pieces of online education together. Both sections described how others could use the framework outside of this dissertation.

The section *Why Research in Online Education Matters* discussed some of the contemporary issues in both online education and higher education in general. The section described some of the needs in higher education (e.g. access for more students and institutional finances) and the potential that online education has for filling the need in these areas. However, in order for this to work, online education has to overcome hurdles, such as creating online courses and programs that successfully recruit, retain,

instruct, and place clear target populations. This is something many public online education programs have failed to accomplish in the past without either failing or sacrificing the goals of creating high quality online courses for students that otherwise would not have access. Finally, as online education becomes more popular, institutions of higher education will need ways of determining the effectiveness and efficiency of online courses.

Chapter 3 of the dissertation uses literature in online and higher education to explore an initial framework proposed for this dissertation. In this chapter, actors, potential actor, context, and general properties of the framework are explored. Each section of the framework is then explored in depth using literature for guidance. This chapter was then used as the basis for all further chapters but would be modified after findings from the three studies in the later chapters revealed important changes. And Chapter 4 of this dissertation laid out the methods for the studies to follow; all of these studies were based on the framework developed in Chapter 3 but would evolve towards a final framework as each study was completed (see Appendix L for an illustration of the original framework, Appendix M for the intermediate framework that supported the case studies, and Appendix N for the final generalizable framework).

In Chapter 5.1 an analysis of data was conducted for the first study in this dissertation. The data from this study came from a review of online and higher education literature. This study accomplished three main things: 1) an initial review of the literature as a check for framework sections; 2) a more detailed review of the literature for variables and processes related to each section of the framework; 3) also in this detailed review, a search of the literature for additional major sections in the framework. From

this review, the foundations of the framework stayed firm but some adjustments were made.

In Chapter 5.2 an analysis of the data for a case study of course was conducted. In this study, the data was sourced from descriptions of the course, student survey data, and instructor interview data. This data was entered into the Dedoose (2016) qualitative software and analyzed using a coding scheme based on the framework. The student survey analysis and the instructor interview analysis were conducted using different codes developed specifically for their respective portions of the framework. In this study, the framework again held up and some minor changes and additions were made.

In Chapter 5.3 an analysis of 15 student case studies were conducted. This study was made up of four main areas: 1) student profile development; 2) analysis of framework areas; 3) an analysis of student decisions; 4) analysis of student sequencing. The student profile development included General Demographics; Favorite and Least Favorite Aspects of Course; Regular Participation in Component-Activities; and each student's Primary Sources of Information. These profiles helped in constructing how each student experienced the course. Even from this information, a picture began to emerge of the very different experiences that students had. The analysis of the framework areas was conducted using student interviews. The coding scheme was that was used for this analysis was based on a close to the finalized version of the framework. This coding supported the framework and new information from this review helped to build the final framework (see Appendix N for an illustration of this final generalizable framework). The analysis of student decisions was conducted on the interview explanations of the student cases looking at the 1) student decisions of *whether* to participate in the course; 2)

student decisions of *whether* to participate in component-activities within the course; 3) student decisions of *how* to participate in the course. From these analyses, it was found that, as the framework predicted, student decisions used the predicted processes, were influenced by characteristics related to the student, influences that were internal to the course (such as issues of Control, Curriculum and Content, and instructor participation), and influences external to the course. The last part of Chapter 5.3 examines how the students sequenced their participation in the course. The analysis looked a two main time-periods that students sequenced their participation for: Course-Term and Week-Lesson.

Chapter 6 discussed the main findings in this dissertation and is arranged in a way that references the final framework. This means that foundational ideas that support the framework were examined first followed by a discussion of the results related to each of the main actors in the study. The discussion also examined in more detail some of the main findings related to specific issues, such as control, features of curriculum and content, the role of the instructor, and student decisions. Chapter 7 gave conclusion to the dissertation with closing remarks.

CHAPTER 2: LITERATURE REVIEW

Online Education: A Field in Search of an Identity

From the very start, online education has suffered from a crisis of identity. Online education was born as a combination of other formats that had preceded it (distance education, computer-based instruction, multimedia education, radio, film and television education) (Sherron & Boettcher, 1997). Prior to online education, educational research built a foundation research based on the mixed formats of distance and media-based education:

> Over the past several decades, thousands of studies have examined the effectiveness of e-learning, broadly defined. Much of this work has compared e-learning with traditional classroom instruction and other forms of delivery media. Early research focused primarily on evaluating distance education, such as televised broadcasts and videoconferencing, but over time attention shifted to computer-based instruction and most recently to online instruction as well as computer-based simulations. (Bell and Federman, 2013, p. 170).

Because of the lack of tradition and research, online education began by regularly being classified into these other traditions. This new field inherited much of the research findings and reputations of these other, somewhat similar, traditions. Further, clear distinctions between online education and these other educational formats have not been clearly identified. While this is enough to cause confusion, research articles have added to the problem by not describing setting and context, making it difficult for the audience to know what type of course was being studied. Finally, there has not been an integrated framework that explains how online courses operate in a holistic manner (Zhao et al., 2005). In one of the first reviews of online education research, Phipps and Merisotis (1999) explained the lack of a theoretical framework to guide online education:

> The research does not include a theoretical or conceptual framework. There is a vital need to develop a more integrated, coherent, and sophisticated program of research on distance learning that is based on theory. Theory allows researchers to build on the work of others and, therefore, increase the probability of addressing the more significant questions regarding distance learning. Using theory as

> a guiding framework also allows the research to be replicated and enhances its generalizability, making individual studies more meaningful." (Phipps and Merisotis 1999, p.6).

Phipps and Merisotis made this assertion when online education was still in its infancy, yet there is still no comprehensive framework that guides online education research. In fact, the very definition of what constitutes an online course is still set institution-by-institution, instructor-by-instructor, and researcher-by-researcher, leaving real questions even about the number and scope of online courses currently offered at institutions of higher education and the research that includes online courses. This dissertation provides a comprehensive framework that incorporates the diversity of existing online research and models the processes of online course implementation. From this framework, researchers will be able to target certain aspects of online courses to understand how they may affect the overall experience for students, instructors, or course designers. As the empirical part of this dissertation I will demonstrate the use of the framework on a specific online course and target on one aspect of this framework, which has been largely under-researched–student participation decisions.

In order to understand where research into online education needs to go, it is important to understand what online education is, what it has looked like, and where online education research has been. Online education has inspired hope for solutions to budget cuts and possibly even better student learning outcomes. However, successes in online education have been inconsistent and the reasons for irregular effectiveness and efficiency remain unclear. Inconsistent definitions of online education, lack of clear identification of online characteristics and features, mistaken generalization of characteristics and features across online courses, the absence of a complete model of online courses, and common problems with research methods could be some of the

reasons for ambiguity and vagueness of when and why online courses are successful. Understanding these issues and finding a way of connecting research through a general framework is essential for understanding why and when online courses work and this understanding will help institutions know how and when to implement online courses.

A New Educational Format

Online education is a format that resulted from the marriage of prior educational formats and new technology. While other formats can be seen in the makeup of online education, it has emerged from other education formats of distance education, computer-based instruction, and prior modern technology movements (radio, film, and television) as a unique format with some of the characteristics and stereotypes of these prior formats both good and bad, true and false. Understanding online education origins is important in understanding what online education is and why there have been problems with research in this area.

Technology has long been a part of the educational experience. From a pen and paper to chalk on the chalkboard, some of the less obvious forms of technology have permeated the educational experience. For a time, modern technologies, such as radio, film, and even television seemed to promise education of the future that would solve contemporary problems in education (Sherron & Boettcher, 1997). However, these technologies did not revolutionize education but rather were used by only small segments of the population. For example, radio and television were time sensitive and required clear pedagogical planning for how it would fit within the curriculum. Film was more widespread but was only used in some situations. In short, modern educational

technology was used as supplementary to other instruction and had a hard time taking off (Cuban, 1986).

Computers began to enter the educational system and they were praised for their ability to provide an individual with tools for production and automatic feedback that would otherwise require multiple other resources and instructor attention. However, one of the early problems with educational computer use was lack of access. When computers were first being used in the classroom, curriculum as set up to include computer instruction in a lab rather than at home since it was assumed that most students would not have access to computers and instructors would have little control over the regulation of home computer usage (Cuban, 1986). It can be assumed that much of this had to do with the expense and novelty of computers at the time. Also, the World Wide Web had not yet been established and educators had to assume that the only type of guided use of computers had to happen in the computer lab utilizing professionals trained not only in pedagogy but the technical skills of working with networked computers in a laboratory format. However, even in the very early years, computers were already showing potential as a way of connecting students with the instructor in the classroom and as a means of intelligent assessment and tutoring (Cuban, 1986). Even with these early successes, the potential for computers to go the way of educational film, television, and radio seemed very real. It was assumed that educators would have to make hard choices about what they valued and answer what the purpose of education was in order for educational computer usage to survive (Cuban, 2001).

Distance education has a tradition of multiple formats that have grown in number over the years (Sherron & Boettcher, 1997). Distance education could use the

technologies of radio, television, film, and computers, and it could use more traditional technology, such as textbooks (Sherron & Boettcher, 1997). Distance education has traditionally suffered from a poor public image:

> "from an inferior public image and/or low popularity compared to [courses] conducted at traditional universities, either due to low-quality academic materials and poor academic control, or because of the difficulty of dealing alone with complex learning materials. The relatively low rate of success of these distance courses, and the even lower rates of those completing their schooling and obtaining degrees, have contributed to the poor image" (Beller and Or, 1998, ¶6).

Additionally, distance education had a reputation for being a last case alternative to in-person education, an alternative for those that are unable to attend in-person or are unable to be admitted into college through standard means (Beller & Or, 1998). In addition to the image problem that distance education had suffered, new educational technologies for much of the 20th century had difficulty permeating the system, as these technologies were often expensive and only useful for specific circumstances (Cuban, 1986, 2001). With advanced computing and the beginning of the Internet, it seemed that e-learning would need real strategic push from institutions to make Internet-based learning or the Internet would be doomed to entertainment and commerce:

> This [merging of phone, video, and computer] capability presents the prospect of interactive video integrated with access to large multimedia data bases distributed among people in offices, classrooms, and living rooms all over the world. If by then we have not come to understand the relationship between media and learning--if we have not forged a relationship between media and learning- this capability may be used primarily for interactive soap operas and on-line purchasing of merchandise with automatic funds transfer. (Kozma, 1994, p. 8).

Despite the concerns that computers would be sidelined like the prior technologies, computer usage in education has taken off. The reasons for computer technology to be commonplace in universities has been the interplay between technological advancements that have made computers smaller and more affordable, the near universal acceptance of this technology by society, and strategic investment and planning by universities. Strategic planning and investment by universities helped make

computer and Internet technology more available and accessible and gave an early boost to Internet-based educational practices. For example, many institutions have invested in Online Learning Environments (Falvo & Johnson, 2006; Hill, 2012; Paulsen, 2003). Online Learning Environments (OLEs) is a more general and inclusive term for Learning Management Systems and Course Management Systems (Moore, 2011). OLEs are the websites used for course organization, content distribution, and some forms of communication (Falvo & Johnson, 2006; Zemsky & Massy, 2004). The investment into OLEs has allowed instructors to easily add materials to protected a website with less individual expense or effort (Hill, 2012). And when instructors use OLEs, students become obligated to use the online course materials, assignments, and activities. "Learning Management Systems along with the popularity of computers and online interaction will bring more teachers and learners into the online or e-learning environment" (Falvo & Johnson, 2006, p. 41). While OLEs can be developed by individual instructors as a personal website dedicated to a course or set of courses, most institutions of higher education in the United States have adopted a university-wide OLE service that the university implements and services (Falvo & Johnson, 2006). In addition to the instructor time and effort that an institution-wide OLE investment alleviates, institution-wide OLEs allow students to remain familiar with a single OLE during their college experience. This reduces the learning curve for students and the need for explicit instructions on how to use the OLE on the part of the instructor. Further, if a whole institution invests in a single OLE, then support and maintenance is needed only for that single OLE. The investment into OLEs by institutions has allowed for an opportunity for

use and has eased the jump for both instructors and students to participate in online courses.

Institutional efforts to include technologies have paralleled the saturation of technology in society. However, institutional adoption of computer and Internet technology does not seem to be the only reason for the widespread computer usage at colleges and universities. Computer usage in education could be more about the *nature of computers* than any planned usage strategy by institutions. Improved technologies, lower prices, and a changing society helped make computers more commonplace. They have become pervasive, not just as laptops and personal computers but also as tablets and hand-held devices. And as the World Wide Web has connected these privately owned computers, educational institutions only needed to build on this infrastructure and culture. This rapid rise in computer usage promises to bridge the educational access gap that so many technologies before had failed to deliver (Bowen, Chingos, Lack, & Nygren 2012). Opposed to prior technologies before it, online education has proven to be versatile, accessible, widespread, and allows for a variety of pedagogies and practices through the multiple applications and technologies it provides.

Thus, online education is breaking free from prior non-traditional formats in both characteristics and magnitude of adoption. Whereas Classic Distance Education was once an alternative for those that were particularly unable to attend in-person, and usually served only this population, possibly because of a poor reputation (Bernard et al., 2009; Beller & Or, 1998; Phipps and Merisotis, 1999), online education is evolving to include not only the geographically restricted but also other educational consumers that may not have otherwise enrolled in distance education (Bernard et al., 2004; Bernard et al, 2009).

Critical attention has been focused on online education as it has been increasingly encroaching on the market traditionally held by in-person courses (Beller & Or, 1998; Burnette & Conley, 2013). However, the reputation of online education has still had a difficult time moving beyond the formats that came before it, with the public perceiving online as having inferior outcomes to in-person courses (Hill, 2012), and while the technology seems mature and much of the infrastructure has been developed, delivering online education has proven to be more difficult for public and other non-profit institutions than to simply produce standard courses and put them into an online format. Defining online education and determining how it is different than other educational formats is an important step in understanding what works in online education.

Online Education: A Problem with the Definition of Terms

As online education has emerged as a different format, clear distinctions of what makes a course online have not been made. In order to study an aspect of online education, it is important to first distinguish how online education is different than other formats, define what online education is, and determine the key characteristics and attributes of online education. Even these fundamental steps can prove difficult as there are disagreements in the literature on the definitions of online education (Bell & Federman, 2013; Brown et al, 2012; Moore et al., 2011) and since online education uses a wide range of contemporary technologies and formats it has a vast potential for instructional combinations of technology and instruction (Hill, 2012).

The terms that have been used for these instructional formats by practitioners and researchers are often inconsistent. In other words, there is no universal convention and terms sometimes have different meanings depending on the author and have varying

potential interpretations depending on the reader (Moore et al., 2011). For example, Brown et al (2012) reviewed a sample of 128 articles in online education and found 46 distinct terms for online education and only 18 of the articles defined the terms they used for the online education mode under study. This lack of consistency and overlapping of terms has been acknowledged by others as well:

> The breadth of the subject and the divergent objectives among those studying e-learning have led to a fragmented understanding of what e-learning means and how it should be defined. The current state of affairs is perhaps best illustrated by the many terms used to refer to instruction delivered through computer technology—e-learning, online learning, distance learning, distance education, computer-assisted instruction, computer-based instruction, technology-based instruction, technology-delivered instruction, computer-based simulation, and simulation games (Bell and Federman, 2013, p. 167).

In addition to the multiple terms used for computer-based education, the definitions of computer-based education are often overlapping with fluid boundaries. And in addition to a lack of cross-referencing between articles, there is good reason for these overlapping definitions, technology has been integrated so much into in-person courses, that in many ways, online and in-person courses are sometimes barely distinguishable (Murray et al., 2013; Zhao et al., 2005). These problems with multiple terms, multiple definitions, and fluid boundaries between terms, causes communication problems that can result in inaccurate research understanding and replication (Bowen & Lack, 2012; Moore et al., 2011; Phipps & Merisotis, 1999) especially since these disagreements on the definitions occur not only in literature and but also in surveyed opinion of education professionals (Moore et al., 2011).

Distinguishing between instructional modes. An important way of distinguishing between types of instructional modes is presented here. This is an important area, as this distinction has not been made with the following criteria prior to this dissertation. In other words, there has been difficult between these instructional

modes in the past. Different instructional modes can be distinguished by the level to which they integrate the following: *Computer-Enhanced, Internet-Enhanced, Distance*. For example, an online instructional experience is computer-enhanced, Internet-enhanced, and it occurs at a distance (Means et al., 2009). A Computer Lab uses computers, could use the Internet, but the learning does not occur at a distance. Web-Facilitated Instruction refers to courses that use computers and the Internet for some assistance but it is not the primary or only way information is transferred. In Web-Facilitated Instruction, the instructor might post readings to an Online Learning Environment, but students still attend in-person lecture and complete assignments in much the same way they would in a traditional course. These distinctions are important because they could all impact learning and thus could alter research results. Table 2.1 illustrates some of the differences, similarities, and vagueness of the terms, such as *Online, Hybrid, Web-Facilitated, Computer Lab, Classic Distance, Contemporary In-Person,* and *Traditional In-Person*.

Table 2.1

Terms used for a range of *Computer-Enhanced, Internet-Enhanced*, and *Distance* Course Formats

	Characteristics of Instructional Format		
Term Used for Instructional Format	Computer-Enhanced	Internet-Enhanced	Distance
MOOC	Yes	Yes	All
Online / Alternative / Totally Online Mode	Yes	Yes	All/Most
Hybrid / Blended / Mixed Mode / Flipped / Enhancement	Yes	Yes	Some/Most
Web Facilitated / Web-Based Materials and Activities / Adjunct Mode	Yes	Yes	Some
e-Learning	Yes	Yes	Maybe
Computer Lab	Yes	Maybe	No
Traditional Distance (Classic Definition) / Correspondence Education	Maybe	No	All/Most
Distance	Maybe	Maybe	All/Most
In-Person / Face-to-Face / Conventional / Traditional / Classroom Instruction	Maybe	Maybe	No

Online courses are conducted mostly/completely over the Internet (Allen & Seaman, 2013) and instruction and learning is intended to occur at a distance (Cahil et al.,1997; Caywood and Duckett, 2003; Zemsky and Massey, 2004). Other terms used in place of *Online* have been *Alternative* (Means et al., 2009) and *Totally Online Mode* (Harasim, 2006). A MOOC is the same as an *Online* course except that the configuration is set in such a way that allows for a ramped up (Massive) enrollment:

> is scaled to enable an essentially unlimited number of students to take the course from the faculty members, who both design and lead the course. This design process replaces the master course concept and leverages the natural scaling power of online tools (Hill, 2012, p. 92).

This should mean that a MOOC is implemented completely at a *distance* it is possible that institutions would offer a "MOOC" to a single campus and have requirements for an in-person meeting as part of instruction or assessment. However, because MOOC is an acronym for both Massive and Open, MOOC has been classified her as the same as *Online* except that it is always completely at a distance. Courses that are largely conducted over the Internet but also some in-person elements are called *Hybrid*, *Blended* (Allen & Seaman, 2013; Carroll et al. 2009; Childs et al. 2005; Hill, 2012; Means et al., 2009), *Mixed Mode* (Harasim, 2006), *Enhancement* (Means et al., 2009), or *Flipped* (Hill, 2012). Courses that use the Internet for only a small portion of the course are called *Web Facilitated* (Allen & Seaman, 2013) or *Adjunct Mode* (Harasim, 2006), or they are said to have *web-based support materials and activities* (Falvo and Johnson; 2006). E-Learning is a more general term and refers to courses that use any level of computer and Internet-based instruction, from online to web-facilitated (Moore, 2011). Computer Lab means that students meet in-person in a single room to work on computers and may or may not be connected to the Internet. Distance courses have historically been described as anytime-anywhere courses with Keegan's (1996, as cited in Bernard, 2004, p. 380) definition that included five characteristics of distance courses:

> (a) the quasi-permanent separation of teacher and learner, (b) the influence of an educational organization in planning, preparation, and provision of student support, (c) the use of technical media, (d) the provision of two-way communication, and (e) the quasi-permanent absence of learning groups.

The last criterion "the quasi-permanent absence of learning groups" suggests a certain level of isolation that the students in classic distance courses would experience.

> *Traditional Distance* [used] mainly use textbooks and other written materials (which replace lecturers), and supply students with varying degrees of individual support (academic and administrative). Under this model, distance learning is essentially self-learning, and requires great will power and self-discipline on the part of the student as well as suitable learning skills (Beller and Or, 1998, ¶6).

However, this definition of Distance courses is now disputed and a more liberal definition was introduced that has included computer and Internet to share content and as a way to communicate: “For some, the key definitional feature of [distance education] is the physical separation of learners in space and time. For others, the physical separation in space is only a sufficient condition for [Distance Education].” (Bernard, 2004, p.387). Thus, some definitions of Distance Education refer to an isolated form of education without the use of online characteristics and another definition includes Online courses in the broad category of distance courses. Even within this Traditional Distance definition, there are forms of variation, such as *Correspondence* courses, which use mail as a way of communicating, or radio and television-based distance education (Sherron and Boettcher, 1999). Lastly, there have been an array of terms for in-person courses: in-person (Bowen et al., 2012), face-to-face (Bowen et al., 2012; Means, 2009), classroom-based (Bowen et al., 2012); conventional Mehlenbacher et al (2000), traditional (Bowen et al., 2012), and classroom instruction (Bell and Federman, 2013). Mehlenbacher et al (2000) defined their in-person course as “conventional” rather than “traditional” to indicate the instructional pedagogy was not a simple lecture tell-the-class format. Bowen et al (2012, p.7) explained, “Even courses that are called ‘traditional’ almost always involve some use of digital resources.” The use of conventional can still be confusing because it does not give a sense of what technology is used for class and how much technology is used.

Lack of Universal Terms. The terms provided here are not universal across all literature. In some cases, the terms are used with completely different meanings. For example, as a demonstration of the contradictions of terms, Falvo and Johnson (2006) used the term *online courses* to describe a broad spectrum of course types that included

completely online courses where there is no in-person interaction to *hybrid* courses where class meets both online and in-person and to courses that mostly meet in-person but use *web-based support materials and activities*. Means et al. (2009) continued with this broad definition of online by stating that,

> *online learning* is defined as learning that takes place partially or entirely over the Internet. This definition excludes purely print-based correspondence education, broadcast television or radio, videoconferencing, videocassettes, and stand-alone educational software programs that do not have a significant Internet-based instructional component. Means et al. (2009, p. 9)

Here Means et al. (2009) used the term Online *Alternative* to signify a completely *Online* course. But also used *Online* in reference to *Hybrid* courses by terming them as Online *enhancement*.

Further, online could either be a complete "alternative" to in-person instruction or online elements could be added and these components would be "hybrid" or "blended" with in-person instruction.

While the distinctions may seem clear at first glance, taking a closer look at the classifications of "maybe", "some", and "most" should raise flags that there is a good deal of ambiguity. These classifications signal variation between what the terms mean. They are classified as such because of the various the ways that the terms could be applied and have been applied. Many of these definitions leave room for interpretation. As indicated in Table 2.1, there are a number of places where classification has the designation of maybe, some, or most. These characteristics mean that the term is left up to the author and reader to determine at what level the course was computer-enhanced, Internet-enhanced, and distance. This can be a problem for interpretation of study results when the course features are not described.

Problem with term ambiguity. While these qualifiers help distinguish between the different instructional formats, problems still exist. For example, designating the level of computer or Internet-enhanced is subjective. Allen and Seaman (2013) used percentages of online instruction or material to distinguish between instructional formats: Traditional (0%), Web Facilitated (1-29%), Blended/Hybrid (30-79%), and Online (80-100%). Using Allen and Seaman's (2013) percentages helps to clarify the levels of computer and Internet-enhancement, however, these distinctions still do not escape the subjectivity of applying the terms. In other words, it is not clear whether it is the amount of ***material*** that is online or the amount of ***time*** that a student spends online. One problem with using the amount of instructional material has to do with nonlinearity and multiplicity of online material, for example, the instructor could post an instructional program that has no definitive end, and thus, what may look like just a small amount of material, could take a student a large amount of time to complete. The difficulty with estimating student time is differences in student participation, for example, different students could spend considerably different amounts of time on the same material based on how interested they are in the material or how much time they need to learn it. Essentially, instructors could post a specific amount of material and expect students to engage with that material for a certain amount of time. However, students could spend very different amounts of time on that material based on their pacing and interest. Thus, we are left with subjective criteria that lies somewhere between percentage of intended instructional material and the time students spend online with online materials or tools. This subjectivity in how terms are applied makes it increasingly important for researchers to describe instructional formats and clearly indicate when in-person instructional formats

are used and when computer and Internet-enhanced formats are used and to describe the characteristics of the computer and Internet-enhancements. The next few sections of this dissertation provide some of the essential aspects of online education. These sections go beyond the ambiguity of the terms described above and offer important markers for both online educators and researchers for the implementation and research of online courses.

Key Characteristics of Online Education

Unlike many other prior educational technologies, computers and the Internet are not single types of media. Instead computers and the Internet are *vehicles for multiple types of media*. These technologies often make media easier to use and access. Computers also often enhance the functionality and quality of the media as well. Whereas filmstrips, radio, course readers, and phone teleconferencing were each a single source of media, computers and the Internet can display video, audio, and text of multiple forms. So now the content of filmstrips, radio, and readers can be accessed on a single device and can be manipulated so that users have greater functionality. For instance, course participants can utilize computer-mediated communication technologies that mimic the phone teleconferencing but also utilize on-screen visual manipulation devices and text-based chat functions. Or students can watch videos online that mimic videos but also allow for instant replay. And in addition to being able to duplicate these technologies, computers provide greater access and enhance the technologies. Instead of having to have physical film for each video, instructional videos can be stored on a server and can then be accessed from any computer with Internet connection. The video can also be easily duplicated and saved as relatively small files on a computer, thumb drive, or DVD. Computers enhance the quality and functionality of the video, text, or audio; computers

and the Internet make materials more accessible; and digitization makes materials more compact and requires less equipment to access multiple forms of media.

Computer Enhancements have introduced the intellectual power of computers to education. Internet Enhancements have allowed the transfer of Information through Internet. Computer-enhancements and Internet-enhancements can be considered two separate forces, however, except for some instances of Computer Lab and Contemporary In-Person instruction, courses that use some form of e-learning generally use computers in combination with the Internet. This combination may allow for more dynamic technology-enhanced courses through greater functionality, access, and portability. Thus, in addition to being at a distance, an online course can be described as being Computer and Internet-Enhanced. Computer and Internet Enhanced education utilizes the intellectual power of computers and the distribution of information through the Internet. Through an extensive review of the literature, Computer and Internet enhancements seem to come from three main sources: Communication, Organization and Distribution of Content, and Content Interaction and Assessment (see Table 2.2). While no known article to date lists all of these characteristics, there are some that list many of them. For example, Caywood and Duckett (2003) defined online courses as a course that separates students from the instructor in both time and place, is conducted over the Internet, and uses a tool-mediated form of communication. Rovai (2001) went a little further and described four types of programs that are often included in Online Learning Environments (OLEs):

> (a) productivity tools such as calendars, address books, and information services; (b) communication and collaboration tools, the most important of which are discussion boards, e-mail, and group areas; (c) assessment tools such as computer-assisted testing and an online gradebook; and (d) content management tools that allow the online instructor to present a rich content online, including hypermedia (Rovai 2001, p.110).

Similarly, Zemsky and Massey (2004) noted that online courses opened markets through the following characteristics: Distance Education, Facilitated Transactions Software, and Electronically Mediated Learning. In a course that was offered in 1994, at the very beginning of the World Wide Web, one can sense their realization of what online material provided when Cahil et al. (1997, p.97) described the online course they studied as "a foreign language course entirely on-line to college undergraduates. The course uses a distance learning approach that incorporates an electronic messaging system, multimedia, World Wide Web, and Internet assignments." Similarly, for a hybrid course offered in 1997, the authors expressed their pleasant surprise of communication and organization software, when they stated, "the advantage of offering all these features [electronic mail, web pages, and newsgroups] within a single platform, thereby increasing communication coordination and convenience for both students and faculty members" (Arbaugh, 2000). Rudak and Sidor (2010) used three main categories to discuss online education: Organization (materials stored online), Communication, and Structure (such as pedagogy). Combining all of these together, online courses can be described as having four main characteristics:

- Distance
- Communication
- Organization and Distribution of Content
- Content Interaction and Assessment

These characteristics are mapped out in Table 2.2 and then explained further below. Each article referenced in Table 2.2 provided a definition of online education using one or more of the four characteristics above. The way these characteristics are realized in an

online course are described by the *Component-Activity Operation* sub-section of the literature review in this dissertation.

Table 2.2
The four main characteristics of online education

Essential Characteristics of Online Education*	Four Main Characteristics	Sub-Characteristic	Reference
Distance	Distance		(Cahil et al.,1997; Caywood and Duckett, 2003; Zemsky and Massey, 2004)
Computer and Internet Enhancements	Communication	Communication Software	(Arbaugh, 2000; Cahil et al., 1997; Caywood and Duckett, 2003; Dabbagh and Kitsantas, 2013; Rovai, 2001; Rudak and Sidor, 2010; Zemsky and Massey, 2004)
	Organization and Distribution of Content	Organization of Content	(Arbaugh, 2000; Dabbagh and Kitsantas, 2013; Rovai, 2001; Rudak and Sidor, 2010)
		Distribution of Content	(Cahil et al. 1997; Dabbagh and Kitsantas, 2013; Rovai; 2001)
	Content Interaction and Assessment	Content Interaction	(Cahil et al., 1997; Dabbagh and Kitsantas, 2013; Rovai, 2001; Zemsky and Massey, 2004)
		Assessment	(Dabbagh and Kitsantas, 2013; Rovai, 2001)

*By definition, online education has the *Distance* characteristic and at least one *Computer and Internet Enhanced Characteristic*

Distance. Online courses are a type of distance education (Bernard, 2004; Caywood, et al., 2003). By this definition, people should be able to take an online course over a long distance. However, there are some exceptions. Some online courses have the requirement of showing up for an introductory meeting (Taraban et al., 1999; Wallace and Clariana, 2000), while others require students to take exams in-person (Poirier and Feldman, 2004; Taraban et al., 1999). An online course that does not require any in-

person meeting or assessment is sometimes referred to as a fully online course. This is important to communicate with potential students since some students might register with a course under the assumption they could take the course without meeting in-person. As an online course moves away from distance and requires some in-person attendance, it becomes a hybrid or blended course (Allen & Seaman, 2013). So fundamentally, an online course has the characteristic of being a distance course. While online courses are a type of distance course, not all distance courses are online. Educators have the option to share CDs, DVDs, or hard copy materials to create activities and assignments. However, since distance courses require a means for sharing information over a distance, using the Internet to communicate and share materials instantaneously in digital form makes online education a convenient option for distance education. Vice versa, distance can be beneficial characteristic for online courses: "Distance learning provides answers to the problems of availability (accessibility and cost) and the demand for flexibility (time, place and pace) of learning" (Beller and Or, 1998, ¶6). Distance can influence common attributes of online education, such as media, synchronicity, symmetry, anytime and anywhere, multiplicity, non-linearity, control of pacing, sequencing, content and component-activities, effectiveness, and efficiency. How distance affects these common attributes are discussed in the sections below. As noted for many of these attributes, distance provides the space by which a student can work individually so that many of these attributes can occur as to not disturb others in the class but also affects interaction between students and instructors with other people in the course and the content. However, online education bridges the distance gap through the mediation of online technologies.

Communication. Historically, distance education often meant isolated and independent work. Working with others meant students would have to meet together in-person or schedule phone conferences. Computer-Mediated Communication (CMC) in online courses has simplified the process for collaboration that was traditionally difficult in distance courses (Hrastinski, 2008). Part of the benefit of CMC is the range of possibilities available to instructors and students for communication, which allows for broad pedagogical options. To understand what is possible through CMC, it is important to understand the characteristics of CMC. Communication technologies can be described through three main properties: type of media, dialogue potential, and synchronicity. Advances in computers and the Internet have made possible new forms of communication through combinations of media, variations in synchronicity, and symmetry. For example, conferencing software allows for the immediacy and dialogue potential of in-person communication and allows for the use of multiple forms of media (i.e. audio, text based chat, and picture display and document sharing). These improvements in technology give instructors greater range in communication possibilities but they also allow greater control for the instructor over timing. For example, instructors can set deadlines for blog or discussion board posts. Synchronous communication, such as chat and video conferencing require the two or more parties be present at the same time. Additionally, OLEs are developed with software meant to help to facilitate online interaction between individuals (Falvo and Johnson, 2006); this means that instructors and students are provided with communication software without having to look to external developers. As with Distance, the Communication characteristic of online courses affects common attributes of online education and this is discussed in the sections

below. As noted for many of the attributes, Communication technologies provide a mediating tool that allows greater variation in how individuals connect and this variation affects how online courses operate.

Organization and distribution of content. One of the big benefits of computer and Internet enhanced education is the ease with which educators and students can organize and distribute content. The World Wide Web brought websites and webpages to the general population. Websites allow for the storage of information and links to sites and pages with other information. Universities and industry quickly got into the online business by creating Online Learning Environments (OLEs) (Hill, 2012) . These platforms provide easy-to-use locations to store and distribute information, content, materials, and links to educational software and videos. Instructors and students can now easily upload and access materials from a computer wherever there is an Internet connection. The technology has advanced so that the amount of information storable and retrievable is extensive. Information that would once take up the physical space of whole libraries can be stored online and viewed from computers and portable devices. Instructors can post volumes of material with little or no additional cost. Thus, OLEs and other technologies allow for an easy place to house the materials and links of multiplied potential learning experiences. OLEs "help instructors provide their students with learning materials and activities while tracking participation and progress through data systems and assessments" (Falvo and Johnson, 2006). As with Distance and Communication, the Organization and Distribution of Content characteristic of online courses impacts media in online education and this is discussed in the sections below. As noted for many of the attributes, Organization and Distribution of Content technologies

provide a mediating tool that allows greater access to material and this access impacts the operation of online courses.

Content interaction and assessment. Another general characteristic that helps define online education is how the students interact with and are assessed for content. Computer and Internet enhancements have allowed for automated, adaptive, and intelligent content interaction at a distance. While computer enhanced education has been around for decades before online education took off, it was generally limited to on-campus computer labs and those that could afford home computers. Further, with developments of new technologies, computers have gotten better at adapting to student behavior. Graphics have improved and processing power has increased so that computers have greater response time to student interaction. The advancements in communication software and the ability to organize and distribute content has made computer and Internet enhanced activities and assignments available at a distance. This means that students can interact with videos, simulations, online quizzes, and adaptive environments from their own home, a coffee shop, the library, or anywhere that is convenient and has access to the Internet.

An evaluation of online courses examined a wide range of online course component-technologies (Yun et al, 2013; see the *Operation of the Component-Activities* section of this dissertation). Some of these technologies include replayable videos that students can play, replay, or find specific points within the video; online discussion boards, online chat, email, online quizzes, online readings, and intelligent tutoring systems and adaptive homework. One change that computer and online enhancements

have brought to online courses is a change in the possibilities for nonlinearity (see the *Non-linearity* section below).

While formative assessments can utilize automated and adaptive technologies to redirect students to other problems and immediate feedback for continuous improvement (Narciss, 2008), summative assessments can redirect students to problems that help pinpoint participant knowledge given a specific amount of time. However, one of the more obvious features that computers and the Internet provide is the ability for students to be assessed at a distance. Students can submit papers and essays through an LMS assessment upload program or through email. Restricted answer, multiple choice type tests, can also be conducted through institutional software, such as an LMS. If instructors are interested in increased security around the possibility of cheating, there are online proctoring services and companies. However, even with the possibility of online proctoring, instructors often choose to have tests proctored in-person. This preference for in-person could be because of cost, logistics, or the need for performance based assessments that are not compatible with proctoring services. Some instructors have students show up during the course orientation with a photo ID to ensure that the student taking the course matches the student that gets credit (Carey, 2001). While there have been advancements in online summative assessments, cheating is still possible. Bacow et al (2012) suggested that alternative assessments that require more time and more personalization, such as long-term performance assessments (e.g. performances and projects), should be used to replace the selection-type (e.g. multiple choice and true-and-false) and supply-type assessments (e.g. fill-in-the-blank and short essays) that are often used (and cheated on) in online courses. Another possibility that was suggested was to

use in-person testing centers, instead of online assessment technology, for high stakes assessments (Bacow et al., 2012). Hillman (2011) used fictitious students to investigate potential cheating practices at for-profit online programs and found a range of neglectful cheating and plagiarism enforcement by instructors. In some cases, instructors actively encouraged cheating type behaviors (Hillman, 2011). For example, in one of the cases Hillman (2011) described how the instructor responded to a fictitious student that had failed a quiz:

> When the student failed two multiple-choice quizzes, the instructor reminded the student that each quiz could be retaken and that since the correct answers were displayed after completing it the first time, "it's not hard to get a 100% on the second try; just jot down the correct answers and take the quiz again.

Thus, online courses have great new assessment capabilities. However, these assessment capabilities are susceptible to cheating practices of both students and instructors.

As with *Distance*, *Communication*, and *Organization and Distribution of Content*, the *Content Interaction and Assessment* characteristic of online courses affects media features in online education and this is discussed in the sections below. As noted for many of the attributes, *Content Interaction and Assessment* technologies provide a place for interacting with material for learning and assessment and this impacts the operation of online courses.

The combination of these four characteristics seems to differentiate online education from other forms of education. These four characteristics add bring to online courses different qualities. However, to make an online course, all that is required (by most definitions), is *Distance* and one of the Computer and Internet Enhancements (*Communication*, *Organization and Distribution of Content*, or *Content Interaction and Assessment*). While many online courses use a variety of Computer and Internet

Enhancements from each of these three areas, online courses only need one of these general characteristics to be classified as online and that each of these characteristics can be expressed in a diversity of ways helps illustrate the diversity of form of online courses. As explained in the next section, the four characteristics of online education (*Distance*, *Communication*, *Organization and Distribution of Content*, and *Content Interaction and Assessment*) interact with features of curriculum and content, particularly, *Control*.

Control Source and Type

One of the big impacts that online education characteristics have is on the ability and ease to vary *Control* type and source. *Control* is the power to make decisions about certain important aspects of a course. There are two important aspects of control: *Source* and *Type*. A clear distinction between these two areas of control has not been apparent in the literature prior to this dissertation. However, after a thorough review of the literature, this distinction is made here. There appear to be four main *Sources* of control: *Instructor*, *Learner (Individual), Learner (Group)* and *Computer-Automation*. Additionally, from the literature, there appear to be four main *Types* of control in a course setting: the *pacing* of content and activities, the *sequencing* of content and activities, the *content*, and the *component-activity* (including activities, assignments, assessments, and their associated media-technology tools).

Source of control. A review of literature has revealed that there appear to be four main sources of control: *Instructor*, *Learner (Individual), Learner (Group)* and *Computer-Automation*. These sources are not immediately apparent in the literature, as different authors have focused on different sources, or have blended sources with types of

control, and until this dissertation, there has neither been a distinction between type and source, nor has there been a comprehensive list of the different types or sources of control.

Online learning environments can be highly instructor-controlled, highly student-controlled, or highly computer-automation controlled. Or the online learning environment can be a combination or blend of all of these different sources of control (Hamilton & Tee, 2010). Moore et al. (2011) described some combinations of these control sources by describing three forms of online courses: instructor-controlled, self-paced, and self-directed. In instructor-controlled environments, the instructor sets the sequencing and pacing. In self-paced environments, students have some control over the pacing of instruction and can choose how quickly they want to go through the course material. In self-directed study, students choose every aspect of learning, from what they will study to when they will study it. However, these definitions provided by Moore et al (2011) seem to be an amalgam of both source and type. There are multiple possible combinations of control in a course and across different component-activities in a course. Some aspects of a course could be instructor-controlled while other aspects are self-paced or self-directed. For example, an instructor might allow students to self-pace on the homework, but then might require students to complete quizzes at certain times. Also, a course might be completely self-paced except that it has to be completed within the time-frame of a semester or quarter (Lowenthal et al., 2009). Further, computer-automated can be mixed into certain component-activities and control can be programmed before the construction of the course (i.e. it can be pre-bought) or an instructor can program aspects of the media. Smith and Dillon (1999) distinguished between two sources of *Learner-control*: *Individual* and *Group*. These two types of learner control determine whether an

individual student makes decisions about the learning process or whether the student works within a group to make those decisions. This can greatly influence the decision-making process. For example, an individual student experiences both the freedom and responsibility of making decisions about every step of the process.

An individual in a group can also make many of the decisions for the group, or a student can sit back and let the group make the decisions for her/him. This means that the decisions about learning processes may be blind to the individual student needs. This problematic decision-making can be further exacerbated when the students in the group are unaware of effective learning practices, if socializing distracts students, if there are problems with technology; or if some of the students are unmotivated. For example, Capdaferro and Romero (2012, p. 26) described some of their findings:

> The perception of an asymmetric collaboration among the teammates was identified by the students as the most important source of frustration. Online learners also identified difficulties related to group organization, the lack of shared goals among the team members, the imbalance in the level of commitment and quality of the individual contributions, the excess time spent on the online CSCL tasks, the imbalance between the individual and collective grades, and difficulties in communication, among other factors leading to frustration.

From this we can see that online education can make group decisions even more difficult. Further, having differing goals, motivations, and work ethics can make group control difficult for making the optimal decisions for each member of the group. Thus, one the one hand, the group might make decisions that are bad in general and bad for the individual students in the group. On the other hand, a group can be an effective way of supplying students with peer guidance and feedback by what has been referred to as the Zone of Proximal Development (Cole, 1996; Daniels, 2001).

Decisions about pacing, sequencing, content, and component-activity can occur *before* or *during* the course. An instructor can make decisions about how to promote and constrain the choices of students. Instructors can promote certain decisions by adding incentives (such as adding grade points) for participating in certain activities and learning in certain ways. Or the instructor can more subtly promote learning activities by including certain materials or activities on the course OLE. Conversely, an instructor can constrain student decisions by adding penalties for certain learning activities and more subtly constrain choices by reducing materials on the course OLE.

Table 2.3

Sources of control before and during a course

Source of Control	Before Course Begins	During the Course
Instructor Controlled	Design specific structure into course and component-activities	Instructor can make adjustments to course structure based on intuition, student feedback, student output and outcomes, or other environmental data.
Learner Controlled (Individual)	Selection of courses that match control preferences	Depends on level of control granted to the student and whether student chooses to follow course structure.
Learner Controlled (Group)	N/A	Depends on level of control granted to the group and whether students in the group choose to follow course structure.
Computer-Automation Controlled	Can be programmed to be set for a specific structure and can be adjusted based on instructor changes or student interaction data.	Follows a predetermined structure and path (e.g. rigid or adjusts based on student interaction data).

While control can be dispersed to different parties in traditional in-person courses, online courses provide a format that is naturally prone to diffused control. Control is inclined to escape instructor control in the online environment as students are less of a captive audience and instructors rely more on media to provide course structure.

Additionally, online characteristics make it easier to vary the source and type of control. In turn, this variation has a large impact on the curriculum and structure of a course.

Type of control. Piccoli et al. (2001), and later Sitzmann et al (2006), described three types of control during instruction (*sequencing*, *pace,* and *content*). Where the control over these aspects of instruction resides can affect student experience (Sitzmann et al., 2006). In addition to sequencing, pace, and content, students have the capability of controlling the *types of activities and assessments* they will participate in. For example, Miller, Risser, and Griffith (2013) described a college introductory statistics course in which students were given the option to attend an in-person lecture or an online synchronous conference type lecture. Thus, there are four main types of control in a course setting the *pacing* of content and activities, the *sequencing* of content and activities, the *content*, and the *component-activity* (including activities, assignments, assessments, and their associated media-technology tools).

The different subsections below (*Pacing*, *Sequencing*, *Content*, and *Component-Activity*) describe the specific types of control.

Pacing. Pacing refers to the speed at which the course and component-activities are enacted and completed. For example, assignments might have to be completed weekly or midterms may occur at a specified time. In a study by Tucker (2001) of an online course, materials, such as lecture notes, audio explanations, and video lectures were posted once per week and students had just one week to access them. This keeps the students focused on the material for the week so the material, in the week after or before, does not distract them, although a potential downside is that students are unable to look up information from prior lessons that they may need, and they are unable to prime their

learning for the next week. Sexton et al (2002) conducted a study that looked at the difference between in-person and online students. The online students were paced to the extent of their own abilities. If the student successfully passed a quiz for the lesson, they would receive a check mark and were allowed to move on. So, while these types of pacing possibilities can be used to motivate students and keep them on track, they could just as well inhibit the students' ability to use other parts of course materials that would be beneficial. It also does not allow students to move at the pace they see best for themselves and places all students in a one-size fits all structure.

Taraban et al. (1999) showed that students my not make the best decisions about pacing in regards to learning effectiveness. In their study, the online course as completely asynchronous and self-paced (except for the tests that would occur every three weeks). The online course material was posted for the unit and students could access the material and practice quizzes at any time during the exam cycle. Virtually all students would wait until the last couple days of the exam cycle to access the material. These students chose procrastination over prolonged study. While this type of study method may result in good exam grades, the more effective method for mastery and long-term memory is prolonged study [studies]. In a sense, students were choosing the most efficient way of achieving a good grade but ignoring the most effective learning process. This type of decision by students points to the priority of student goals, how students understand effective learning practices, or both.

What is unclear is the most effective balance between different sources of control. The different sources of control (instructor, individual students, student groups, and computer-automation) have different advantages and disadvantages. Questions about the

most effective and efficient ways to distribute control remain. Understanding the decisions that students make, why they make them, and how these decisions impact the results of the course can help course designers when building a course.

Sequencing. Instructors can also control how the materials are sequenced, or the order in which material is experienced each week (or module) and the sequencing for the whole term. Instructors can give a linear structure to their course but may branch this core curriculum to extra materials, thus the course uses multiple media potentials. Collis and Moonen (2001) described activities before, during, and after a focal event that is aimed at bringing together the lesson and focusing the curriculum. Online courses can change the way that content is sequenced (such as "flipping" the classroom so that the lecture happens via video recording before scheduled meeting times) and this sequencing can be designed into the course. Adapting the course web material to match student characteristics could maximize learning benefits. Graff (2003) found that segmenting portions of the course helped students with certain cognitive styles but decreased the learning for students with other learning styles.

Branching is a term used to describe the instructional action when the "sequence of instruction is determined by prior response. Thus, individual learners can select or be directed to different instructional events depending upon interest, need, or competency level" (Smith and Dillon, 1999, p. 18). Branching is a form of sequencing that relies heavily on prior actions and performance. The instructor, student, or computer-automation can control branching. One of the benefits of computer and Internet enhancements is that computer-automation can quickly individualize student instructional paths based on data from prior action.

Content. As instructors plan the curriculum, they can make predictions as to how students will interact with the material and try to plan for student needs. Whereas an in-person instructor can sometimes just show up on the day of a class and determine the lesson plan in class, online classes often have to be pre-planned well in advance of the date of instruction. Because online students are unable to look to the student next to them for help or modeling, instructors must pre-plan the computer-mediated learning environment. These preplanned learning environments can either take the form of computer-mediated communication or such media as video tutorials. Since the their interaction is limited to the capabilities of computer-mediated interaction, instructors must think out what students will need ahead of the instructional period and what can be accomplished through computer-mediation; in online environments, students are unable to just ask the student next to them how they are approaching a problem or studying for the final.

While students can visit any external site they navigate to, a course can designate the content that is posted on the course website or distributed through some other means. Learning objectives can be set and students can be expected to accomplish those objectives, as new content and media are designed and incorporated into the course. To some extent, multiplicity can be increased or decreased by the amount of material that has been included. Students have always been able to move beyond the material in a course (e.g. a visit to the library) but instructors can signal the material on which to focus on by limiting course-specific content. Poirer et al (2004, p.60) described an online section of a course that used a Learning Management System and had "unit introductions consisting of text and audio files, learning objectives, reading assignments, Web activities,

short paper assignments, and practice exams were posted on the eCollege site." In this way, material posted on a course website can point students toward what is needed to succeed in the course. There is always the potential that students will find additional material or support outside of class, but students could also stay within the course content set by the instructor. How students vary in their approach to content exploration is important in the understanding of how students learn the content of a subject area and how variation occurs in the results of online courses.

The content set by the instructor can be organized based on different levels of student abilities. This helps meet the student at their level as they enter the course, building on a learner-centered structure and allows for greater access starting at the course entry-point. Gilliver, et al. (1998) described an experimental study of a computer-enhanced Economics course that created a website that was broken up into beginner, average, and advanced materials. The course website had 800 pages with resources and were broken up in the following ways:

Slow:

- Detailed Lecture Notes
- Lecture Examples
- Variations of Lecture Examples
- Tutorial Questions
- Tutorial Solutions
- MCQ's [Multiple Choice Questions]
- Frequently Asked Questions
- Email access, 24 hours per day

Average:

- Additional Questions (same standard as tutorials)
- Library References

Advanced:

- Advanced Readings
- Comments from Practitioners
- Advanced Questions, combining several weeks' topics at once (Gilliver, et al., 1998, p. 217)

The students that had access to the site were able to choose between the levels of materials based on their own self-perceived abilities. Once they chose a certain level, they were encouraged to stay at that level. The group of 111 students that had access to this website did significantly better (mean 71.4% for course grade) than the 333 students in the traditional course that did not have access to the site (mean 64.5% for course grade) with fewer students in the low end of the course grade. The results are a clear indication that extra material, meant to meet the student at their level is beneficial to the student development. As this study showed, course material can build from a beginning level, where students can get the basic level of support, into advanced material so that students can move further toward subject-level expertise. However, despite the potential, the advanced material had very few visits. The trick is to motivate students to surpass the basic course satisfaction requirements and foster in them an even greater interest in the material or topical area.

Metacognitive skills relevant within a specific subject can be embedded in the material so that students learn to think more like an expert. Zion et al. (2005) investigated the effects of metacognitive embedded instruction on student performance. The group that received metacognitive guided inquiry in an asynchronous form scored better than groups that did not receive the treatment and a group that received the treatment embedded in an in-person setting. This suggests that the course curriculum can go beyond simple subject matter and move into lessons that will develop how students think about the material.

Learner control can either be high or low (Hamilton & Tee, 2010). An example of extreme learner control is a non-enrolled student that visits education websites and

decides what, when, and how quickly to view the material. Someone can choose to use the video tutorials on the Kahn Academy website and work through Carnegie Mellon's Online Learning Initiative asynchronous course material without pressure of the order or pace at which to move through them. The student can use as much or as little of the material as they like, can move to other websites, and can end learning the material at any moment. This allows students to determine their own curriculum based on their interests and learning needs. The argument for learner control is rooted in Constructivism and Learner-Centered theory. Students are able to control what they learn and how they learn it based on their prior knowledge and their abilities. However, in a high learner control environment, learners can be quickly overwhelmed with an overwhelming sense of choices.

Allowing for a high degree of learner control assumes certain characteristics of the students; "it is likely that more extensive control aids only the learning of students with very high levels of prior knowledge of the subject matter and/or those who have learned how to benefit from increased control" (Clark, 2005, p. 26). McManus (2000) looked at how nonlinear media interacts with advanced organizers and self-regulated learners. While there was no significant interaction between nonlinearity and advanced organizers or self-regulated learners, McManus (2000) recommended that for students who have low to medium levels of self-regulation, either more linear environments be implemented or these students should be provided with advanced organizers.

Schmeeckle et al (2003) conducted a study on a Law Enforcement Training program. All of the material in the program had a high level of user control, however, the students had to complete the two or three days of material during the span of a week.

Also, the instruction provided hints on how to move through the material, which included text, activities, example forms, some accompanying photos, some video segments, and review questions. At the beginning of each unit, there was a "user guide" introduction that discussed the purpose of the lesson and the learning objectives. And at the lesson level, more specific learning objectives were listed. So, while it was up to the student to decide how to move through the material, there was suggestion from the program on what the students needed to learn.

Component-activities. Twigg (2003) termed the combination multiplicity and high user control over media selection as, *The Emporium Model*. This model allows students to decide what materials to use and when to use them based on what they are trying to learn. The *Emporium Model* can be seen as a variation of the *convergent* media structure, in that whatever medium the student chooses to learn in should guide them towards the learning objectives for the course:

> The emporium model is heavily dependent on instructional software, including interactive tutorials, computational exercises, electronic hypertextbooks, practice exercises, solutions to frequently asked questions, and online quizzes. Modularized online tutorials present course content with links to a variety of additional learning tools: streaming-video lectures, lecture notes, and exercises. Navigation is interactive; students can choose to see additional explanation and examples along the way. Online weekly practice quizzes replace weekly homework grading. With the development of a server-based testing system, large databases of questions are easily generated, and grading and recordkeeping are automatic. (Twigg, 2003, p. 35)

The material is heavily asynchronous and allows for a blending of course sections so that there is a single large section for a course with multiple faculty and TAs teaching a single section of the course, an instructional model that administrators often envision when thinking of cost savings and the model that instructors fear will replace their jobs. The argument against this model is that students don't have the level of contact that they would have with instructors if their course was taught in-person. In this model, instructors move away from the traditional lecture model and instead take on the role of

responding to student needs. Additional graduate students and peer tutors can be hired to help guide students seeking help (Twigg, 2003).

High levels of learner control may be beneficial in the uses of certain media. Zhang et al. (2005) conducted a study in which students in one group were able to control their pacing of videos, the ability to switch between watching the video with notes or to video without notes, and quickly flip through material while another group was limited to viewing material in a linear order. The group that was allowed to control the level of pacing and order of viewing scored higher than the group with low user control. In another similar study by Zhang et al. (2006), a group with high-level user control of pacing when flipping through materials and modality scored higher on the post-test than a group with low-level of user control.

Relationship between control source and type. In any learning situation, there can be ascribed a control source and type. Thus, in any learning situation, there will be some combination of control source and type. For example, a learner could be controlling the pacing of the course or an instructor could be controlling the content of the course. Table 2.4 provides example descriptions of these pairing relationships between the type and the source of control.

Table 2.4

Examples of how types of control and sources of control pair

Type of Control	Source of Control			
	Instructor Controlled	Learner Controlled (Individual)	Learner Controlled (Group)	Media Controlled
Pacing	The instructor sets the pacing ahead of the course start date and could change it based on student feedback or data from student output and outcomes	The student determines the pacing of the course based on goals, motivation, and self-perceived performance	The group negotiates the pacing of the course based on goals, motivation, and self-perceived performance	Pacing is determined through a computer program based on how the student scored on a prior assignment/ assessment
Sequencing	The instructor sets the sequence of the course ahead of the course start date and could change it based on student feedback or data from student output and outcomes	The student determines the sequencing of the course based on goals, motivation, and self-perceived performance	The group negotiates the sequencing of the course based on goals, motivation, and self-perceived performance	Sequencing is determined through a computer program based on how the student scored on a prior assignment/ assessment
Content	The instructor sets the content ahead of the course start date and could change it based on student feedback or data from student output and outcomes	The student determines the content of the course based on goals, motivation, and self-perceived performance	The group negotiates the content of the course based on goals, motivation, and self-perceived performance	Content is determined through a computer program based on how the student scored on a prior assignment/ assessment
Component -Activity	The instructor sets the activities, assignments, and assessments ahead of the course start date and could change it based on student feedback or data from student output and outcomes	The student determines the activities, assignments, and assessments of the course based on goals, motivation, and self-perceived performance	The group negotiates the activities, assignments, and assessments of the course based on goals, motivation, and self-perceived performance	The activities, assignments, and assessments are determined through a computer program based on how the student scored on a prior assignment/ assessment

Media in Online Education

Idiosyncratic Variation of Media Features in Online Education. Advances in computer technology have made creating various types of media easy for even the most basic user. Instructors with little prior experience creating multimedia materials are able

to create presentations, videos, and orchestrate conferences with little training. This means that instructors can increase the amount of media available to students without having to be experts in media creation. However, the ease of manipulation that new technologies provide also means that many instructors can create content without necessarily knowing what is effective and when it is effective. Additionally, instructors can easily select computer-automated media programs on a whim. Further, without close examination of how media is presented and used, research into online education could be missing a key element of why courses succeed or fail. Disseminating this information to instructors and course developers are immensely important, as they will be left to instinct and uninformed knowledge designing media and constructing online courses. Quality media that has been created based on research will have an advantage in creating successful learning experiences. And this differentiation could have a large impact on outcomes. Without knowing the quality of media in an online course makes research difficult to interpret. Any grand generalized statement made by a meta-analysis or literature review about online education without knowing the quality of media has a high potential for bias.

In other words, understanding media quality is especially important since media plays a large role in online courses, acting as the mediator between different actors for most course operation processes.

In an earlier section of this dissertation a review of the literature found four *Key Characteristics of Online Education* that represent the unique and necessary pieces that make a course online. One of the more noteworthy contributions of *Content Interaction and Assessment* technologies has been the *processing capabilities* that have been

developed over the years with advancements in computing and Internet. Learners can now interact with media in ways that were previously reserved for just human-to-human interaction. Among other capabilities, media can now react to student actions. For example, educational video games will run a simulated world, can take in information about student action, and then react in a way that logically corresponds as appropriate. Some of these capabilities are explained below in the sections of synchronicity and symmetry. Another characteristic of online that contributes to media features is the *organization and distribution of content*; through this key feature, online courses can produce more material, contributing to the *Multiplicity* feature explained below.

In addition to profound way that *computer and Internet enhancements* are linked to media, *distance* provides space for students to view of media as an independent task. While students can all view media independently in a classroom, a shared space can constrain options. By providing independent space for learning, student interaction with media can occur more individually and more freely without the constraints of a class, group, or instructor. Because online education takes place only when it is at a distance and through one or more computer and Internet enhancements, media is a compulsory mediator for learning.

Definition of Media. Because online education must be conducted through some form of media, it is important to understand what media is. Media are the means by which information is presented. Salomon (1978, p. 1) described media as "an entity consisting of technology, contents, instructional situations, and symbol systems." Kozma, (1994, p. 11) used this definition as a guide but compounded the description of media as having three integrated parts (*technology*, *symbol systems*, and *processing capabilities*).

> Technology is the physical, mechanical, or electronic capabilities of a medium that determine its function and, to some extent, its shape and other features. These are the surface characteristics of media that we typically use to classify something as a "television," a "radio," and so on, in everyday language. From a theoretical perspective, however, the primary effect of a medium's technology is to enable and constrain the other two capabilities and these are the aspects of media that have more direct implications for cognitive processes. (Kozma, 1994, p.11).

As Kozma (1994) described, technology is the means by which a medium's *symbol systems* and *processing capabilities* are enabled or constrained. The medium's symbol systems are the ways information is presented. This presentation can be textual, audio, pictorial, or video (Mayer, 2005; Smith & Dillon, 1999). *Symbol systems* can be "spoken language, printed text, pictures, numerals and formulae, musical scores, performed music, maps, graphs, and so on" (Kozma, 1994, p. 11). Or it can be a combination of these, such as audio and video, or audio and video with textual display on the screen. Certain combinations and design principles have proven more effective to student learning than others (Mayer, 2005). Similarly, some things are easier to learn using specific media forms than others (Cobb, 1997; Mayer, 2005). The last attribute of media is *processing capabilities*, which are, "the ability of a medium to operate on available symbol systems in specified ways. In general, information can be displayed, received, stored, retrieved, organized, translated, transformed, and evaluated among other processes" (Kozma, 1994, p.11). Essentially, *processing capabilities* are how the media function. These three attributes make media inextricably linked to computer and Internet enhancements of *Communication*, *Organization and Distribution of Content*, and *Content Interaction and Assessment*. Thus, online education is inextricably tied to media at some level. Infinite combinations in the realization of media and interaction with media can make each experience of the medium unique. The sections below describe some of the common media features in online courses.

Media Features

Media form. Each instance of media can be seen as having certain properties that give the media form (Wysocki, 2004). For example, if we were to look at media on a computer screen, the content would be presented in a certain form (e.g. text, static image, moving image, sound). These forms of media would be made up of certain properties: the background could be made up of shapes, color, text, and possibly images; text could be described in font such as typeface, size, style, color, and position on the screen; certain graphics, such as dots, arrows, lines, or checkmarks, might be presented with specific sizes and positions on a website; and static and moving images would have similar properties, such as, shape, position, size, color, and quality, however, moving images would also have a temporal property that means these other properties could change over the duration of the moving image; finally, sound could be seen as having general properties, such as volume or quality but could also have qualities attributed to either verbal discourse or music.

Out of all of the features of media, *media form* seems to have the most controlled type studies (Mayer, 2005) and is likely the most heavily researched media feature. This massive amount of research could be the result of practicality. Different types of *media form* can be easily produced and tested for learning effectiveness in short laboratory situations. This lends itself nicely to practical studies that can be easily reproduced or replicated with small variations. Many of the other media features described in the other sections below can be more difficult to test outside of the context of an actual course and this makes replication difficult. However, the frequency with which instructors use the principles that have emerged from multimedia learning research (Mayer, 2005) is

unknown and should be accounted for in research in online education. In order to understand how multimedia principles have been applied in the real world will require a renewed effort that combines methods of documentation and analysis that can capture how courses implement media form.

Media structure. The media across a course can be described by structure. Posner (1992) outlined four types of media structures: *parallel, convergent, divergent*, and *mixed*. These media structures describe how course materials and content are related to learning objectives. In a *parallel* media structure, students are expected to move through multiple media in ways that have little to do with each other. For example, our statistics course might be presenting simple linear regression in the textbook and there are diagrams of the linear regression in the lecture notes, but the two might not be teaching the same aspects of regression or in the same order. Therefore, it is up to the instructor or student to move between the two, pulling out the parts that are relevant to what they are trying to teach/learn. The readings and the diagrams are presenting parallel content with no overlap in objectives. In a *convergent* media structure, all media are focused on achieving a single objective, so if there is a lesson on calculating *r*, then the textbook, the workbook, and the lecture are all presenting instruction on how to calculate *r*. This type of media structure is *convergent* because all media is converging on the same outcome. A media structure is *divergent* if a medium is aimed at achieving multiple outcomes. Anderson et al. (2001) used the example of a field trip to the zoo as this type of *expressive objective*. There is no specified objective for the field trip, instead the objectives are the experiences and new insights that a student might have as a result of going to the zoo. Finally, there are *mixed* media structures. In a *mixed* media structure,

there can be divergent media, which might change into parallel media, and then might converge on the same objectives as other media.

Even as the Internet is expanding educational practices these models still hold up; however, whereas once they may have been rather simple, they can get very complex with the vast amount of learning materials and information that can now be acted on by students in courses. As explained in other areas of this section, media can take on vary on features in terms of synchronicity, symmetry, multiplicity, and non-linearity, and these features can influence the structure and function of media. Media structure is especially tied to multiplicity since multiplicity is the use of multiple forms of media. Thus, multiplicity will mean that some form of media structure will occur. Further, the types of control and where the control over component-activities is placed can all make a significant impact on operation of media. Because media can influence and be influenced by the characteristics unique to online courses, the media structure can change dynamically as a course or component-activity progresses.

Online communication technologies allow users to utilize multiple forms of media and multimedia during communication. For example, students can choose from synchronous text-based chat, asynchronous text-based discussion boards, asynchronous text-based email, synchronous audio conferencing, synchronous audio and video conferencing (this could include video of other participants in the conference, screen-sharing, and other forms of communication media, such as text-based chat). New technologies that specialize in the Organization and Distribution of Content assist with digital media by providing a place for storage and consumption. Media can be placed on OLEs and then accessed online by students and instructors.

Synchronicity. Synchronicity refers to the timing of actor-to-actor information transfer through media in terms of both immediacy and automation. How quickly this information transfer is to real-time determines the level of synchronicity. Usually the level of synchronicity of a media is identified as belonging to one of two polar groups: Synchronous or Asynchronous. Synchronous media refers to information transfer that occurs simultaneous to the production of the information. Asynchronous activity and communication refers to information transfer that occurs or was intended to occur in delayed time. "Asynchronous [distance education] has its roots in correspondence education, wherein learners were truly independent, connected to an instructor or tutor by the postal system" (Bernard, 2004, p. 387). Online education research usually only refers to synchronicity when describing communication. However, depending on whether the computer is an actor, synchronicity could refer to the transfer of information between a human and computer-automation.

The four broad characteristics of online education (*Distance*, *Communication*, *Organization and Distribution of Content*, and *Content Interaction and Assessment*) affect media and how it can be used. Without a mediating technology or application, distance removes synchronicity. Individuals would be unable to communicate with others or work on materials at a distance in a synchronous manner without a technology to assist the interaction. Digital technologies bridge that gap and allow for greater choices for asynchronous and synchronous interactions. Computer-mediated communication is one of the more influencing characteristics of online education on synchronicity. Online education literature often describes synchronicity as the immediacy of the transfer of information between two humans through a medium:

> A synchronous learning environment supports live, two-way oral and/or visual communications between the instructor and the student. This exchange of information facilitates the transfer of knowledge from instructor to the student and can be achieved by 1) the use of audio response systems that support oral communications only; 2) the use of interactive keypad devices that support both the exchange of data and voice; or 3) the use of video-conferencing technologies" (Holden and Westfall, 2008, p. 10).

Since asynchronous communication is delayed, people can communicate at their leisure and are often able to spend more time on the construction of a message or the understanding of what they have seen or heard and then can spend more time thinking about what to compose, how to compose, and edit what they have written, said, or visually produced. Because synchronous communication occurs in the moment, people have to coordinate a time to meet and when they are communicating, they have to think and respond in real-time. Before online courses, synchronous communication in school was limited to telephone or in-person meetings. With online courses and improved computer technology, various forms of computer-mediated communication can assist with interactive and collaborative experiences for students (Hrastinski 2008).

If computer-automation is viewed as an actor, then synchronicity also refers to the information transfer between a human and certain computer programs (Content Interaction and Assessment). For example, if a learner worked on a quiz that had automated feedback that was given simultaneously to student interaction, then the interaction would be classified as *synchronous*. If a learner worked on a quiz and the feedback was not given until after the quiz was completed, then the interaction would be asynchronous. Advances in computer and Internet-enhanced communication as well as content and assessment interaction have increased the choices for synchronous and asynchronous information transfer. Software used for online organization and distribution of content has allowed for greater options of synchronicity compared to previous

organization and distribution of material at a distance. Online courses are often a mix of synchronous and asynchronous components (Lowenthal et al. 2009; Means et al. 2009). Bernard et al (2004) found that in studies of distance education, those courses that were mainly synchronous had better outcomes when they were conducted in-person. However, asynchronous appeared to have better outcomes when they were conducted at a distance (Bernard et al, 2004). Despite these findings of a large meta-analysis, a lot has changed in technology over the past ten years, as technology progresses, synchronous applications could improve to a level that makes learning synchronously at a distance is as good or better than in-person instruction.

The levels of synchronicity of the component-activities of an online course are an important feature of online education as they have the potential to affect the timing of teaching and learning and are appropriate for certain types of activities and objectives (Holden and Westfall, 2008). As a result, online education has both potential for greater variation in the level of synchronicity and in the quality of the experience based on how and for what purposes synchronicity is chosen.

Symmetry: Dialogue potential. Symmetry refers to the degree to which there is two-way interaction or dialogue. Holden and Westfall (2008) termed media that had a high dialogue potential as *symmetrical* and those with a low dialogue potential as *asymmetrical*.

> Asymmetrical learning or asymmetrical interaction is when the flow of information is predominantly in one direction such as in a lecture, textbook, or computer based instruction. Conversely, in a conferencing, collaboration, or brainstorming environment, the information flow is symmetrical; that is to say, the information flow is evenly distributed between learners and instructors. A close relationship exists between symmetry and interactivity. The more the interaction, the greater the need for a symmetrical delivery system, whether synchronous or asynchronous (Holden and Westfall, 2008, p. 11).

This dialogue potential is the degree to which communication allows for a back-and-forth conversation between two or more actors, whether that is two humans or human and media (Sherron & Boettcher, 1999; Smith and Dillon, 1999). Computer-mediated communication allows the ability to restrict or promote dialogue. This symmetrical communication can be in the form of easy two-way dialogue such as email, listservs, video conferencing, chat rooms, and discussion boards. One-way or asymmetrical communication includes text, pictures, or videos posted to websites or OLEs. In a course, this one-way type communication might take the form of instructor announcements, lecture videos, or pictures of the subject in focus. It is also possible for students to create one-way communication media in an OLE, through personal blogs or they can upload pictures or videos required for an assignment. Thus, instructors and students have the ability to promote or restrict dialogue potential through the use of different communication technologies. Human-to-media interaction can also be termed symmetrical or asymmetrical, depending on whether the media is classified as an actor. For example, some smart phones now have software that allows the phone to take on human characteristics when spoken to. Contemporary technologies allow for symmetrical interaction between human-to-human and human-to-media in ways that no prior media-technologies allowed (Kozma, 1994). Similar to synchronicity, choices of symmetry have the potential to influence the variation of the course and the quality of the course based on whether symmetry matches desired instruction and objectives (Holden and Westfall, 2008).

Distance removes symmetry without a mediating tool or artifact. While symmetry could occur through traditional ground-based mail, digital technologies allow for more

immediate synchronous and asynchronous symmetry for both person-to-person and person-to-content interaction. Computer and Internet enhancements that offer the possibility of two-way dialogue at a distance have radically changed the potential of education (Bernard, 2004). The level of symmetry in these types of interaction depend on the communication and automated tools and artifacts.

Anytime and anywhere. Arguments for online education often include the assertion that the courses are more flexible as students can learn *anytime and anywhere*: "Online learning has become popular because of its potential for providing more flexible access to content and instruction at any time, from any place." (Means et al. 2009, p. 1). The *Anytime and Anywhere* term carried over from distance education, particularly correspondence education when students were left to their own devices for long periods of time with little and slow communication with the instructor or others in the class (Sherron & Boettcher, 1999). Because it was another form of distance education, the assumption of *anytime and anywhere* was carried over into online education. While this term is especially relevant for correspondence courses, the introduction of computer and Internet enhancements has put this assertion at risk (Bernard et al., 2004). Traditional Distance (Classic Definition) allows for both anytime and anywhere. Distance implies that students will be elsewhere. However, whereas distance courses meant that there was also a separation of time, synchronous and symmetrical technology means that learning experiences are time-bound. Especially eroded by synchronous technology is the "anytime" half of the anytime and anywhere attribute of online education. The term *Anytime* is used to describe how the student can decide the timing of participation in online education. An often attributed feature of online courses is that participation and

engagement can happen anytime, which allows students to keep a more flexible schedule that they can integrate in busier lives. However, one of the changes that Computer and Internet Enhancements have brought to the traditional distance course has been a higher variation in the level course synchronicity. Synchronous online activities and assignments change the anytime nature of distance education as they require participants to be online at a specific time. Whereas Classic Distance Education may have more frequently been anytime learning, technological development has made it easier for synchronous experiences to occur at a distance. While this allows some of the immediacy that occurs with in-person education, the tradeoff is that when synchronous features are added, the course can lose the benefit of anytime flexibility for the student (Romero & Barberá 2011, p.132). While technologies that enhance *Organization and Distribution of Content* allow for more learning activities to take place anytime, new synchronous and symmetrical communication and content interaction changes the possibility of online education occurring *Anytime* as it varies according to the pedagogies of the instructor and the technology used. Some modes of computer-mediated communication, such as discussions over online conferencing software, require that all participants be online at the same time. When this occurs, students lose the flexibility of anytime. Additionally, any synchronous content interaction, such as synchronous online documents, multi-user virtual worlds, and synchronous simulations and games can reduce the *anytime* flexibility. The second half of the "Anytime and Anytime" assertion – *Anywhere* – still holds true, so long as the student has a computer and Internet for all required online activities. Whereas in traditional distance courses, students could take their books and printouts with them anywhere they wanted to do work, a lot of the work for online education has to be

conducted with a computer and frequently that has to be over the Internet. As with *Anytime*, *Anywhere* has been affected by synchronous interactions, synchronous communications and content interaction require students to be in a spot with a computer and an Internet connection.

Multiplicity. The term multiplicity refers to an expansive amount of available material. Technology has the potential to quickly accumulate material and content for a course. Levin et al. (1997) described how technology influences five ways in which multiplicity is impacting education by offering:

- Multiple contexts for learning
- Multiple instructional media
- Multiple instructional formats
- Multiple learning activities
- Multiple assessment techniques

Levin et al. (1997) argued that multiplicity helps education in two main ways: (1) encouraging Levin et al. (1997, p. 267) explained, "By providing our students with a range of multiple contexts, media, formats, activities, and assessments, we have helped them acquire multiple coordinated representations of the domain of integrating technologies into curricula in service of educational reform." Multiplicity can also help students at *remedial* levels by providing beginner level materials (Gilliver, et al. 1998) and can be used for supplemental and performance boosting materials, such as *study strategy* training (Miller and Pilcher, 2002). While this can be beneficial as it can provide supplementary content for those that need it, educators may need to be mindful of student prior knowledge and their ability to make sense of and connect the multiple

representations. Students that are relatively new to a subject area or topic may need guidance to understand different representations (Kozma, 2003).

The four broad characteristics of online education (*Distance*, *Communication*, *Organization and Distribution of Content*, and *Content Interaction and Assessment*) affect media and how it can be used. Distance gives space for students to view of materials that are different than other students. This opens the potential of multiplicity as students are free within their own time and space restrictions to view and interact with materials as they please without interfering with the learning processes of other students. While students can all view media and content independently in a classroom, a shared space can constrain options. Online technologies allow for multiple possibilities for communication media and formats. As explained earlier, there are multiple types of software course participants can choose from, such as: synchronous text-based chat, asynchronous text-based discussion boards, asynchronous text-based email, synchronous audio conferencing, synchronous audio and video conferencing (this could include video of other participants in the conference, screen-sharing, and other forms of communication media, such as text-based chat). Technologies that aim to Organize and Distribute Content allow for the multiplication of materials and content online.

OLEs simplify the process of storing and accessing content and materials and this allows instructors post additional content and links to resources. Further students can interact with material and assessments in new ways that can increase the content, media, and formatting that they would otherwise be exposed to. The whole movement of Universal Design for Learning (Rose, 2000; NCUDL, 2013) relies on multiplicity. Also, in addition to the ways a course has been planned and developed, World Wide Web

technologies allow for students to easily look up information that was not included in the intended or planned course content structure. Thus independent initiative can also increase multiplicity for the student learning processes during a course. Thus multiplicity can greatly impact the learning experience by multiplying the content that students interact with.

Non-linearity. In addition to multiplicity of entire course structure, complexity and multiple potentials for learning paths can be increased within a single instrument or medium. Media may have different levels of linearity (or nonlinearity), which can be described as navigation potentials. Nonlinearity allows the learner to jump around in a medium to different areas of content in the course and increases the number of directions a course can go. McManus (2000, p224) described nonlinearity as the degree to which a medium has a "predetermined beginning, middle, and end." McManus (2000, p.224) described five levels of nonlinearity, which were defined by three main criteria: if the media has a predefined beginning, middle, or end (media without predefined beginning, middle, or end were more nonlinear); how freely one can navigate in the environment (media that can more easily skip around means more nonlinear); the means by which one can navigate (being able to use search terms is more non-linear than flipping through a book or having to rely on hyperlinks). Some of the examples that McManus (2000) gave as being more linear included radio, film, and TV (moves in one direction, with a predetermined beginning and end) and described online encyclopedias, like Wikipedia, and help centers as being more nonlinear. More linear items like radio, TV, and film can only be navigated from beginning to end. The most nonlinear types of media have no obvious beginning or end, such as an Internet search engine, and can be navigated

through searches or static hyperlinks (McManus, 2000). A search engine can be seen as highly non-linear, anything can be typed into the search box, and from the search results, a person can navigate to any of the sites listed. Videos have high linearity to them (although they can be skipped through and re-watched), while the "help box" has a conceptually low linearity. Online replayable videos changes the degree of nonlinearity, as students can easily start the video midway through, replay the video, or scan through the video. A book is very linear, while a reader can flip from one page to any other, there is an implied linear structure to it, the reader is usually supposed to move from the beginning of the book to the end or selected pages can be chosen. In courses, media can be described in these non-linear terms. The level of nonlinearity of each media type can further multiply the potential directions a student can take in a course. Because of the expansive possibilities for how curriculum can be organized and displayed online, instructors have to make calculations about how much potential time students will put into the interaction with different materials.

Similar to multiplicity, distance allows students the space to move in nonlinear directions through the subject without disturbing the learning space of other students. Thus, distance allows for more opportunities for nonlinearity. With computer-mediated technologies, conversations can more easily be switched up. Students can move from one discussion board post to another and has the opportunity to create new posts while other conversations are happening. The tools for communication allow for new opportunities and new rules for how to engage in conversation with others. Technology that specializes in Organization and Distribution of Content, such as OLEs, can also enhance non-linearity, depending on the types of material and links posted. For example, if an OLE

has listed a type of software that gives students a lot of navigational options, then the OLE has assisted in non-linearity. Another increase in non-linearity could occur if the OLE posts links to other websites that are search based.

Table 2.5
Four main characteristics described by common features of media

Feature	Characteristic of Online Education		
Distance	Communication	Organization and Distribution of Content	Content Interaction and Assessment
Media Form			
Distance allows the viewing of media an independent task.	New forms of communication allow multiple simultaneous media. Example: Discussion boards allow for students to type content and post pictures. Conferencing software allows for simultaneous display of audio, printed text, and visual images.	Media can be placed and accessed online by students and instructors Example: Instructors can post images and text to the course OLE while students can submit media for homework via the course OLE	Learners can interact with media in new ways. Example: online widgets that allow for the manipulation of visual aspects.
Synchronicity			
Distance removes synchronicity without a mediating tool or artifact.	Sometimes Synchronous depending on the type of communication tools used Example: Conferencing software is highly synchronous while a discussion board is more asynchronous	Online organization and distribution of content is quickened compared to previous organization and distribution of material at a distance. Example: Instructors can post material and students can access instantaneously	Sometimes Synchronous depending on the tools used Example: quizzes with feedback, synchronous video games
Symmetry / Dialogue Potential			
Distance removes synchronous symmetry without a mediating tool or artifact.	Sometimes symmetrical depending on the type of communication tools, the interaction between people, and whether pedagogy allows for it Example: email is more symmetrical than instructor announcements	N/A	Sometimes symmetrical depending on how the media responds to user Example: quizzes with feedback, synchronous video games

Table 2.5 Continued
Four main characteristics described by common features of media

Feature	Characteristic of Online Education		
Distance	Communication	Organization and Distribution of Content	Content Interaction and Assessment
Anytime and Anywhere			
Distance allows for anywhere. Traditional Distance (Classic Definition) allows for both anytime and anywhere.	Anywhere or anytime there is a computer and an Internet connection Example: asynchronous discussion board allows for a larger time-frame while synchronous conferencing software requires participants to be online at the same time	Anywhere or anytime there is a computer and an Internet connection Example: OLEs allow for access to resources and information anywhere and anytime there is am accessible computer and Internet connection	Anywhere or anytime there is a computer and an Internet connection or if the material has been downloaded Example: Students can interact with an online textbook anywhere and anytime they have access to a computer and an Internet connection
Multiplicity			
Being at a distance allows space for students to view materials that are different from other students	Multiple possibilities for communication Example: asynchronous communications allow students to view history.	Depends on the amount of material and links posted Example: Instructors can post an unlimited amount of resources and links to an OLE	Depends on the amount of material and links posted and how the tools operate Example: Components such as textbooks and intelligent tutoring software can include large amounts of material and information
Non-Linearity			
Being at a distance allows space for students to move in different directions on a subject than other students	Conversation has greater potential to flow in multiple directions Example: Certain communication tools use different conventions than in-person communication	Depends on the type of material and links posted Example: links to a wiki increase non-linearity substantially	Depends on how the tool operates Example: wikis have a high level of non-linearity while a video has more linearity

Determining the Success of Online Education

Researchers and practitioners frequently look to understand whether online education is successful. As the above sections describe, definitions and the complexity of the online space make this challenging. However, despite these challenges the literature on the success of online education can be categorized into two general concepts: effectiveness and efficiency. Here, effectiveness means whether the online education produced good outcomes; efficiency takes the definition a bit further and is based on how well the outcomes were met based on the costs associated with that education. The two subsections below describe how these success concepts have been measured and the difficulty researchers have faced and continue to face.

Effectiveness. Online course effectiveness is often attributed to how well students learn the content (*Content-Learning*), how much a student liked the course or content or how satisfied the students were with the course (*Affect/Satisfaction*), or how many students were served (*Access*).

Table 2.6

Example criteria for exploring online course effectiveness (Content Learning, Affect / Satisfaction, and Access).

	Examples of ways effectiveness can be explored			
	Overall	Populations	Instructional Practices	Media
Content Learning	Content learning of a course(s) are presented in a summed fashion	Content learning analyzed based on different populations	Content learning analyzed based on instructional pedagogy or practice	Content learning based on specific media within a course or in a laboratory setting
Affect / Satisfaction	Affect / Satisfaction of a course(s) are presented in a summed fashion	Affect / satisfaction based on different populations	Affect / satisfaction analyzed based on instructional pedagogy or practice	Affect / satisfaction based on specific media within a course or in a laboratory setting
Access	How well members of a course(s) are able to access course materials.	How well different populations were served.	How accessible instructors make courses	How accessible different types of media are.

Many studies of online courses look at effectiveness (Zhao et al 2005; Means et al 2009), however, the findings from studies of online course effectiveness are often conflicting, with some reports showing no significant difference, some studies showing that online courses are more effective and other studies that show the in-person courses are more effective (Zhao et al 2005).

> We have learned that DE [(Distance Education, including online education)] can be much better and also much worse than CI (i.e., wide variability in effect sizes) based on measured educational outcomes and that some pedagogical features of DE design are related to increased student achievement. (Bernard et al, 2009, p. 1245)

Bell and Federman (2013) explained that the research into the effectiveness of online education has been vast with sometimes seemingly opposing results. In order to make a review of online education effectiveness manageable, Bell and Federman (2013) reviewed selected prior meta-analyses in order to get a sense of what types of online

education is effective and under what conditions. Prior to their review, Bell and Federman (2013) identified three general perspectives that were used in the view of online education effectiveness that centered around media. The first perspective originated with the work of Clark (1983; 1994) and asserted that comparisons of effectiveness were not useful when all other instructional design variables were held constant, since media is just the vehicle for delivering the instructional message. The second perspective notes that the advancement of technology has allowed media to become ore advanced, dynamic, and interactive. These advancements actually create environments and interaction that would otherwise be difficult or impossible without the use of these new technologies. However, this perspective also acknowledges the high level of variation in types of media and the instructional ways it can be used in different courses. The third perspective is the opinion held by much of the general public, and that is that online education is of an inferior quality than that of traditional in-person education.

Bell and Federman (2013) concluded that the wide variability in findings between meta-analyses suggested "that other explanations—such as aspects of the instruction, teacher effectiveness, or student characteristics—account for the relative effectiveness of e-learning in the studies" (Bell & Federman, 2013, p. 174). Instead of spending more time and money on research asking whether online education works, effort should be invested instead into determining under what conditions online education works (Bell and Federman, 2013; Cobb, 1996)

Efficiency. Efficiency is the amount of resources that go into a course compared to the actual outcomes of the course. If fewer resources go into a course with the same or

better outcomes as the comparison, the course can be said to be more efficient. The resources that go into a course come from multiple sources. Resources can come from various stakeholders, such as the university, the department, the instructor, and the student. The utilization of these resources eventually impacts various actors through the implementation of an online course. These impactees can be the students and instructors of online courses, the people that the students interact with in the future, taxpayers, government, and future employers of student.

Table 2.7

Stakeholders and Impactees of Online Courses

Proximity to Evaluand	*Stakeholders*	*Impactees*
Primary Level *(Closest to the Evaluand)*	• Primary Investigators (Faculty) • Instructors • Area Faculty • Administrators of online courses • Students	• Students • Instructors
Secondary Level	• Other University Faculty • Faculty Senate • Administrators in the University	• People that the online students interact with (Instructors, Students, Peers, Family)
Tertiary Level	• Taxpayers • Government	• Future Employers of Students • Taxpayers • Government

Stakeholders have some investment in the course and outcomes. Stakeholders can invest money, time, and resources in an online course. A university or department in which a course originates often devotes a certain amount of money, employee time, classroom space, and infrastructure to the course. Instructors and students also have to also devote a certain amount of time, money, and physical resources to a course. Further, courses that are taught at public institutions (and sometimes private institutions) often benefit from the

money and physical resources that are set aside by government programs aimed at supporting education. The table below illustrates the ways different entities invest money, time, and physical resources into a particular course.

Table 2.8

Money, Time, and Physical Resources that are invested in an online course by various actors

	Actors that Invest in Courses			
	Society	Institution	Instructor	Student
Money	How much society pays in taxes for a particular department, course, set of courses, or particular students	How much money an institution invests in a particular department, course, or set of courses	How much money an instructor invests in a particular course or courses	How much money a student invests in a particular course or courses
Time	-	How much time an institutional staff invests in a particular course or set of courses	How much time an instructor invests in a particular course or set of courses	How much time a student invests in a particular course or set of courses
Physical Resources	How much physical resources (e.g. land, electricity, water) that society has spent on a particular course or courses	How much physical resources (e.g. a classroom) an institution invests in a particular course or set of courses	How much physical resources (e.g. a home office or computer) an instructor invests in a particular course or set of courses	How much physical resources (e.g. a computer) a student invests in a particular course or set of courses

One of the less studied forms of efficiency in online courses is student time efficiency. Cobb (1997) described one of the key benefits of media is potential efficiencies. While Clark (1984) had once dismissed the use of an efficiency variable when studying media, Cobb (1997) argued that this was precisely the benefit that media offered. Cobb (1997) gave the example of learning bird songs from a book versus hearing their audio recording. The majority of people would feel they could learn the bird songs faster from the audio recordings than from a book. However, in some cases, if the notes

were written out, then those who knew how to read musical notes would prefer reading the notes as that would be more efficient for them (Cobb, 1997).

Van Gog and Paas (2008) examined the way that the original instructional efficiency definition has adapted over the years and how researchers have accepted the adapted version more readily. The original method of instructional efficiency was a simple pre-test compared to a post-test measure. The adapted method of instructional efficiency has mainly been a pre-test compared to a combined post-test measure and the time or effort it took to attempt to learn the material. The adapted measure takes a closer look at cost-benefits and therefore lends itself more to an efficiency definition. Van Gog and Paas (2008) also pointed to the multiple terms used to sometimes express the same or different things. They stressed not a need for a uniform term, since it might be difficult to obtain agreement. So, instead, Van Gog and Paas (2008) suggested the need for a clear definition of what is being measured by the authors of different articles, so the reader will be able to understand what is being measured.

While it may take carefully designed laboratory settings to study specific cognitive efficiencies of certain media (see Mayer, 2005), overall efficiency of online studies can be studied using more natural environments. For example, Lovett, Meyer, and Thille (2008) shortened a section of a hybrid statistics course. Not only did the students spend fewer weeks in this section than the in-person and online course, they scored better than the longer in-person comparison group. However, caution should be applied in the interpretation of these results since there are multiple potential reasons for the seemingly greater efficiency. For example, because the statistics course had shortened duration, students could have been taking the final for this course during a time that they did not

have to study for or take final exams for other courses and this would leave more time for studying than other courses. Also, it is unclear how much additional time students spent on the course material while they were enrolled in the course. Further, it is unclear how much of this time was useful, because while spending time on task is important for student learning, the time on task needs to be applied appropriately in order to be effective (Bransford, 2000).

Bell and Federman (2013) warned that increases in effectiveness through e-learning could be the result of more time spent on learning and pointed out that when instructional processes were equivalent, gains made through online instruction were cancelled out. In other words, "offering web-based instruction as a supplement may lead to more learning time or other important instructional differences relative to the comparison classroom condition" (Bell & Federman, 2013, p. 173). This additional time spent on learning could be the result of multiplicity, nonlinearity, or differences (type of control or other variations) in pacing, sequencing, content, or component-activities. However, because of the multitude of studies that shows there is no significant difference in e-learning and in-person courses, Bell and Federman (2013, p.175) renew the call for research "to move beyond the 'does it work' question toward a better understanding of exactly what does influence the effectiveness of e-learning and thus of the conditions under which e-learning is likely to be most effective." And part of this review of effectiveness is to include an evaluation of efficiency, because, if more time, effort, and physical resources are spent on online courses, effectiveness becomes a less convincing argument.

Obstacles in Online Education Research

Institutions and researchers have been attempting to figure out what works with online education and both have been experiencing setbacks. As discussed later in the section *Why Research in Online Education Matters*, both the research of and programs of online education has produced seemingly conflicting results. Online education researchers have produced a prolific amount of studies with a wide range of results. In some cases, research has shown that online education was effective while in other cases it was not. Large-scale reviews and meta-analyses have mixed results. Additionally, online courses and programs in Institutions of higher education have also experienced varied successes. Predicting the success and popularity of online education has remained largely unsuccessful. Transforming online courses into a popular, successful, and sustainable form of education has proven difficult for some institutions of higher education (Kamenetz, 2015). While some for-profits have successfully unlocked the market for online education, many public institutions have been unable to make online courses and programs as desirable as in-person courses and programs. So why are there these conflicting results in both research and practice? Why is it that some for-profit schools have been successful in the pursuit of online education while many online courses and programs at public schools lack popularity? Why do public schools keep investing in these online ventures? In order to understand how to make sense of what works in online education, the problems that have previously plagued online education research should be identified and examined.

Complications in online education research. Research in online education has used underwhelming methods and has been unable to satisfactorily report methods and

the courses they study (Bernard et al., 2009). “Fundamental confounds associated with different media, different pedagogies, different learning environments, and so forth, mean that causal inferences about the conditions of design, pedagogy, and technology use are nearly impossible to make with any certainty” (Bernard et al., 2009, p. 1245). This diminishes the strength of both large-scale statistical studies and summary reports, such as qualitative reviews of research and quantitative meta-analyses. Perhaps, this is part of the reason for the opposite conclusions that have been made in the summary reports of online education. Making sense of this variation seems to be the key in understanding what, how, and when online education works.

Zhao et al. (2005) used a model of distance education and research to describe different sources of variation in distance education research. The sources of variations that were described by Zhao et al. (2005) included *Study Features* (*Design, Sample Size, Measurement, Results*); *Publication Features* (*Publication Year, Instructor as Author*); and *Instructional Features* (*Teacher, Student, Curriculum, Milieu*) (Zhao et al, 2005, p. 1843). Zhao et al. (2005) created this model based on the assumption that the broad categories of variation that would occur in distance courses would be the same as those in in-person courses. Each of the elements in this model can influence the study. For example, the instructor for the course could approach teaching very differently than another instructor. This difference can make a dramatic difference in how a course is implemented and how students will participate in the course. Additionally, the curriculum in one course could be very different than the curriculum in another course, even in the same content area. However, one of the more particularly relevant design issues for online courses is the publication feature of the year of the study. This is especially

relevant since online technology continues to change and improve. Further, the collective knowledge, abilities, and regular usage of technology for both instructors and students continue to grow with time. In other words, students and instructors know how to use technology more and integrate it into their lives more with each passing year. Further, there could be particular years in which the consumer technology advances are disruptive and cause a major change that educators must adapt to. For instance, a major upgrade in smart phone technology could push the demand for educational software that adapts to these new hand-held devices. Additionally, as explained earlier in this dissertation there are vast differences in the technology features (e.g. synchronicity, symmetry, interaction, and media features) from other contemporary technologies. Thus, while some of the broad issues that face the research of online course are similar to those of in-person course research, online courses have their own unique features.

Adapting the model provided by Zhao et al (2005), two main categories of obstacles in the study of online courses are discussed here: *Design* and *Setting*. There are abundant *Design* issues that are particularly difficult to tackle in the study of online courses, such as differences in quality or substance of studies (Bernard et al., 2004); few randomized studies of online courses (Bell & Federman, 2013; Cook et al., 2010; Means et al., 2009; Phipps and Merisotis, 1999); vast dominance of single group pre-test and post-test studies in literature (Bell & Federman, 2013); lack of a overarching framework of online education (Phipps and Merisotis, 1999); lack of good inclusion and exclusion criteria for student subject samples (Bernard et al., 2004); many of the studies included in meta-analyses are small sample studies (Bernard et al., 2004); the type of measurement or assessment in studies widely varies (Machtmes & Asher, 2000; Zhao & Lei, 2005);

variation in who developed the measure (whether it is outsourced, the researcher, or the instructor; Zhao & Lei, 2005); limited selection of independent variables (Clark, 1994; Zhao et al., 2005); difficult to identify possible competing reoccurring and unexpected independent variables (Bergamin et al., 2012; Bernard et al., 2004; Clark, 1985; Lowenthal, et al., 2009); limited selection of outcome variables (Bernard et al., 2004); limited description of course and context of study (Bell and Federman 2013; Bowen & Lack, 2012; Cook et al., 2010; Lowenthal, et al., 2009; Phipps & Merisotis, 1999); limited description of in-person comparison courses (Bowen & Lack, 2012; Cook et al., 2010; Smith and Dillon, 1999); and limited description of processes affecting outcomes (Bell and Federman, 2013; Bergamin et al., 2012; Bowen & Lack, 2012; Cook et al., 2010; Lowenthal, et al., 2009; Phipps & Merisotis, 1999). Because the design of research has such an impactful, elemental role to play in research, careful examination of the challenges of research in online education is needed. The *Design Issues* section below explores some of these issues in greater detail.

In addition to design issues, Zhao et al (2005) described *Setting* issues that could impact online course studies. These setting issues are also numerous and further the complexity of online course research. Some of these issues include instructors have different teaching styles that can influence instruction (Campbell et al., 2002); instructors actively working against the comparison group through a "John Henry" or *Compensatory Rivalry* confounding effect (Clark, 1985; Heinich, 1970; Heinich, 1984); differences in instructor participation (Zhao & Lei, 2005); differences in pedagogy are often not described or accounted for in literature (Lowenthal, et al., 2009); differences in student input variables (Bergamin et al., 2012; Bowen, Chingos, Lack, & Nygren, 2012; Phipps

& Merisotis, 1999; Zhao & Lei, 2005); open enrollments allow for greater variability among students enrolled when students are not randomized (Beller and Or, 1998); potential for the course content area to make a difference on whether online instruction is effective (Zhao & Lei, 2005); greater variability and difficulty in controlling the amount and type of content in a course and/or across courses (Bernard et al., 2009; Lowenthal, et al., 2009; Phipps & Merisotis, 1999; Twigg, 2003); greater variability in number of components and activities in a course and across courses (Bernard et al., 2009; Bowen & Lack, 2012; Lowenthal, et al., 2009; Twigg, 2003); variability of types of media within a course and across courses (Bergamin et al., 2012; Bernard et al., 2009; Bowen & Lack, 2012; Lowenthal, et al., 2009; Smith and Dillon, 1999; Twigg, 2003; Zhao & Lei, 2005), and variability in features of media (Bergamin et al., 2012; Mayer, 2005). Because the setting such an important and unique aspect of online education, an exploration of some of the main issues around setting that influence research design is needed. A brief overview of the issues surrounding research design in online education is presented in the next section called *Design Issues*. Following this, the *Setting: Context and Processes* section below delves into some of the setting issues that have a big influence on online education research.

Design Issues. Bernard et al. (2004) explained that major problems with the conclusions from reviews and meta-analyses of distance and online education had occurred because of differences in the quality of studies in this area. Bernard et al (2004) explained that researching courses is a difficult task with few studies acknowledging the delicate work needed to go into quality studies. For example, Bernard (2004) noted that many quantitative distance education studies had small sample sizes, which reduces

statistical power and increases the possibility of committing a Type 2 error. Further, many studies have not stated strong inclusion or exclusion criteria for their comparison studies, which indicates the strong potential for selection bias (Bernard, 2004). In addition to these problems in comparison studies, Bell & Federman (2013) explained that in fact, many studies use a simple single group pre-test, post-test design, which reduces the ability to draw conclusions about when certain online approaches work.

One of the more important aspects of a study's methodology is how data is gathered. In many studies of education (especially quantitative studies), the measurement comes in the form of a text or survey. The test is meant to measure the cognitive content knowledge a student has learned before, during, or after instruction. A survey is often meant to measure the thoughts and feelings the student has about the course and his/her experience in the course. However, the type of survey or assessment varies widely across studies (Machtmes & Asher, 2000; Zhao & Lei, 2005), which makes comparison across courses difficult. On the other hand, Bernard (2004) observed that meta-analyses often review only a small number of outcome variables that occur in studies of distance education. This means that a narrow picture of course success emerges. Further, there is a potential problem with implementation of assessments in online courses. As mentioned in the content interaction and assessment section of this paper, online summative assessments are susceptible to cheating practices. In addition to the potential technological flaws that could lead to cheating, Chapman et al (2004) found that students are largely willing to cheat if they are given the opportunity. Hillman (2011) found a number of instances in which cheating practices were ignored or encouraged in online for-profit programs. This points to glaring problem that will affect results and ultimately

that would interfere with any research studies looking at online course effectiveness. Additionally, as with any type of course, online researchers must take into consideration the alignment of material and activities with assessment. Tests that deviate too far from instruction could lead to poor student performance on the exam, while instructors that align the material too closely or "teach to the test" could intentionally or unintentionally inflate student test scores. Finally, the instructor could construct the assessment to artificially inflate the scores of the group he/she wants to do well. Often, to avoid this type of problem, the construction of the assessment instrument is outsourced to an external vendor or the researcher. However, the source of assessment construction is inconsistent across studies (Zhao & Lei, 2005).

While Zhao et al (2005) focused on the type of causal conclusions that could be made between experimental and quasi-experimental studies, the design of online course study can go beyond causal design and study design of any study type can influence the conclusions that can be made. When looking at the preference of experimental and quasi-experimental design, randomized experimental design is most often preferred for the purposes of explaining causation. However, often experimental design is difficult to implement and in many cases, quasi-experimental design is selected instead. This could be because of the larger context of online courses, they most often take place within an institutional setting where students are supposed to be given a choice for what course to take and the format (when there are different format options). Thus, researchers are often forced to accept the students that choose the course without any inclusion or exclusion criteria for the in-person versus online course. Studies of online education have not had a large number of randomized studies (Bell & Federman, 2013; Cook et al., 2010; Means et

al., 2009; Phipps and Merisotis, 1999). While this has not stopped researchers from investigating online education, the Means et al (2009) meta-analysis is example of how the lack of experimental research has proven problematic as it only accepted experimental articles and there were only a handful from the thousands of articles on online education. Despite the lack of causal explanation, deciding whether the lack of experimental design is problematic could be more contingent on what the research questions are and what the researcher is trying to learn about online education. As explained next, comparison studies between online and in-person for understanding whether online education works, might be relevant no longer.

Despite the call by some for randomized designs to explain causality, it has been argued that comparisons between online and in-person may not even be needed. Because online education is inherently computer-based, lessons can be learned from the in-person Computer-Based Instruction (CBI) movement that preceded online education. Likewise, CBI researchers learned from other media-based instruction that preceded it, such as instructional television (Clark, 1985). One of these early lessons was that when compared one-to-one, the media-based instruction was no different than the in-person instruction. In 1985, when examining methodological issues that deviated from this one-to-one style comparison, Clark concluded that CBI had no affect on learning and recommended against educators making large technology purchases. However, in order to come to this conclusion, these comparative studies had to match one-to-one all aspects of the two different forms of instruction so that they were essentially the same. This research tradition meant that all aspects of the instruction should match the comparison mode of instruction except for the media itself. For example, if animation was included in the

television-based instruction, then the same animation would be needed in the in-person version of instruction (Mielke, 1968). This type of comparison did not take advantage of the unique possibilities within the particular media, but instead focused on creating exact replicas in order to determine whether the means of communicating the information had any affect on learning. However, technological advancements have made this one-to-one comparison difficult, and is possibly the wrong way to approach computer-based and online educational research. Advances in technology have changed what is possible via computers. A well-prepared online presentation would be difficult to match by an in-person instructor that is using just a chalkboard. The argument that followed was that when the instruction is made to stay one-to-one, both forms of instruction become limited to the instructional activity that the other could also perform. Thus, the potential benefits of both types of instruction are lost (Clark, 1985). Further, as instruction has moved into online forms of education and as technology has advanced, it has become difficult to find the exact equivalent to in-person instruction. What makes comparison even more difficult is the vast amount of possible online activities and the large number of options available for each activity. Students can now access whole libraries of text and videos on their electronic devices. Other forms of media are also available and each of these can potentially be modified and customized according to each student's preferences. Further, online instruction changes the environment of students, which can add distractions and the ability to access additional information. For example, the nature of computers allows students to move beyond the immediate presentation and follow resources not specifically vetted by the instructor. Professional opinions on specific topics can be accessed with ease. All of these advancements make direct one-to-one comparison

difficult. And with all of the advancements and changes, direct comparison studies that attempt to duplicate all aspects of the instruction might not always be the most desired methodological approach. This makes the implementation of direct comparison between the two forms of instruction difficult, as it is nearly impossible to control for the variation that occurs between the two modes. Further, as technology becomes pervasive and in-person put materials online, the line between online courses and in-person courses has become less clear. Consequently, online education researchers could be left to guess what caused an online course to be better or worse than the in-person equivalent.

One common problem with online course studies is an inadequate description of the conditions involved in the study. While this may seem like a non-issue, in online course environments where the course has multiple options for course components and activities, description is important in understanding potential competing independent variables from the environment. For example, an article might be written about a new communication tool that is being implemented in one section of an online course but not another, however, that study might fail to mention that one of the sections is taught by a different instructor or also has additional assignments issued through the communication tool. Historically, studies of educational media in the course environment have included only a small number of independent variables (Clark, 1994; Zhao et al., 2005). If possible competing independent variables are not included in a statistical model in quantitative studies, then at the very least, the course should be described in sufficient detail for readers to understand alternative potential influences. However, this infrequently happens in both quantitative and qualitative studies (Bell and Federman 2013; Bowen & Lack, 2012; Cook et al., 2010; Lowenthal, et al., 2009; Phipps & Merisotis, 1999). And

frequently, there is a limited of description of processes affecting outcomes (Bell and Federman, 2013; Bergamin et al., 2012; Bowen & Lack, 2012; Cook et al., 2010; Lowenthal, et al., 2009; Phipps & Merisotis, 1999). This could be because of how difficult it can be to identify possible competing independent variables (Bergamin et al., 2012; Bernard et al., 2004; Clark, 1985; Lowenthal, et al., 2009). Smith and Dillon (1999) described how even if a study does a good job of describing the intervention version of the course, a good description of the comparison course is still needed. Bernard et al (2004) lamented that indeed, many of the studies they reviewed did do a good job of describing the distance education intervention but did not do a good job of describing the comparison in-person group. Others have described how comparison in-person courses for online course studies are also lacking in description (Bowen & Lack, 2012; Cook et al., 2010; Phipps and Merisotis, 1999; Smith and Dillon, 1999). While there is always the possibility of confounding variables, a detailed description of the online intervention course and any comparison courses can be helpful so that the audience of an article can understand course processes and context as well as determine any other potential confounding variables that could affect the research outcomes or the generalizability of the study. This variation and lack of documentation could even have influenced the results of meta-analyses of online education:

> If there is substantial heterogeneity, the studies may not be measuring the effectiveness of a particular kind of online learning so much as evaluating the effectiveness of the 'average' (so to speak) online course included in the sample. Knowing how much and what kind of variation exists among the different 'treatments' is useful, but unfortunately this information is not always provided" (Bowen & Lack, 2012, p.9).

In addition to the overall setting and context, one of the problems in study of online courses is that they often focus on just a single technology component and leave out other technology components that are used in the course (Phipps and Mersotis, 1999). Studies

that only use a specific technology-component ignore the individual and dynamic effects that other technology-components can have on the outcomes of a full course. Studies that look at full courses but focus on a single technology-component and leave out a description of other technology-components make it difficult for researchers to understand the instruction and learning processes involved in the course. Research in online education often focuses on just a single portion of the course. The focus is often placed on the outcome rather than the process that brought about the outcome. The lack of descriptions and measurements of multiple technology-components can make interpretation difficult (Phipps & Merisotis, 1999). It is difficult to determine when competing variables may be responsible for the outcomes of computer-based instruction (Clark, 1985). Thus, it is important for researchers to be explicit about learning environments (Lowenthal, et al. 2009) and thoroughly describe and/or control for competing variables.

In one of the most influential meta-analyses in the online education, Means (2009) was unable to escape the problems with variation and lack of description that plague the online education literature. For example, one of the studies (Bayea et al. 2007) reviewed by Means (2009) examined the effect of a single 15-minute in-person lecture versus a web-based equivalent. A 15-minute intervention can be quite a different learning situation compared to a full online course and many of the other studies in this review were full courses. A 15-minute intervention allows the instruction to be well-tuned and can be easier to omit distractors and other variables that would influence outcomes in a full course. Further, from the article, it was unclear whether the online group actually took the lesson at a distance or if the learning took place in a computer lab. In the same

meta-analysis, Means (2009) used the results from a study that examined a full course but the duration of the course was taught was not described. Other than the online portion of the instruction, the similarities that a 15-minute lesson had with an online normal length course would seem minimal. However, if they were similar it would be difficult to know since they both have critical missing elements in the description of the courses.

There is a clear lack of standards for description of instruction and learning environment. Since the field of online education is still relatively young, there are too few studies to saturate the field and provide a large enough number to protect against the variation in courses. Even with large numbers of studies, the sheer possibilities for course operation are widely varying and could negatively affect the ability of research to answer whether online courses are affective. Thus, even the best of reviews of online education literature, including Means' (2009), has had to include studies with descriptions of components and processes that are unclear and educational contexts that can be widely varying. Instead of asking, "Are online courses effective?", perhaps a more appropriate question would be, "under what conditions are online courses effective?"

Thus, it is difficult to know whether research has looked at the best, worst, or average online educational experiences. This lack of description also makes it difficult to understand under what conditions certain online interventions work or fail to work. This may also be influencing comparison studies since the research might not be addressing whether online courses are better but rather, whether the sampled online courses have had vastly more development than the sampled in-person courses. This is subtle but important difference since a poorly developed online course could be compared to a highly developed in-person course, or vice-versa. It may be more beneficial to determine

whether high quality online courses are at the level or better than high quality in-person courses. Or, since many online courses require more work upfront but then require less hands-on work from instructors, it may be best to compare highly developed online courses with normally prepped in-person courses. However, the preparation time and implementation time that instructors spend on the course does not seem to be universal, thus, researchers would need to explain the amount of preparation work versus implementation work the instructor invests in the online and comparison courses.

Online courses may also be covering different content than the in-person course. While former comparison studies of non-online computer-based instruction (CBI) were able to tightly control variables, such as using the same instructor, using the same content and practice, and determining the location of instruction, many of the CBI studies failed to control important variables (Clark, 1985) and now comparison studies of fully online college courses are even more difficult to control since the content of the full course can fluctuate over the term, the content is decided by the instructor, and students work at home where they can be influenced by many other variables. Because of the wide variation that can occur between online and in-person courses, Bernard (2009) came to a similar conclusion as Clark (1985) and suggested that instead of comparing distance with in-person courses, distance courses should be compared with other distance courses in which small changes are made.

> We have learned that the very nature of the question (How does DE compare to CI?) impedes our ability to discover what makes DE effective or ineffective, because the question is cast as a contrast between such starkly different forms for achieving the same end. For example, in DE versus CI studies, delivery method is often confounded with instructional design, in which the DE condition has instructional design features not present in the classroom control condition and vice versa. This does not mean that we know nothing about designing good DE; it is just that we have not learned it from classroom comparison reviews (Bernard et al., 2009, p. 1245).

This suggests that online instruction should be researched through methods that look more closely at what types of online instruction works and in what context. So, how does one take a more focused look at online courses for the purposes of understanding what works and when? An overarching framework could help sort out the various factors that could influence course experience and outcomes (Phipps and Merisotis, 1999). As this section on methods suggests, many of the problems that have made online education research difficult have been influences from the context and processes of the course that bleed into the results. The next section discusses some how setting can influence the study of online education.

Setting: Context and Processes. The model that Zhao et al (2005) used for reviewing distance education courses was based on instructional setting that included the teacher, students, curriculum, classroom culture, media, and technology. However, the variables that could influence the learning experience go beyond just instructional setting and include a broader *context* and *processes* of the course. This includes the broader context of society, the institution, the department, the instructor's environmental and internal context, students' environmental and internal contexts, and the processes of the online course, components within the course, instructor actions, and student actions. In order to explain the variation that occurs from potential external variables, Lowenthal, Wilson, and Parrish (2009, ¶1) explained the need for describing the context and processes of the online course in research, "Differences in setting, audience, technology, pedagogy, and subject matter make generalizations and comparisons extremely challenging", further, "practitioners and researchers of online learning rarely place enough emphasis on the context of their practices and models. And context changes

everything." Because context makes up variables in and out of the classroom, research in online education would benefit from examining variables in and out of the classroom.

As mentioned, online education affords new options for teaching and learning. Some of these variations are slight and can be easily passed over from careful observation. Additionally, the potential of including extra materials and creating courses that have options for students, allows for a wider range in course implementation across courses (Cook et al., 2010; Lowenthal et al., 2009; Zhao et al., 2005). Additionally, online courses can provide greater diversity in how different students experience the same course. Through a review of literature, Bergamin et al (2012, p.104) listed a number of ways online courses are changing and flexible: *Time* (*time of learning, duration of learning, teaching time,* and *pace of learning*), *Space* (*delocalization*), *Methods* (*learning place, learning resources,* and *language*), *Learning Styles* (*individual work vs. group work*, *on-campus study vs. online or self-study,* and *learning strategies*), *Content*, *Organization and Infrastructure* (*combination of study, work, and family, communication between student and teacher, information and communication technology, technical infrastructure,* and *logistics of learning material*), and *Requirements* (*entry requirements, forms of examination,* and *time of examination*). While this list of variation in courses seems large, it is not a complete list. Some of these are deliberate instructional practices while others are unintentional or not carefully decided.

While a course might be the same and have the same syllabus, different instructors can have different styles, pedagogies, and emphases. These differences can influence the instruction and the research on different online courses (Campbell et al., 2002). Zhao et al (2005) explained some of these instructor characteristics as *instructor*

involvement, *the status of the instructor*, and *training for teaching online/distance courses*. According to Zhao et al (2005), *instructor involvement* stands above the other issues as a key to understanding online education. If it is found that instructor involvement does not impact student outcomes then online courses could be scaled to be much larger, where students learn primarily through videos and other media. However, deciphering the impact of instructor involvement can be tricky, as many of the other instructor attributes could influence student learning, for example, an instructor that is trained to teach online could be much more effective than an untrained instructor in the in-person comparison course, or vice-versa. An untrained first-time instructor may fair worse than automated online instruction and the results of a study like this might suggest that instructor involvement is not important since the automated media did better. Further, instructional pedagogy is often not observed or documented in online learning (Lowenthal, et al., 2009). This could make a difference as instructors come to the course with different styles for instruction (Campbell et al., 2002). Or the instructor in a study could feel threatened by technology and media that could replace them and thus work hard to deliberately sabotage the online version of the course so it does worse, creating "John Henry" (compensatory rivalry) confounding effect (Clark, 1985; Heinich, 1970; Heinich, 1984). Therefore, potential influences of the instructor can make a big difference in the results of a course that has important repercussions on how large and automated online courses become.

Prior sections of this dissertation illustrated in detail much of the variation that could occur through online technology (media, synchronicity, symmetry, anytime and anywhere, multiplicity, linearity, control (for pacing, sequencing, content, and

component-activities as set by the instructor, student, group, or computer-automation). Changes in any one of these could impact the results of the study. For example, slight changes in multimedia presentation can have a strong influence on effective and efficient learning is (Mayer, 2005). Or the degree to which communication is synchronous and symmetrical can change the learning experience. Specific types of media can vary in their features (Bergamin et al., 2012; Mayer, 2005) and technology and media features vary across courses (Bergamin et al., 2012; Bernard et al., 2009; Bowen & Lack, 2012; Lowenthal, et al., 2009; Smith and Dillon, 1999; Twigg, 2003; Zhao & Lei, 2005). However, the impact of media on outcomes can be difficult to detect in a full online course where differences in outcomes could actually have been the result of differences in instructional interventions such as pedagogy (Bell & Federman, 2013) or, if the format for a course works in one subject area, it might not work in another (Zhao & Lei, 2005).

One of the features of online education is the wider array of learning possibilities presented to each student. Twigg (2003, p. 36) stated, "one of the strongest reasons for using information technology in teaching and learning is that it can radically increase the array of learning possibilities presented to each individual student." Inded, online education allows for an increase in number of components and activities that a course can have (Bernard et al., 2009; Bowen & Lack, 2012; Lowenthal, et al., 2009; Twigg, 2003). In a similar manner, the amount and type of content in a course is able to fluctuate substantially as instructors can post additional materials online (Bernard et al., 2009; Lowenthal, et al., 2009; Phipps & Merisotis, 1999; Twigg, 2003). While this greater array of options may seem like a completely harmless concept, it can also cause problems for research. The more options that a student has to choose from, the more time it will take

the student to make decisions about what to learn. It can also make it more difficult for instructors and researchers to gauge what types of activities are effective and under what circumstances. Additionally, while there are multiple possibilities, some courses take advantage of the different technology types and activities available, while others use the minimum, in sometimes lackluster ways (Bowen & Lack, 2012). Further, because there are multiple possibilities for learning in not only a single course but there can be greater variation across courses, it is important to have precise descriptions about the learning environment and what types of activities students engage in. Since there has been a lack of consistent descriptions of the courses in studies of online courses (Bell and Federman, 2013; Bowen & Lack, 2012; Cook et al., 2010; Lowenthal et al., 2009; Zhao and Lei, 2005) and a lack of description of comparison in-person courses (Bowen & Lack, 2012; Cook et al., 2010), interpretation of much of the online education literature can be difficult. This can be especially difficult since there is potentially more variation in learning environments in online courses that in in-person courses (Bernard et al., 2009).

Differences among students can create variation that could expose a weakness in effectiveness studies of online education. Students enter a course with different sets of characteristics that can influence how they participate and their outcomes in the course (Bergamin et al., 2012; Bowen, Chingos, Lack, & Nygren, 2012; Phipps & Merisotis, 1999; Zhao & Lei, 2005). If all student are grouped into an average without taking into account hidden variation that could influence outcomes then effectiveness studies could be compromised (Bowen, Chingos, Lack, & Nygren 2012; Phipps & Merisotis, 1999). These differences can be especially important to account for in online courses where it is common for open enrollments that allow for greater variability in entry characteristics

(Beller and Or, 1998). Because the entry characteristics of students can affect processes of the course (e.g. how they participate, how often they participate, how they learn, what they are able to learn, whether they enjoy the activities, whether they enjoy the course material, whether they enjoy the instructor's instructional style) and the outcomes of the course (e.g. if it was possible for them to learn the material, if they put effort into learning the material, how likely they are to give high ratings regardless of the course), these characteristics should be included in studies of online education.

In addition to student input characteristics, the experiences a student has in the course also affects their outcomes. As explained earlier in the paper, the degree to which an instructor, student, group of students, and computer-automation controls pacing, sequencing, content, and activities can vary. This means that it is possible for students in the same class to receive very different instructional experiences. Different outcomes could result from students can be exposed to different materials or the difference in outcomes could be in the amount of time that students put into learning (Bell & Federman, 2013). Are there different levels of control that are better for online courses? Is the level of control better for certain subject content areas? Do certain types of students do better with more control over other students? Only through student input and process data, can questions like these be examined.

Further, with distance also comes some anonymity to student experience and how they are experiencing the course. Because the student can be anywhere when they are engaging in an activity or conversation, a wide range of external variables can influence the student experience that normally would have been confined to an in-person classroom. Roommates can distract students or students may choose to have the television on in the

background while watching course video lectures. Other external environmental variables (that have an influence on students regardless of online or in-person studies) could affect the student experience in a more general way. For example, a student working 40 hours per week might have less time to put into coursework than students who do not work. These environmental variables could be problematic in non-randomized design since certain students (e.g. those who work full-time at a job) could be drawn to online courses.

Moving forward with design and setting issues. Recognizing all of these and other obstacles in both design and setting, moving forward on research in online courses presents a challenge. Should researchers use multivariate statistics or propensity scores to account for different student variables? Could Structural Equation Models capture the learning environments for different courses while accounting for some student differences? Or is it necessary to run experimental and quasi-experimental designs that would account for student variation? Even when experiments are conducted, course implementation and context can make the results of these studies difficult to interpret. And meta-analyses of experiments could be compromised since all online course studies could be generalizing results that should not be generalized. For example, what if all of the courses represented in a meta-analysis use only asynchronous communication but that is not stated in the articles? That may affect the results and, unbeknownst to others, should not be generalized to online courses with a greater variety of communication types. And because online courses have diverse potentials for implementation, generalization should be carefully applied (Cook et al., 2010). Thus, only through a close examination of the course and the context can reviewers make informed conclusions about how one online course might be like others.

Towards Understanding What Works In Online Education

The broad question about online education that both researchers and institutions want to answer is "*What Works?*" However, this question is very general and needs to be broken down before it can be meaningfully approached. Under this general question of "*What Works?*", there are three more specific questions: "*Does it work?*"; "*How does it work?*"; and "*When does it work?*". Each of these three questions has implications about the evidence that is required to answer them. Table 2.9 below shows broad types of evidence that could be used to answer these questions. Evidence for "*Does it work?*" can be answered by the degree to which output, outcomes, and goals were achieved. Evidence for "*How does it work*?" can be answered by examining the processes that take place during a course. Evidence for "*When does it work?*" can be found through by examining the context within which the course took place. By separating the questions out like this, researchers can determine if there is a program failure or a theory failure and work to pinpoint the reasons for the positive or negative results of the course. However, in order to implement the investigation of these questions, the evidence needs to become specific enough to gather data.

Table 2.9
Implied evidence that is needed to answer questions about online education

Question	*Evidence*
Does it work?	• Output • Outcomes • Goals
How does it work?	• Processes
When does it work?	• Context

In order to collect data that will answer the questions of "*Does it work?*"; "*How does it work?*"; and "*When does it work?*", researchers need to make decisions about

what kinds of variables are suitable and the type of data that is available that can represent those variables effectively. Table 2.10 below illustrates the types of variables and data that can be used as evidence that could be used to answer these questions. For example, a variable such as achievement can be represented by grades in the course or on assignments, through an analysis of student work samples, or indirectly through surveys or interviews of the students. This can be used as outcome evidence that helps to answer, "*Does it work?*" As shown in Table 2.10 variables and data can be easily found for each of these questions. However, as the previous section of this dissertation detailed, even if each of these questions were answered, the broad question of "What works?" is only marginally answered. For example, would a course with successful outcomes that had high instructor participation also have successful outcomes if the course had low instructor participation? In the form presented in Table 2.10, the variables are static without a relationship to one another. Thus, in order to understand the conditions to which the variable all work together, a framework that demonstrates how these variables work together is needed. Answering "What works" is not a sum of answering the other questions, instead this question has to be answered by examining the variables as an interlocking dynamic system.

Table 2.10
Types of data aligned with variables associated with evidence needed to answer questions about online education

Question	*Evidence*	*Variables*	*Type of Data*
Does it work?	• Output • Outcomes • Goals	• Participation • Student feelings about course • Student learning outcomes • Achievement • Matriculation • Continued high-enrollment • Profitability	• System Data • Surveys • Interviews • Grades • Samples of student work • Drop-out data • Matriculation and future enrollment data • Expenses and profits
How does it work?	• Processes	• Actions by students • Actions by instructors • Actions by media • Actions by administrators	• System Data • Observation • Surveys • Interviews • Documentation of Media • Funding for course and support • Advertisement for course
When does it work?	• Context	• Student characteristics • Instructor characteristics • Institutional characteristics • Societal characteristics • Subject • Curriculum • Activities • Technology types • Technology quality	• Institutional Data such as Demographics • Surveys • Interviews • Documentation of subject, curriculum, activities, and technology types • Technology quality data

Decision Theory Guiding this Dissertation

The Framework in this dissertation has a strong focus on how the different actors make decisions. Part of the reason a strong theory for decision-making is needed stems from the intersection of actors with varying levels of control. Online courses offer the possibility of limitless options for studying and participating. Because of the added options, actors are faced with increased decisions. As a result, the framework places decisions as a vital and fundamental process in the operation of an online course. The

theory presented here recognizes a confluence of an actor with the environment. When there is the potential for decisions to be made in that environment, the actor has choice options (something referred to in this dissertation as "Control"). However, there are many instances when the individual does not have control, either over their environment or over internal processes.

The decision theory for this dissertation is best represented by a two line intersecting axis diagram that demonstrates a spectrum of the degree to which outcomes are influenced by an individual's internal and external variables along with the circumstances and possible choices (see figures 1 and 2). Thus, in any given situation, the outcomes are governed by: *Internal and External BY Choice and Circumstance*.

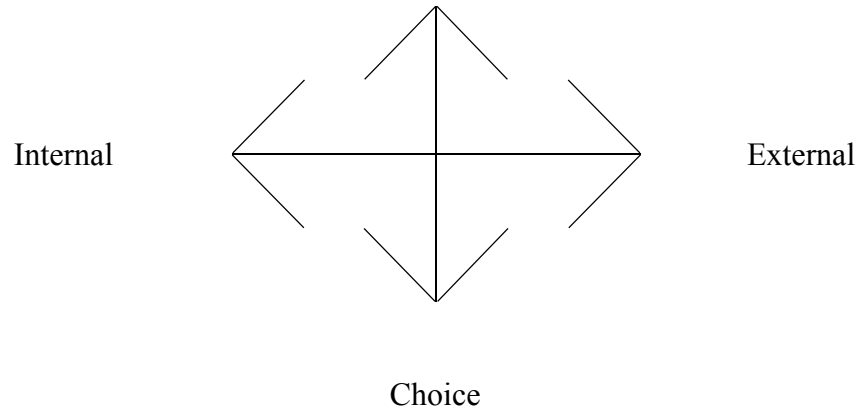

Figure 1: Choice and Circumstance by Internal and External

In order to visualize how this theory works with more specific examples, this axis diagram can be converted to two-by-two box format. However, while this layout allows for a better way of displaying example, it sacrifices the fuzzy boundaries that are more reflective of the theory when manifested in reality. Figure 2 below displays this converted

two-by-two box format with some selected examples of how the theory represents situations.

	Internal	*External*
Circumstance	• Predispositions • Prior learning • Non-cognitive skills developed over years.	• Family • The level of course difficulty • Courses offered at a university • **Fixed characteristics within a course**
Choice	• Attitude • Beliefs • Goals	• College courses enrolled in • Roommates • Extracurricular activities • **Decision options available within a course (Control)**

Figure 2: Example of Variables for the Conceptual Framework of Student Experience
*Note: These variables can fluidly move between Internal and External as well as Circumstance and Choice.

Each of the Quadrants in Figure 2 is important for the study of online courses. All of the quadrants potentially contain characteristics that the actor will bring with them into a course that can impact the experience and results of the course on that individual. However, there are two quadrants that should be of greater interest for those creating and running an online course because of the implication on course manipulation. When talking about what External-Circumstance means inside of a course, the trait would be items that could not be controlled by the actor. For a student, this might be the time lecture meets; a student cannot change the timing of lecture. For External-Choice quadrant, the trait would be items that can be controlled by the actor. For a student, this might be the pace at which she/he reads a book; in most courses, a student can read at any

pace they choose so long as they keep up with the course deadlines. The section in this dissertation on Control explains this in more detail. While all of the quadrants are important and can be influenced through the selection criteria for students that enroll, the External quadrants can be of considerable interest to instructors and course creators because of what Control means for how individuals participate.

This decision theory is important because of the role that each of these quadrants can have on an individual choice. Variables of circumstance can influence the choices of an individual. And variables of choice signify what options are available for the decisions of an individual. For those interested in online courses, these quadrants provide guidance for what can be influenced through course set-up, those that can be influenced by persuasion, and those that can only be influenced by the selection of actors.

Because education (usually) has the main purpose of helping a student learn, it is important to see how the decision theory applies to a student. Internal variables are factors internal to the student. For example, levels and type of motivation, self-efficacy, confidence, and computer skills are internal aspects of an individual. External aspects include friends, family, employment, and leisurely activity. The line between internal and external is not always clear, for example, personal health can be seen as both an internal and an external aspect of an individual. The accuracy to which a variable is placed on this spectrum between internal and external is not so much important as the idea that there are variables that are more internal to a student and variables that are more external or environmental to the student. The other part of this framework consists of choice versus circumstance. Choice means anything that a person currently has a choice about, such as, diet, attitudes, goals, and courses enrolled in. Circumstance is the situation someone is in

that she or he has little ability to change. For example, a normal citizen will have little choice over turning the electricity back on during a blackout. The choice and circumstance interact with the internal and external variables of an individual. An individual can make certain choices about these internal and external variables but there are also unavoidable circumstances regarding the internal and external variables that an individual are unable to choose. So in this model, there are four possible combinations: choice for internal, choice for external, circumstance for internal, and circumstance for external.

A student can choose to influence certain internal variables. For example, an individual can make decisions about how they will think and the attitudes they will hold. Frankl (1985) explained that even in the worst of circumstances, when humans have no control over their environment, an individual still has the possibility of making a choice about attitude, frame of mind, and how to view the situation. Students can decide the content they will focus their attention on, regardless of the course grading scheme or how they are being instructed. Some of this may be a clear decision and some of it is indirectly related to choice through the ability to focus and the interests of an individual.

People are often able to make decisions about their environment too. In an educational setting, an individual will sometimes have choices over the courses they will take, the school supplies they purchase, whether they will buy a course reader, the people they will interact with, and the clubs they join. Even the environmental choices students make outside of school can have an impact on their educational experience, such as where they live, their friends, what they eat, and whether they go out drinking or partying.

Despite having some choice over these internal and external variables, there are also some circumstances affecting internal and external variables that are difficult to avoid or that cannot be chosen. An individual does not have control over inherited predispositions for mental health. An individual may have a family history of bipolar disorder that could manifest in the individual without any choice in the matter. Preventative measures can be taken and an individual can work to live with the complications, but they have no choice over the family history and potential predisposition. Thus, an individual does not have control over all internal variables, but instead, there are certain circumstances that an individual is given.

Particular external variables are also part of the circumstance of the situation. For example, a student has little choice over the buildings on a campus or the energy consumption of the school. An individual student can petition to add new buildings and reduce energy consumption, but at any given moment, they may have no choice in the matter. Even though an individual can choose classes, he or she may have little ability to control the course offerings.

The classification of variables into quadrants in Figure 2 may be difficult as some variables overlap. For example, choosing to go out to party or drink is at first a choice of external variable, however, the effects of these decisions impact the internal functioning of an individual. So, in a sense, it is a choice over both internal and external variables. This framework is not meant to make rigid distinctions between the quadrants of internal-choice, internal-circumstance, external-choice, and external circumstance. Instead, the framework is meant to show that these are forces that have an impact on student experience and performance. In the framework presented later in this dissertation,

internal and external variables are differentiated as separate input variables for both instructors and students. Regardless, there are potentials for choice regarding both internal and external characteristics. Some of these variables can be directly influenced by the course and interventions in the course; others are more personal choices for the student.

According to Ryan and Deci (2009), students are naturally inclined to learn. Instructors often inhibit learning by setting artificial boundaries and external motivational rewards and positive and negative reinforcements. The setup of a course can restrict the natural curiosities and motivations to learn. When intrinsic motivations are nurtured, students learn better and are more satisfied with their learning experience. Further, Self-Determination Theory has been supported by research in that students, who are given autonomy and choice in their learning experiences, will thrive. Instructors that are pressured by administrators to adhere to standards often impose a rigid learning structure to curriculum. This type of structured and accountable educational system relies on extrinsic forms of motivation to drive students (Ryan and Deci, 2009).

Ryan and Deci (2009) describe a continuum of extrinsic to intrinsic motivation that moves from highly externally regulated to highly intrinsically regulated. In the past, it was believed that extrinsic motivators completely negate any intrinsic motivation. Ryan and Deci (2009) have mapped out how in some instances, extrinsic motivators can actually accompany intrinsic motivation. This is important for researchers and educators to understand because it has implications for environmental manipulation.

The *Internal and External BY Choice and Circumstance* (IECC) theory provides a theoretical foundation for the framework presented later. The IECC demonstrates that

there are variables both internal and external to an individual that can influence action. Further, according to this framework, there are certain behaviors of an individual that can be chosen and others that are victims of circumstance. This theoretical foundation for the presented this decision theory helps to make the distinction for things that can be influenced by researchers and educators. The proposed framework helps to sort out how that can be done from the broader perspective of an online course.

Uses for the Framework

Many aspects of the framework proposed in this dissertation have been investigated in the past. However, the literature of online education has not assembled these disparate areas into a cohesive framework. Not only is there great variation in how courses are implemented, the study of online courses has a tradition of variation in methods and findings (Zhao & Lei, 2005). While there are areas of the framework that are often researched together, such as inputs and outcomes, or outputs and outcomes, these cross-pairings look only as specific aspects of the different areas without tying the results back to a larger framework. Further, aspects of the framework are investigated at inconsistent levels. A cohesive framework is critical for identifying gaps in online course research and how disparate prior research fits together.

The framework describes how the instructor and courses in general work in relationship to the student. While the general areas, sections, and subsections should stay consistent across courses, the details of the model will change depending on the unique course and the variables related to the individual student. For example, the Composition of the course changes based on Inputs and how the course Activities are run and how students and instructors engage with those activities. Process Decisions will change based

on the how the instructors and developers conceptualize Instructional Process Decisions and the variables that affect each student when they are making Student Process Decisions. The Results depend on how students' interaction with the course results in Outputs and Outcomes. And finally, as mentioned before, while the student and media will stay constant, the other actors in a course can vary. While many online course have an instructor, this is not always the case.

Thus, the framework shows that a course is a complex system of interacting interconnected independent parts. Because of interconnected nature of the framework, changes in any one area of the framework can affect other areas of the framework and ultimately influence the actual outcomes of the course. Despite the interconnectivity and complexity of the system, there is evidence that well designed and implemented courses can influence outcomes in positive ways (Mayer, 2009; Sitzmann, 2006; Tallent-Runnels, 2006; Zhao & Lei, 2005). Identifying the limits of good design should help set the parameters for course requirements. The following are some of the ways the framework, developed and analyzed in this dissertation, can be used by others:

- Researchers can use the theory to connect variables and identify established areas of research as well as gaps in research. Studies that focus on a specific area of the theory can more easily identify what was focused on and what was ignored.
- Instructors and developers can use the theory to identify areas of instruction that need attention
- The theory goes beyond online education and could be used for other organized learning systems.

Uses for Framework Connections

Online education has opened the opportunity for a wide range of potential course formats. Instructors are both able to make decisions about the course and are restricted by technology in making those decisions. Some of these decisions are whether or not to

allow students more freedom and thus more choice (Bachman and Stewart 2011; Kozma, 2003). In turn, students have to figure out what kinds of freedoms they have and then what decisions they have to make based on choices in the course and variables in their own lives, such as their abilities (Kozma, 2003) and environmental influences, such as work or living situations. These dynamic changing possibilities mean that students must gather information about each course as they are interacting with it.

Since there is great variation in the component-activities of a course and the potential for a high degree of course flexibility and user-control, one area of the framework that is particularly important for online education is Student Participation Decisions and is the focus of the proposed study. In addition to the proposal of the framework, this paper focuses on an aspect of the framework that has had limited attention in the research of online courses, Student Participation Decisions. This area has implications for student attrition, student output, and the attainment of instructional outcomes and student goals.

Other portions of the framework are also important in the development and implementation of online courses and will need to be studied and validated in future studies. While most sections and subsections of the framework have been researched in the past, a comprehensive framework such as the one proposed has not been offered to show how the areas are linked. These linkages are important in that researchers can see more clearly how variation in results may occur. The following are ways that researchers and practitioners can examine connections in the framework in the future:

- Researchers can use the findings to conceptualize how students behave outside of the classroom and how that could affect learning.
- Instructors and course developers can use the findings as a way of understanding how and why students interact with online courses.

Why Research In Online Education Matters

Figuring out what works in online courses is increasingly important because of how online education has been targeted as the solution to budget cuts and lack of student access to higher education. With the need for more workers to have a degree in higher education and the need for greater access (Burnette & Conley, 2013), online education seems poised to fill the gap in educational access (Means et al., 2009; Schultz & Crow, 2014). The benefit for obtaining a bachelor's degree, especially in STEM and management fields, is evident through the lifetime earnings of people who have earned a degree (Julian, 2012). However, at the same time, American education has gone from 1st to 12th in the rate of college-educated citizens and this lower rate of college-educated citizens has been seen as a strategic problem for the country. One proposed solution is to keep costs of education down so that more students can afford to go to college (The White House, 2014). However, economic problems have been squeezing university finances and this has made it difficult to lower prices for students. For example, potentially devastating budget cuts in California regularly threaten UC, CSU, and community colleges. In addition to services, caps in enrollments have scaled back accessibility of education in California and have threatened the mission of public education to provide accessible education that will prepare a future workforce (Medina, 2012). Online education has been seen as a scalable way to offer more accessible education:

> Online learning has become popular because of its potential for providing more flexible access to content and instruction at any time, from any place. Frequently, the focus entails (a) increasing the availability of learning experiences for learners who cannot or choose not to attend traditional face-to-face offerings, (b) assembling and disseminating instructional content more cost-efficiently, or (c) enabling instructors to handle more students while maintaining learning outcome quality that is equivalent to that of comparable face-to-face instruction. (Means et al., 2009, p. 1).

Further, some consider online education as a possible solution to finance problems (Asimov, 2013; Sherron & Boettcher, 1999). However, meeting the goal of providing both a more accessible and more cost-effective education could mean that the savings will need to come from savings in operational and infrastructure costs, rather than passing the bill onto the students:

> Online education should create lower cost structures, and the new educational delivery models universally offer this opportunity. It will be increasingly difficult for traditional institutions to justify not having reduced tuition for online courses and programs. Even with no other change, there will be tremendous price pressure for online program costs to drop. In the long run, the higher-priced models could become untenable for all but the most selective universities (Hill, 2012, p. 96).

If institutions can find a way of reducing development and implementation costs and resources while keeping a high level of quality, online education could help fill the void of accessible and available higher education.

However, using online courses to reduce costs and increase access for students may prove more difficult than it may seem. Over the years, a number of public and non-profit private colleges and universities have shutdown their online programs (Arenson, 2003; Hafner, 2002; Kolowich, 2009; Parry, 2009; Westervelt, 2013). More recently, higher education leaders have been uncertain about the benefits of online courses. In a large nationwide survey of institutional leaders at colleges and universities, institutional leaders have indicated that while 69% believe online courses are strategically important for their institution, leaders are divided on the strain online courses put on faculty. Forty five percent of leaders believe online courses require more faculty time and effort than in-person courses, while only 9.7% do not believe (and the rest were neutral) that it takes more time and effort for faculty (Allen & Seaman, 2013). Institutions are also divided on whether or not to develop the larger Massively Open Online Courses (s) with only a

small percentage of organizations actually offering or developing MOOCs (Allen & Seaman, 2013). And whether online courses actually increase access is still debatable. For example, in a study of over 500,000 students taking online courses at community colleges, a disproportionate number of male and black students, as well as younger students and those with lower GPAs, performed poorly (Xu & Jaggars, 2013). This indicates that online courses could unintentionally harm certain demographics (Black and male students), as well as those that are less mature (younger students) and those that have previously not done well in education (students with lower GPAs). Thus, rather than blindly investing, it may be important that institutions understand how and when online courses are a solution. Even with the vast amount of research in online courses, there are gaps that leave researchers, educators, and administrators uncertain as to what works and when. While much of the differences in outcomes could be the result of the unique circumstances, other variables can be identified as similar across some courses. Organization of the literature that maps out the broad issues could prove helpful.

For-profit schools like the University of Phoenix have seen tremendous financial reward from their online education programs as well as substantial criticism of their outcomes. Meanwhile, online education programs at traditional universities have had a rough start and continue to experience problems. For example, some of the earliest online initiatives like those at Columbia University, New York University, Temple University, and the University of Maryland ended almost as quickly as they started (Arenson, 2003; Hafner, 2002). Even more recent online initiatives, such as the University of Illinois' Global Campus have shut down (Kolowich, 2009; Parry, 2009). More recently, Massive Open Online Courses (MOOCs), which are online courses that have a massively high

enrollment potential, have received attention for serving a large number of students (Hill, 2012). However, the promise of MOOCs has lost its momentum (Kamenetz, 2015). San Jose State University's venture into the world of MOOCs also seemed to promise university savings, however, the results showed that the MOOCs at San Jose State had fewer students completing, with lower grades, at a higher price to the university, and were not serving the underserved that the courses were targeted to (Westervelt, 2013). And while public perception is that online courses have a lower price (Hill, 2012; Saad, Busteed, & Ogisi, 2013) the institutions that are still in the online business seem to not be able to keep costs down and pass the costs off to the students (Bacow, et al., 2012; Hill, 2012). For example, Cal State Online offers courses at $500 per unit (Cal State Online, 2014). At 12-16 units per quarter, just one quarter would cost about the same amount as the in-person equivalent in the same CSU system for the whole – three quarter – year (Cal Poly, 2014).

This cost structure appears to be at odds with the idea that online and distance education programs keep prices down (Jones and Gower, 1997) but these charges for online seem to arise not only from the initial start-up and long-term costs, but also from institutional goals of creating new revenue streams. However, in many cases these new revenue streams have not been realized in public and non-profit institutions. The lack of effort to boost online and pass the costs of technology onto students has potentially contributed to the bad publicity that online courses get. Passing the costs onto students not only deters potential students from taking online courses, it moves away from the goal of creating greater access to students that might not otherwise be able to attend college. One of the enduring low-cost large online educational systems from traditional

universities are course materials and lectures that were posted online for anyone to use for free, such as Open Yale Courses, MIT's OpenCourseWare, and Carnegie Mellon's Open Learning Initiative. And these free systems seem to have strong competition from independent vendors like Khan Academy, a system of short online lectures that originated as a one-person website (Hill, 2012). This turbulent start for online education has made it difficult to predict the future of online courses and what it would take to make them cost-effective and popular.

Meyer (2005, 2014a) described four sources of cost shifts from online education: 1) away from human guides toward automated learning; 2) from higher-priced labor toward lower-priced labor; 3) from on-campus costs to technology costs; 4) from instructor instincts to research-guided instruction. While a simple view of online education costs may give the impression that it is more expensive because of the cost of developing materials, creating technology infrastructure, and training instructors (Hiltzik, 2014), a more thorough cost-benefit analysis is likely to reveal that there are far more variables involved. And instead of trying to create revenues by taxing the student, perhaps institutions should look at the cost savings and improved learning in well-developed semi-automated courses. Similarly, Hill (2012), said

> for MOOCs to become truly transformative for higher education, the concept must accomplish the following goals: Develop revenue models that will make the concept self-sustaining; Deliver valuable signifiers of completion such as credentials, badges, or acceptance into accredited programs; Provide an experience and perceived value that enables higher course completion rates (in most MOOCs today, less than 10 percent of registered students actually complete the course); Authenticate students so that accrediting institutions or hiring companies are satisfied that a student's identity is known. (Hill, 2012, p. 94).

Even as there have been failures, online education has grown in popularity. For example, in 2011, first-time online course enrollment (9.3% increase in students) still far exceeds the rate of students starting college, which actually declined by 0.1%. While this was the

first time in ten years that the rate decreased, online education has had a higher growth rate than general college enrollment every year since 2003 (Allen & Seaman, 2013). From 2002 until 2011, the number of students taking online course grew from 1.6 million to 6.7 million (at a compound annual rate of 17.5%) compared to a growth in over all college courses increase of 16,600,000 to 21,000,000 (at a compound annual rate of 2.7%). During that same period, the percentage of students that had taken an online course has gone from 9.6% of all college students to 32% of college students. It is hard to deny the impact of online education when 32% of students have taken at least one online course and the numbers of online students continues to grow (Allen & Seaman, 2013). And the need for online education exceeds supply (Instructional Technology Council ITC, 2010). As the number of students enrolling in online courses has steadily increased, administrators, educators, and policy-makers wonder if online is an effective and efficient alternative to in-person education, and if so, under what conditions (Bacow et al., 2012; Bell & Federman, 2013): "The key challenges now facing college administrators and faculty are to decide when to use e-learning and how to design and deliver it to maximize student achievement. As yet, however, e-learning research provides minimal guidance on these central questions" (Bell & Federman, 2013, p. 177).

CHAPTER 3: FRAMEWORK CONCEPTUALIZATION

One of the main focuses of this dissertation is the development of a framework of online courses. As explained in the previous sections of this dissertation, the field of online education has been a relatively new development and the research in this area has been diverse with frequently conflicting findings. And these conflicting findings can be attributed to the variability in instructional practices, instructor effectiveness, and student characteristics (Bell & Federman, 2013). While many of the various aspects of online courses have been investigated and a large number of variables have been studied, these variables have not been placed in a larger theory of action that shows how these variables relate to one another.

Having a general theory of action allows both researchers and practitioners to see the big picture and how research in online education relates to other research investigating different variables. This in turn allows investigators, administrators, and practitioners to focus their research and practice, understand the limitations of research and practice, and understand what could be done to improve research and practice. The longer the field of online education goes without a general theory of action, the more miscalculations will occur in research and practice. And these problems with online education research will foster false impressions of what works, as the field will continue to rely on piecemeal and conflicting results. Thus, a comprehensive framework is needed for researchers to place their research in the larger field and for practitioners and administrators to understand how research findings relate to other research findings. By using the framework, educators can get a better sense of what is happening in their course

and researchers can more readily identify which aspects of an online course they are focused on and what aspects might need further research.

Building a Framework

This dissertation presents both a framework. The framework acts as a unifier of concepts that can be generalized across online education. Developing and validating a framework is the focus of this dissertation. At some points in the dissertation, the framework was shaped in a way extended beyond what is generalizable. There were two reasons for this. One, the dissertation was a work in progress. The conceptualization of the framework occurred before any data was collected. By looking across important actors, the parameters for this framework could be more firmly established. Second, Study 2 and Study 3 were conducted using additional actors that were relevant to the studies. Indeed, the framework is meant to allow additional actors to be added when appropriate.

The purpose of framework is to provide a generalizable theoretical device that unifies concepts, processes, and variables that are important in online education. Establishing a theoretical device that could generally describe all online courses was a difficult task that required addressing questions such as:

- How many actors are there in the framework?
- What are important variables related to the framework?
- What are important processes related to the framework?

This chapter was the first attempt at developing this framework. The sources for this development came from online education and higher education literature and my experience in higher education and years of evaluating programs of online education.

While this conceptualization was well-informed, it was only through the course of the whole dissertation that a generalizable framework could find solid grounding.

Building on Prior Frameworks, Models, and Typologies

A comprehensive framework of online education is needed since past models that have been limited, static, or both. This framework reflects many of the models and frameworks that have come before it, from models of student change in higher education, models of online education, and logic models developed by program evaluators. Each of the different types of models offers different variables and different paths to outcomes and these differences provide valuable insights into what are the inputs, processes, and outcomes of an online course. Further, the framework allows for the incorporation of different typologies, such as the Lowenthal (2009) typology described below. All of the characteristics and attributes of online courses described in the first chapter of this dissertation fit within the *Input* and *Operation and Participation* sections of this framework.

Astin (1993) used an Input-Environment-Outcome model to describe the way college affects students. A student enters with input variables, is affected by they environment of college, and then exists college with certain outcomes. The degree to which certain environmental variables influences student outcomes is something instructors, administrators, and researchers wish to understand so they can make good decisions about what is needed for quality student outcomes. As Astin (1993) explained, it is difficult to isolate these environmental variables, not just in the documentation of what variables are present, but also which of these environmental variable make an impact, how they make an impact, and to what degree. The input variables are also very

important in understanding outcomes. How might the outcomes be different for three students with different college experiences but with similar input variables? And how might the experiences and outcomes be different between two different people, one that attended university and one that did not? This model of Input-Environment-Outcome is important in understanding how both input variables affect outcomes and how environment and experiences might affect outcomes.

Models of student dropout in colleges, such as Bean and Metzner (1985) and Tinto (1993) are directional and start with background characteristics that the student brings to college (or the class). These models then move to variables that influence the student during college and then end with outcomes and a decision of whether to dropout. Rovai (2003) developed a dropout model based on the prior models of Bean and Metzner (1985) and Tinto (1993) that included some online course and skill variable but it too ended with the ultimate out come of a decision to dropout. Ultimately, the outcomes of persistence models are a decision to stay or leave the university or course. However, these models are also helpful in understanding other outcomes in college and online courses.

Pascarella (1985) developed a model of student change in college. The model included Structural/Organizational Characteristics of Institutions, Student Background/Precollege Traits, Institutional Environment, Interactions With Agents of Socialization, Quality of Student Effort, and Learning and Cognitive Development. This model is directional and causal and moves from starting variables (Characteristics of Institutions and the Student Precollege Traits) to variables that affect the students during college (Interactions with Faculty and Students, Institutional Environment, and Quality of

Student Effort), and moves to the impacted variables of Learning and Cognitive Development. This model moves away from the persistence models in that the ultimate outcomes are Learning and Cognitive Development rather than the dropout decision outcomes of persistence models. Pascarella's (1985) model also places institutional variables as input variables along with the incoming student variables.

Social Cultural Learning Theory lends to the idea that there are multiple influences in the learning process. Students not only have artifacts that mediate learning (Cole, 1984), there are systems that shape the process (Engeström, 1997). Cole (1996) describes context as having two separate properties: 1) that which surrounds and 2) that which weaves together. The first property, i.e., that which surrounds, was described as all environmental factors that contribute to a given learning situation. Cole used concentric circles to illustrate the multiple levels and layers of influence on a context. For example, a student is nested within a group, which is nested within a classroom, which is nested within a school, which is nested within a city, etc. Cole uses that which weaves together to describe context as the simultaneous combination of all contextual elements, such as artifacts, other people, and one's goals. This means that there is a simultaneous play of contextual elements that are affecting cognitive processes and that these cognitive processes extend out into these objects. Cole (1996) described how one's display of a cognitive process in one situation or context is not necessarily indicative of what that person will display across activity systems.

A very early model of a "Virtual Classroom" by Hiltz (1993) included the equivalent of Inputs, Processes, and Outcomes. The Input was broken up into three main areas: Technology (Equipment Access, Software Functionality, Software Interface –

Usability, and Reliability), Course [Composition] (Level, Class Size, Type of Subject Matter, Instructor Skill and Effort, Organizational Context), and Student Characteristics (Motivation, Ability, Skills, Attributes). The Processes was made up of Amount and Type of Use of Virtual Classroom, Active Participation, Collaborative Learning. And the Outcomes included Quality and Access.

In their 15-page report of a 3-year, 17 course field study of online courses, (Benbunan-Fich and Hiltz 2003) built on the Hiltz (1993) model and used a model of online courses that included three main areas: moderators, mediators, and outcomes. The moderators included technology (mode, equipment access, software functionality, software interface usability, and reliability), course (course type, class size, type of subject, instructor skill and effort, and organizational context), and student characteristics (ability, skills, and attributes). The mediators included motivation, collaborative learning, active participation, access to the professor, and convenience). And the outcomes were described as the perceived learning outcomes of the course.

In a description of Personalized Learning Environments Väljataga and Laanpere (2010) described a learning contract that included Objectives (Learning Objectives), Activities (discussions, assignments, preview, reflections), Resources (people, materials, communication software, other software), and Evaluation Criteria (types of learning outcomes and outputs).

Anderson and Rogan (2011) described a non-directional process of course development and implementation that considers contextual influences (policy, local context, societal expectations, research trends, and technology), the planning of the course, the operationalization and delivery of the course, and evaluation and

improvement of the course based on student survey feedback. A comprehensive approach of describing a course from start to finish is important for understanding course processes.

Lowenthal et al. (2009) provided a broad checklist of online course characteristics. The broad categories for this checklist included Context, Media, and Teachers and Learners with sub-characteristics: Context - Formality Setting, Curriculum Fit, Synchronous/Asynchronous Pacing, Percentage of Online Class Size, Development Model, Targeted Learning, Subject Area; Media - Multimedia, 3-D Virtual Worlds; Teachers and Learners - Instructor Role, Cohort Group, Student Collaboration, Teacher Preparation, Student Diversity, Class Size. The breadth of this framework provides a very useful starting place for how to characterize online courses. This is important in online education research since it helps explain the wide variety of variables that influence the course and outcomes.

Piccoli et al (2001) provided a directional model that described influences on effectiveness. In their model Piccoli et al (2001) described three dimensions: Human, Design, and Effectiveness (effectiveness is influenced by the human and design dimensions). These dimensions were described in more detail: The *Human Dimension* was made up of students and instructors and these two actors have their own characteristics: Students (maturity, motivation, technology comfort, technology attitudes, previous experience, computer anxiety, epistemic beliefs) and Instructors (technology control, technology attitudes, teaching style, self-efficacy, availability). The *Design Dimension* had five main pieces: Learning Model (e.g. Objectivist, Constructivist); Technology (Quality, Reliability, Availability); Learner Control (Pace, Sequence, Content); Content (Factual Knowledge, Procedural Knowledge, Conceptual Knowledge);

Interaction (Timing, Frequency, Quantity). These two dimensions of *Human* and *Design* were modeled as impacting the Effectiveness of an online experience. Effectiveness also had more detail and was broken down into three main areas: Performance (Achievement, Recall, Time-on-Task); Self-Efficacy; Satisfaction (Evaluation of the learning experience, Drop rate, and Anxiety). This model provided an important start in the understanding of the dimensionality of online courses (multiple actors, multiple course elements, multiple contexts, multiple results, and directionality). However, the model lacks some important pieces (such as student decision processes and actual participation) that could influence the results online courses.

The framework developed and described in this dissertation uses an expanded look of online course development and implementation through the use of program evaluation type logic model. The practice of program evaluation often incorporates theories of programs and visually displays that theory in the form of a logic model (Kellogg Foundation, 2010; Rossi, Lipsey, & Freeman, 2004). The framework proposed here has been visually displayed in a logic model format (see Appendix L). A logic model format for the visual representation of the framework was chosen because is allows the incorporation of all or most of the variables that has come before, situates them in a logical grouping and order, and then displays them in a dynamic action-oriented representation. Thus, the framework allows for the incorporation of prior research and then allows for a reconciliation of the missing links. At the broadest level, the framework consists of the Composition, Process Decisions, and Results of the course. Each of these general areas of the framework are broken down further: Composition is made up of an Input section and Operation and Participation section; the Process

Decisions general area is composed of Operation and Participation Decisions; Results are broken down into an Output section as well as an Outcomes and Goals section. The space below the sections is made up of more specific subsections. These subsections are color coordinated to indicate when a subsection and description are related more to the instructor (blue boxes), an individual student (red boxes), and other important aspects of the course such as the class or student-body in general, content, and technology (grey boxes). Sometimes these colors overlap, for example, individual students often overlap with the student aggregate (all or most students in the class). This is done to indicate that the student is part of the larger student body. The sections and the accompanying subsections as well as the temporal and conceptual relationship of these sections are explained below.

Important Properties of the Framework

Certain properties permeate the different sections of the framework. One of these properties are the actors involved (instructors, students, and possibly, content-technology). Another property is the temporal relationship between the different sections of the framework. Finally, behind the framework is the context in which the course is taking place. Each of these properties are important for the functioning of the framework and these properties are explained below.

Two main actors. In an online course, one can observe two primary types of actors: the instructor and the student. The instructor guides the course and the student plays the role of the learner. However, as explained below, some may see content-technology as a third type of actor in the course. For example, McIsaac et al (1999) explained that there are four types of interactions in an online course: Learner-to-

Instructor; Learner-to-Learner; Learner-to-Content; and Learner-to-Interface. In this model, content and interface are combined as content-technology, since content is usually not separated from the technology, except when it is being thought or spoken and thus is communicated through a human agent or some form of artifact. Thus, as explained below, there are two main actors, instructors and students, and content-technology is viewed as an artifact.

Instructor. The instructor has historically been an important part of courses, although their roles have evolved over time. Pedagogical trends have shifted between apprentice models, lecture models, and learner facilitator models. While some institutions set the instructional agenda and pedagogical approach for instructors, for many higher education systems today, the role and pedagogical approach of the instructor is often up to the instructor to decide. While pedagogical decisions may remain with the instructor, the online environment changes the venue on which these decisions are made. Feist (2003) used a before and after model of instructor professional development in the preparation, assessment, and improvement of online courses. Slightly differently, Young (2004, p.142) described processes of before and during the course that included "a variety of tasks such as course design, content preparation, course promotion, knowledge construction, e-material production, engaging students, and interactions." Abdous (2011, p.61) took it a step further and described an online instructional process that considers "three sequential non-linear phases: (1) before: planning and design; (2) during: facilitation, interaction, and feedback; and (3) after: reflection." The framework presented here uses temporal elements of before, during, and after to describe what the instructor brings to the course, how they interact and make decisions in the course, how these

aspects influence the outcomes of the course, and how they impact the instructor's goals. Portions of the framework associated with the instructor occupy the top area and are highlighted with a blue background.

Student. The student is another main actor in the course. Courses are created with the intent to help a student learn. Without a student, there would be no purpose for a course. The framework reflects this importance with half of the model describing both the individual student and students in the aggregate. Like the instructor, the framework uses temporal elements of before, during, and after to describe students as they are introduced to the course, how they interact in the course, and the outputs and outcomes that these interactions produce. Portions of the framework associated with a single student occupy the bottom area and are highlighted with a light red background. Students in the aggregate overlap and surround the areas with a single student (an indication that a single student is a part of the aggregate of all students in the course. Students in the aggregate shares the grey background with other prominent aspects of the course such as content and technology.

Media: actor or artifact?. Media, through technology, symbol systems, and processing capabilities, can be seen as the voices of an actor or actors from the past. Within the displayed text and hidden programming, there are traces of intelligence that have been left by academics and programmers (Pea, 1993). As voices of people from the past, media can be seen as a third actor in education. Although the content and programming of the computer were done in the past, the interaction with the instructor and students occurs in the present. And the interaction can be dynamic and adaptive. As technology improves, the combination of technology and content will increasingly

resemble a human actor. Thus, although content is not embodied and animate like the instructor and student actors, it does serve the role of an actor. However, content and technology fluctuate in both quality and in how people interact with them. So, it may be safer to classify content and technology as an artifact. The framework gives content and technology a prominent position as both an input and through interaction with the instructor and the student.

Temporal and conceptual relationship between sections of the framework. The sections of framework have a dynamic relationship in terms of time and concept. To some degree, the framework moves from left to right. For example, there has to be Input as well as Operation and Participation in order to produce Outcomes. However, parts of the framework overlap. For example, how students participate falls under Operation and Participation as both Aggregated and Individual Student Participation. Simultaneously, this participation can be seen as an Output and can be collected as data. What separates these two subsections is that they are conceptually different. Individual Student Participation can be seen as a process, while as an Output this participation can be seen as produced data. The former could be hidden or observable action, while the latter is the data that may or may not have been captured from report or observation. Finally, the Process Decisions section is strategically placed because of the relationship it has with the rest of the framework. While the rest of the framework mostly moves temporally from left to right, Process Decisions mainly affects the Operation and Participation section to the left. Further, subsections in all other sections of the framework can influence these decisions. For example, a student's output and outcomes can provide the student with information about future decisions.

Institution and other contextual variables. One of the larger influences on a course is the institution in which the course was developed and implemented (Gunn and Fisk, 2013; Zhao et al, 2005). The institution plays a contextual role and often is the source of many aspects of the online course. For example, the platform on which the online course is run will often be determined at the institutional level. Institutions also offer other important infrastructure, such as the development and maintenance of online applications and technical support for students and instructors. Institutions may require or offer training for instructors wanting to teach online (Meyer, 2014a; Zhao et al, 2005) and training faculty for online and distance course instruction has been one of the main online education concerns of colleges and universities (Jones and Gower, 1997). Universities in some countries, including those in the United Kingdom, Norway, and Sri Lanka, have training programs for new instructors of in-person courses that are tied to promotion and tenure. These programs can range from 60 to 500 hours of training. These programs often have advanced techniques aimed at accomplishing the goals of improvement of teachers' skills, the development of teachers' conceptions of teaching and learning, consequent changes in students' learning, develop teachers' ability to reflect and be self-improving, and to increase self-confidence or self-efficacy (Gibbs and Coffey, 2004). Additionally, the institution may offer rewards or incentives for instructors that teach online (Bacow, 2012). Institutions can also clear administrative barriers that may hinder online course development and implementation (Bacow, 2012; Orr et al. 2009; Shea, 2012).

In a study of costs of faculty development in the area of online education, Meyer (2014a) received 39 responses from institutions that were emailed survey requests asking about faculty development costs. Specifically, the survey looked at costs, potential

actions if faced with budget cuts, current measures for cost-benefit analysis, and the percentage of faculty that the professional development efforts reach. Only 21% of the institutions surveyed had evaluations of the budgets of faculty development for online education in place. Administrators are more likely to cut resource-intensive type trainings (trainings that could be more impactful for individuals, such as one-on-one and multiple training sessions) but would keep or expand resource-light type trainings that reach more people but could be less impactful for individuals (like newsletters, webinars, and online modules). Institutions were more likely to cut training of specific technologies and more likely to keep training that promoted student learning. Only about a quarter of institutions were doing any kind of cost tracking of faculty training. While many institutions do not know the number of faculty that they serve with professional development activities, the institutions that did know indicated impressive results, often serving 50% or more of their faculty. Institutions are more likely to serve full-time faculty with professional development than part-time faculty. Mayer (2014a) proposed that the part-time faculty were less likely served because they are more likely to have more commitments outside of the institution and have less reason to improve their instruction.

Instructor training can be categorized according to *format*, *content*, and *theory*. From their review of literature, Meyer and Murray (2014a) identified the following *formats* of training for online course instruction: One-time, face-to-face workshop; Semester-long course; Multi-semester training initiative; Online modules; Webinars; and Computer lab instruction and practice. In their survey of institutional training for online courses, Meyer and Murray (2014a ¶) found the most popular modes of training to be the following (in order of popularity, starting with the most popular): Activity, Workshop (2-

5 hours), One-on-one training, Short session (<2 hours), Hands-on training (in a lab), Create online course, One-time session, Multiple sessions (2-5 sessions), Online modules, Webinars, Year-long training, Peer training, Summer semester training, Peer review of course, Many sessions (>5 sessions), E-newsletter, Train-the-trainer, Consortial (multi-institutional) training, and Use of instructional design. The most common *content* types of trainings that instructors have for online course instruction can be "categorized into five broad groups: 1) basic uses of the course management system (CMS); 2) technological tools (e.g., wikis, blogs); 3) appropriate pedagogies originally used in the face-to-face classroom but applied to online learning; 4) online resources; and 5) instructional design principles or models." (Meyer and Murrella, 2014, ¶7). And Meyer and Murray (2014a ¶) found the following to be the most common topics of online course trainings at (in order of popularity, starting with the most popular): Assessment of student learning, Creating community, CMS, Student learning styles, Instructional design model(s), Advanced topics for experienced faculty, Blended instruction, Experiential learning, Wikis, Use of case studies, Blogs, Problem-based learning, Discipline-specific training, Mobile technologies, Podcasts, Critical thinking, Facebook/Twitter, Research base(s) of online learning, and Community of Inquiry.

Another study by Meyer and Murrel (2014b) looked at the types of theories that are used for online education training. It was found that institutions used a wide variety of theories in their training, including, adult learning, self-directed learning, andragogy, transformational learning, experiential learning, critical reflection, multiple intelligences, student learning styles, ego development theory, moral development theory, individual development, cognitive development, Connectivism, complexity/chaos, Community of

Inquiry, Technological Pedagogical Content Knowledge, and instructional design model. One surprising finding was that institutions were split on whether to cut training that focused on online learning research but were likely to keep or increase training of student learning styles. As explained by Meyer (2014a) and Meyer and Murrell (2014b) student learning styles is a largely disputed area of research and is difficult to incorporate into pedagogy in a meaningful way (Coffield et al., 2004). Also, Institutions are more likely to train faculty using Principles of Good Practice and Instructional Pedagogies than to train faculty with Online Learning Research or Theories of Learning. Thus, institutions train instructors on what good practices are but not the research or large concepts that back those good practices or pedagogies (Meyer and Murray, 2014b). This approach to training with just principles and pedagogies could prove problematic in that the principles could conflict with what the research has shown about learning in online environments. The lack of theory use could also make the training superficial without describing the conceptual issues underlying learning. Instructors may therefore easily forget or abandon the training if problems occur.

In addition to supporting instructors, the institution can support online courses through infrastructure and foster different cultures around online courses. An institution can set the tone for positive learning environments and it can create a culture that highly supports teaching and learning or it can neglect to do so. Some institutions heavily invest in online education and make that the primary format while other institutions have online courses at the periphery or do not offer them at all.

Input

The input section is unique for the three overlapping subsections of Instructional Input, Aggregated Course Input, and Individual Student Input. In no other section is there overlap with an instructor-related (blue-colored) box. The reason for this difference is that there is sometimes a high degree of control that the instructor and course designers have over course inputs. Firmly within Instructional Input are the traits of the Instructor and Teaching Assistant. Instructors can bring with them to the course a level of enthusiasm, background knowledge, and willingness to work with students that is unique the individual instructor.

To a varying degree, instructors have some control over the Aggregated Course Input. However, the control over these input variables is not always in the hands of the instructor. For example, course content can be influenced to a certain extent by the department or institution that the instructor works for. The instructor may or may not be able to decide the type of technology used for certain aspects of the course. Often, technology acquisition, such as Learning Management Systems are decided at the institutional level. Further, the quality of the technology is often more dependent on the companies that made the software or the local utilities that run the Internet. Finally, sometimes Instructors also have some level of control over who is allowed to take the course. Instructors, in coordination with the department and institution, can set pre-requisites so that only students that meet those minimum requirements can enroll.

The Individual Student Input subsection represents all of the characteristics that a student comes into the course with. This is one of the most researched areas in online courses. Students can be surveyed upon course entry to determine their internal attributes, such as personality, learning preferences, abilities from prior learning, and their

motivation for taking the course. Surveys can also determine some of the students' external attributes, such as where they live and if they work a job. Individual Student Input is included within the Aggregated Course Input subsection because each individual student contributes to the course as a whole.

Instructor and teaching assistant characteristics. One of the key elements that makes up online courses is the instructor. Instructors have such an important role in online courses that the Online Consortium (2014, formerly known as The Sloan Consortium) lists faculty satisfaction as one of the "five pillars" of online courses. Pointing to the degree to which instructors are able to influence the outcomes of a course, some studies make it a point to use the same instructor in comparisons between online and in-person courses (Johnson et al., 2000). And Phipps et al (2000) found faculty support as one of the main themes of online course success. The importance of the role of the instructor and TA in online courses is evident by the focus of early online education research. In the first years of online education research, the focus was on instructor comfort with technology and ability to implement online courses (Burnett & Conley, 2013). Over time, the research focus has changed and it is now assumed that the instructors teaching online courses are comfortable with the basics in technology. Thus, training now moves beyond feelings about technology and moves into the philosophy and pedagogy that accompanies. Beyond training, there are other characteristics that instructors bring to their courses that will influence how they teach and how they interact with materials, technology, and students. For example, quality online research takes into account the influence of instructional style that different instructors bring to the course and researchers will often design their studies in such a way that will take the different

instructor or TA influence into account (Campbell et al., 2002). Regardless of the methods used, faculty abilities and enthusiasm are a key aspect of online education. As Sherron and Boettcher, (1997) explained:

> there can be no doubt that the ultimate success or failure of distance learning is inextricably tied to the enthusiasm and continuing support of the faculty. This support must begin with faculty training, which is critical to the success of any distance program. (Sherron and Boettcher, 1997, p. 30)

Regardless of the degree to which instructors can affect an online course, the characteristics that instructors bring with them to online course instruction is important variable in how a course is implemented and, ultimately, the outcomes of the course. This is why *Instructor and TA Characteristics* are included as a subsection within the Input section of this framework.

Online courses can take more of faculty time and effort than traditional in-person courses (Allen and Seaman, 2013; McIsaac et al., 1999). Not only does the teaching sometimes to take more time, but "preparing a course online requires a much higher initial investment of time by a faculty member than teaching the same course in a traditional format." (Bacow, 2012, p.21) What is unclear is why online courses take more time and whether there are ways of speeding up the process or taking some of the burden off instructors. There are contradictory studies that show online courses actually ease the burden off of faculty workloads. Meyer (2012) found that instructors that initially had more work eventually found online instruction took less time and allowed the instructors to have more time for research and other professional activities. It seems reasonable that the technology abilities that an instructor brings with them will have an impact on the amount of time they will have to put into an online course and ultimately, the quality of the course. Teaching an online course can also be qualitatively very different than an in-person course, creating a learning curve for the instructors. Ultimately, figuring out why

online courses are sometimes more time-intensive and sometimes less time-intensive would seem hugely important for understanding when online course development and facilitation is worth the costs and for understanding how time costs could be eased.

The characteristics that an instructor brings with her/him to an online course can be placed in two categories: internal characteristics and external characteristics. These characteristics can analyzed according to whether they are beneficial or adverse to online courses and how fixed or changeable they are. For example, internal characteristics that could be considered more fixed may include an instructor's personality or strongly held moral opinions. Internal characteristics that could be considered less fixed may include knowledge of the subject, enthusiasm toward the subject, or behavioral tendencies, such as being friendly and personable to students. In the past, researchers have focused on instructor characteristics that influence in-person courses (Gibbs and Coffey, 2004). External characteristics that are more fixed could include the instructor's family, financial obligations, or whether they are adjunct or tenure/tenure-track. External characteristics that may be more flexible could include the type of equipment the instructor has in their office. It can then be determined whether certain characteristics are beneficial or unhelpful to the success of an online course. The more changeable characteristics can be changed, shaped, or reinforced through training (Gibbs and Coffey, 2004). Often these are changeable instructor characteristics are the focus of research, possibly because they seems to be the characteristics that administrators and developers are able to shape and change. For example, universities in some countries, including those in the United Kingdom, Norway, and Sri Lanka, have training programs for new instructors that are tied to promotion and tenure. These programs can range from 60 to 500 hours of training.

These programs often have advanced techniques aimed at accomplishing the goals of improvement of teachers' skills, the development of teachers' conceptions of teaching and learning, consequent changes in students' learning, develop teachers' ability to reflect and be self-improving, and to increase self-confidence or self-efficacy (Gibbs and Coffey, 2004). However, administrators could have some control over the more fixed characteristics of instructors through hiring or selection process by administrators. Although this strategy of hiring is not common or explicit in civilian schools, this type of selection of instructors with fixed-type characteristics seems to be a strategy that the military is able to use (Ciancolo, 2011), perhaps because of the greater flexibility in the choice of who to hire or promote as instructors. Thus, there are at least three dimensions that can be explored for decisions on instructor training: type of instructor characteristic (i.e. Internal vs External), whether it can be changed (i.e. Fixed vs Changeable) or if the characteristic should be changed (i.e. beneficial or harmful to student learning). Since it seems that most online education research looking at faculty characteristics has focused on characteristics that are changeable, particularly through faculty training, further research could look at these changeable internal characteristics as well as characteristics are less easy to change.

Slate et al. (2011), looked at how students described their perceptions of effective faculty. From the analysis, it was found that there were

> 29 prevailing themes: knowledgeable; understanding; communication; teaches well; caring; organized; flexibility; positive attitude; patience; experience in the classroom; fair; helping; respectful; open-minded; builds relationships; passion for the job; service; makes learning interesting; uses different modalities; fun; motivating; intelligent; involving students; being available; friendly; connects with the real world; listening; creativity; and challenges students. Of these themes, knowledgeable, understanding, communication and teaches well received the highest endorsements and are congruent with student evaluations that are components of promotion and tenure decisions. (p. 331).

Kendall and Shussler (2013) surveyed and interviewed students to get a better sense of what different words meant when students described the quality of instruction. Kendall and Shussler (2013) were able to develop student-defined terms that were positive and negative descriptions of instructor characteristics. The positive terms included *Engaging, Enthusiastic, Confident, Relaxed, Relate, Understanding, Organized*, and *Respect*. Negative instructor characteristics were described with these terms: *Boring, Nervous, Uncertain, Distant*, and *Strict*. These terms were organized into a framework that included four main themes: *Respect, Teaching Techniques, Interpersonal Rapport*, and *Passion for the Subject*. Given these themes of quality instructor characteristics, it is easy to imagine why instructors have a hard time crossing into online instruction and still maintain the type of quality instruction they conveyed in in-person instruction. Similarly, if students are expecting the same types of quality characteristics in instructors of online courses, they may be disappointed when they are unable to sense these instructor behaviors and qualities through online communication software and course organization. This is especially true as the online courses increase in size, such as with MOOCs. However, the qualities that an instructor brings to an online course may be similar to the in-person courses but could be displayed differently. It seems that more work could be done in this area to determine how student perceptions of in-person instructors differ from their perceptions of positive and negative online instructor characteristics. However, as explained in the introduction, online courses have such a wide variety of formats and instructor characteristics could be displayed quite differently from one course to another.

An area that is still a concern in online research is the instructor approach and philosophy toward teaching and learning. Instructors in colleges and universities are not

often trained on how to teach (Parsons, Hill, Holland, and Willis, 2012), let alone how to teach online, instead, their extensive learning in a subject area is seen as an expertise license to teach (Lowenthal, 2009). Often, instructors starting to teach online courses are poorly prepared to do so (Bacow, 2012). This all could be changing as more research is being conducted on instructor training. However, while research on instructors and what makes a quality instructor has increased over the years, much of the research has focused on instructor characteristics that can quickly change through interventions such as training, there is little or no attention paid to long-term characteristics of instructors, such as personality. While this makes sense, since resources are probably better spent on variables that can be changed, it leaves a partial void in understanding what impact the instructor has on a course.

Instructor and teaching assistant motivation. One of the things that instructors bring to the course with them is their motivation to teach. Different characteristics influence whether instructors will teach an online course such as "their skill in using technology, their attitude toward technology and distance education, their adoption of innovations, and the demographic variables of age, ethnicity, and institutional affiliation" (Tabata and Johnsrud, 2007, p.643). Cook, Ley, Crawford, and Warner (2009) found nine main motivators/inhibitors for faculty teaching online or at a distance: *traditional staff service, monetary rewards, insufficient rewards, technical and administrative rewards, job advancement requirements, and professional quality, professional and personal prestige, bad press, and personal benefits*. Orr, Williams, and Pennington (2009) found that faculty were most often motivated to teach online by altruistic purposes, such as improving campus infrastructure, improving the student experience, and improving

access to education for students, over extrinsic motivators such as pay or recognition. Altruistic reasons to teach online has been fairly consistent over time. For example, Rockwell et al 1999 wrote:

> the primary incentives that encourage faculty to adapt their teaching strategies to deliver education via distance center on intrinsic or personal rewards. These include the opportunity to provide innovative instruction and apply new teaching techniques as well as self-gratification, fulfilling a personal desire to teach, recognition of their work, and peer recognition. Extending educational opportunities beyond the traditional walls of the institution so place-bound students have access and students can reduce travels time is also an incentive. Release time for preparation also is a motivator for faculty to teach via distance. (Rockwell et al 1999, ¶33)

This seems to be counter to the extrinsic rewards that administrators often think will motivate instructors (Bacow, 2012). Instead of focusing on extrinsic rewards, administrators might be better served if they focused on internal altruistic motivators (Orr et al., 2009). Additionally, administrators may want to look at ways of clearing administrative and technological barriers that could be slowing faculty work in online education (Bacow, 2009; Orr et al., 2009; Rockwell et al 1999, Shea, 2007). Instead of putting resources into extrinsic incentives, administrators should seek instructors that want to teach online and value instruction for altruistic reasons and administrators should focus resource on faculty needs, such as pedagogical training, technological training, staff support in course development, and time off for course development (Orr et al., 2009; Rockwell et al 1999; Sherron and Boettcher, 1997). Institutions should authorize the creation and implementation of online courses as a boost for promotion and tenure (Rockwell et al 1999).

Another strategy is go beyond the selection of faculty based on intrinsic motivation and recognize and praise faculty for their efforts (Gunn and Fisk, 2013). In a comprehensive review of instructional efforts, Gunn and Fisk (2013) found institutions present teaching excellence awards that fall under the theme of *Planning and Delivery*

most often related to the following: curriculum design; knowledge of the subject; ability to inspire and motivate; respect and care for students as individuals; active and group learning; critical and scholarly; and engagement in assessment. The awards that fell under the theme of *Evaluating and Reflecting* usually had the following types of criteria: *Peer observation/review of teaching*; *Pedagogical competences portfolio*; *Scholarship of Teaching & Learning*; and *Evaluations and letters of support.* Institutions also promote continual improvement in courses by awarding instructor self-evaluation. Gunn and Fisk (2013) explained that exceptional teachers not only make changes based on training but also continue to think critically about teaching and learning throughout their careers. These types of awards can be added to online course development and instruction as a way of promoting intrinsic motivation.

Other studies seem to have a mix of internal and external motivators for teaching online. Shea (2007) field-tested a pilot survey and then ran a focus group to gather thoughts from those that took the survey on anything else that could be added or how the survey could be improved. 386 survey responses were used. Demographics included, sex, size of the last online class taught, academic rank, online teaching experience, and computer skills. Shea (2007) found the following motivators for teaching online education: flexible work schedule, interests in taking on a new challenge, addressing student needs, learning about technology and pedagogy, and providing access to new student populations. Monetary and professional benefits were not strong motivators.

> Differences with regard to factors that motivate faculty were observed by gender, age, academic rank, whether the instructor volunteered or was required to teach online, by computer skill level, and by institutional setting' (Shea, 2007, p.78).

Meanwhile the following demotivators were found:

> issues surrounding compensation for course development, revision, and teaching, and concerns about students' access to the online environment. The compensation issues may be related to the next group of concerns regarding additional time required to develop and teach online courses, which fell just below the concern that campus administration may not recognize the additional effort required to teach online. (Shea, 2007, p.79).

Hoffman's (2013) literature review found the following extrinsic variables related to faculty motivations for teaching online courses: flexibility, workload concerns, incentives and rewards, perception of peer support, and perceived level of institutional support. Hoffman's (2013) literature review also found the following intrinsic motivating variables for faculty to teach online: self-efficacy, technology experience, opinion of online education, professional growth and student access. Hoffman's (2013) empirical study only confirmed some of these variables, however, this could have been because the sample of faculty was from a small liberal arts college and the participants had limited experience teaching online.

Hew and Cheung (2014) looked at student and instructor perspectives in their experiences with MOOCs. Instructors were motivated to teach MOOCs based on altruism, a sense of interest in MOOCs, and external rewards or recognitions. Students were interested in taking MOOCs because of a desire to learn more in a subject area, the interest in participating in a MOOC, the motivation of a personal challenge, and the external reward of completing certificates. Instructors were unhappy with the lack of student interaction and the sense of isolation, as well as demands of time and money, and problems related to student assessment. Often students would drop out because they were unable to locate help when needed, lack of incentive to complete, and having other external priorities. In a survey of instructors at two universities, Green, Alejandro, and Brown (2009) looked at motivations that drove instructors to teach online. Motivating factors included flexible working conditions, opportunity to use technology, opportunity

to share knowledge with others, intellectual challenge, career development/advancement, and opportunity to gain teaching experience. The factors that faculty rated as most inhibiting included *lack of sufficient financial compensation in comparison to workload, concerns about workload,* and *lack of institutional support*. The mot important factors changed depending on the type of faculty member (adjunct, non-tenure track, tenure track, and tenured). For example, the most motivating factors for part-time faculty included (in-order from highest ranked): *flexible working conditions, the opportunity to share knowledge with others, the opportunity to use technology, increasing personal income, the opportunity to gain teaching experience, the opportunity for career development/advancement, the intellectual challenge,* and *a sense of loyalty to the university*. At the same time, the highest ranking motivators for tenured faculty (included (in-order from highest ranked): *intellectual challenge, the opportunity to use technology, flexible working conditions,* and *the opportunity to share knowledge with others*. Whereas the biggest inhibitors for part-time faculty to teach online included (in-order from most inhibiting): *sufficient financial compensation in comparison to workload* and *concerns about the quality of students*. Full-time tenured faculty ranked the following as being the greatest inhibitors for teaching online (in-order from most inhibiting): *lack of sufficient financial compensation in comparison to workload, concerns about time commitment, lack of personal connection with the university,* and *concerns about quality of students*.

Training. Institutions have historically investigated whether instructor characteristics can be influenced through training (Gibbs and Coffey, 2004). The need for instructor training has been especially apparent in online courses since they have a different format and thus require different skills than in-person courses (Zhao et al.,

2005). Instructors enter the course with different approaches, philosophies, and skills. These instructor characteristics can be improved through training so that their students have better experiences and will approach their courses in a more meaningful way (Gibbs and Coffey, 2004). For example, instructors that are trained to moderate student discussion boards have more friendly discussions, while untrained instructors have more student discussions that are built on negativity and descent (Winograd, 2000). Through a large-scale intervention that spanned 20 institutions and included 400 instructors and 8,000 students, Gibbs and Coffey (2004) found that training instructors influence their students to approach learning at a deeper level. The instructors that were trained also received higher positive ratings from their students than the control group. This evidence points to a positive influence of training on instruction. Instructors in the training group increased their student focus and decreased their teaching focus. In contrast, instructors in the control group decreased their student focus but increased their teaching focus (although the control group changes were not significant due to low sample size). Instructors in the training group also improved on student ratings versus a lack of improvement for a control group. The students of trained instructors were less likely to take a surface approach to learning than students that had an instructor prior to training (Gibbs and Coffey, 2004). Instructor knowledge of student learning can vary from one instructor to another. Instructors often enter a course without understanding how to apply research on student learning into their courses in an effective way (Borrego et al., 2013). Students respond to the values of their instructors and will gauge their performance based on those values (Gros et al., 2012)

There seem to be clear differences in the how students will rate the experience they have had with their instructor based on whether the instructor is tenure-track or adjunct (Carrell and West, 2008). This could be the result of the aims of the different types of instructors. Tenure-track instructors seem to be focused on more long-term outcomes for students while adjuncts are more likely to teach for short-term success (Carrell and West, 2008). Further, student use of the Online Learning Environment has shown to be related to instructor status. The students of adjuncts were more likely to use the OLE but were more satisfied with the tenure-track instructors. Adjunct instructors usually post more materials online and have more activities online, which may explain the more frequent usage. However, it is unclear why students were more satisfied with OLEs in tenure-track instructors' courses (Naveh, Tubin, and Pliskin, 2010). Additionally, students perceive the Teaching Assistants and Professors quite differently. In their study of students in science classes at one research university in the United States, Kendall and Schussler (2012) found that students view professors "as being confident, in control, organized, experienced, knowledgeable, distant, formal, strict, hard, boring, and respected", whereas, TAs are viewed as being "uncertain, hesitant, nervous, relaxed, laid-back, engaging, interactive, relatable, understanding, and able to personalize teaching" (Kendall and Schussler, 2012 p. 187).

Meyer (2014b) looked at community college instructor strategies for improving student learning efficiency when teaching online and found they used strategies to increase student engagement, used focusing tactics to keep students focused and on track, used a variety of formative assessment practices for student learning improvement, and followed fostered a self-passion for online instruction. However, Meyer and McNeal

(2011) found that 4-year university instructors use different tactics, including: increased multiplity through links to websites and resources, changed the way they communicated with students, changed the class to be less hierarchical, increased opportunities for student interaction, increased activities that promoted student active participation, increased the real-world learning activities, and communicated the time students should spend on various aspects of the course. This type of research helps make the connection between instructor characteristics and how these characteristics can impact how the instructor interacts in the course and makes decisions in the course.

There is an increasing amount of research being conducted on instructors, instructor training, and outcomes related to each instructor. However, there seems to be a lack of information about different instructor input variables that are better suited for instruction (such as behavioral or personality dispositions). The field also seems to be lacking a comprehensive model for how instructor characteristics influence the operation of an online course. Research has shown that there are important variables related to instructor effectiveness in online courses, a detailed mapping of these variables should be completed, however, this goes beyond the scope of this dissertation.

Content. The subject-area and content of a course plays an obviously important role in an online course. The subject and content drive the purpose, operation, and outcomes of a course. It is the substance and aim of the course and this can greatly impact course experience. This could be especially true for online courses. Students seem to prefer certain subject areas in-person and others online:

> the scientific investigation course topic was one of the most popular in the F2F format and the least popular in the online course format. On the other hand, humanities and natural sciences were two of the more popular course topics in the online format (Mann & Henneberry, 2014, p. 17).

As part of their meta-analysis, Zhao et al. (2005) coded the reviewed studies by the different subject areas taught in the course:

> social science, mathematics, science, medical science, literacy, humanities, business, law, engineering, computer science, teacher education, and skills. (Skills here represented any professional training that didn't fall into other categories.) We coded medical science, business education, and teacher education separately because they had been among the most commonly taught content areas in distance education. Zhao et al. (2005, p. 1847)

Zhao et al. (2005) found that the subject area of a course is a significant predictor of whether the course has better results in the online or in-person version. Although the studies had a low sample size so no definitive conclusion can be made, it does appear that there is a strong possibility that content area plays a role in whether a course operates better at a distance or in-person:

> studies of distance education programs in business, computer science, and medical science found distance learning to be more effective than face-to-face education. In social science and science areas, there is no significant difference between distance learning and face-to-face learning, although face-to-face learning shows a slightly better effect than distance learning. In military, mathematics and specific skills, distance education has a slightly better effect than face-to-face education. (Zhao et al., 2005, p. 1858).

Further, the more content that is posted online, the more often students will use the course website (Naveh, Tubin, and Pliskin, 2010). However, somewhat surprisingly, the amount of usage and the satisfaction of the course website does not seem to be different across subject matter (Naveh, Tubin, and Pliskin, 2010).

Appropriately, instructors frequently receive training for online instruction in a format that is discipline-specific (Meyer and Murrell, 2014a). Content may affect how instructors perceive different modes of instruction and what counts as excellent instruction in different subject areas (Gunn and Fisk, 2013). For example, even though the soup de jour in education seems to be collaborative work that fosters in-class discussion and having the student's voice heard (Eskey and Roehrich, 2013), certain disciplines such as science have instructors that still feel lecturing is very important and

may have a difficult time understanding how to incorporate collaborative work in a useful way (Marbach-Ad et al., 2012). Content plays an important role in the course and how the users experience it, this is why *Content* is included as a subsection within the Input section of this framework.

Course and component assembly. As described in the *Control* section of this dissertation, courses have pacing, sequencing, content, and activities that can be controlled by the instructor, the learner, or by computer automation. Where the control resides for these aspects of an online course acts as the foundation for curricular organization. If the control of all aspects of the course curriculum resides in the hands of the learner, then the curriculum that an instructor has designed would, essentially, be empty. However, if the course control resides in the hands of the instructor, computer-automation, or some combination of either of these with each other or the learner, then there has to be some prior curricular organization of the course. Anderson and Rogan (2011) proposed a framework for curriculum development that consists of four sequential but non-linear steps: vision, operationalization of the vision, design, and evaluation.

Institutions have historically financially supported the technology administration and infrastructure of online courses (Jones and Gower, 1997). Without the infrastructure in place, costs of an online course would fall completely on an instructor as they would have to assemble and finance the course and all associated technology. If an instructor uses the technology that is provided to him or her, then they must also work within the format that the technology affords. Thus, to some extent, the assembly of a course is heavily influenced by the resources that support the course. And this technology infrastructure can have a powerful impact on the outcomes of an online course as a "well-

designed interactive systems have the potential to achieve at least equivalent educational outcomes while opening up the possibility of saving significant resources that could then be redeployed more productively" (Bowen et al., 2013, p. 17).

The creation of an online course does not have to be an individual venture either, as instructors can work in teams or use pre-fabricated courses built prior to their induction as instructor. Instructors can share material or workload for a single course, across multiple courses simultaneously, or iterations of a single course or multiple courses over time (Young, 2004). Because online courses means that there is likely to be a distribution of locations of where students are learning from, online courses have to be well-planned for communication and engagement far ahead of time (Young, 2004). Adding automation helps to make the course reusable and allows students to have a fixed structure on which they will be able to navigate the system. This automation and fixed environment can help improve focus of the students as they will not be able to navigate to other sites and find distractions (Fischer, 2012) Also, planning out the curriculum to prescriptively lead students to learning outcomes may be attractive to instructors because of the clear logic and simple development and administration. However, too much automation and forced work or participation can kill student motivation:

> Thus, instructors focusing on enhancing an autonomy-supportive learning environment allow opportunities for choice and self-initiation and more importantly provide a meaningful basis for constraining choices (e.g., choice between two types of assignments), avoid pressure and controlling language (e.g., using words such as have to or should), and provide timely instructional feedback (Deci, Eghrari, Patrick, & Leone, 1994). A well-designed web-enhanced course needs to engage students by allowing them choices while making them feel connected and competent. Yet it may be easier for most instructors to structure the web-enhanced learning environment to pressure students to engage in specific activities and to complete assignments during a specific time period. Such controlled environments may be easier for instructors to maintain, but such controlling behaviors will hurt students' motivation. This is particularly important to consider when designing a new learning environment because the more autonomy supportive the social context, the more it promotes intrinsic motivation, persistence in learning, and enjoyment. (Bachman & Stewart 2011, p.184)

Technology and institutional infrastructure. Another input variable is the technology that goes into online courses. As described in the *Media* section in the first chapter of this dissertation, technology is the "physical, mechanical, or electronic capabilities that determine its function and, to some extent, its shape and other features" (Kozma, 1994, p.11). In an online course, this technology can include the computers that students and instructors use, the computer software used to run computer programs, computer accessories (e.g. headphones, video cameras, speakers), the Internet, web servers, and even the electricity infrastructure that all of the computers and associated appliances run on. Technology is vital for online courses because it provides the means by which they run. Without technology, none of the computer and Internet enhancements described in the first chapter of this dissertation would be operational. Similarly, regular technology glitches and failures would disturb seamless media usage and this could affect the learning experience for students.

Technology glitches can cause frustration for the student and instructor but they can also alter and obstruct the instructor's plan of instruction or learner's path for learning. For example, regular glitches during an online conference-based discussion section could make the conversation less fluid. This could result in a different instructional experience than was intended and could lead students to feel less engaged in conversation. Glitches can also lead to incorrect grading practices. For example in a report (Hillman, 2011) that investigated student cheating at for-profit colleges encountered a situation in which an instructor gave feedback to a student on an assignment that, in fact, the student had not submitted:

> Instructor awarded the student an "A" on an assignment the student had not, in fact, submitted. The instructor provided specific feedback on the assignment, which suggests that there may have been a technical error which improperly associated some other submission with our undercover student.

> The instructor provided no additional details on the discrepancy and the student did not inquire further.

Further, even the possibility of potential glitches can change instructor interpretation of student action. For example, an instructor could perceive a non-submitted assignment as a technical glitch and grant a student additional time to submit the assignment.

Students' frustration with technology glitches is sometimes projected onto the instructor. Problems with technology negatively impact student ratings of their instructors in online courses (Lan et al., 2003). Support for technology can come from an institution or a private company. Institutions often provide some level of support for courses. For in-person courses, this support includes the building space and upkeep of the classroom, as well as technology infrastructure and support. The technology includes website development and maintenance, such as registration and online learning environments (OLEs). Many in-person classrooms are also supported with physical technology equipment, such as a classroom computer, monitors, overhead projectors, lighting, electricity, and chalkboards (or whiteboards). Instead of support for Online classes often have non-physical technology support, such as support for the OLE or other online applications. Most colleges and universities have invested in the development or services of an OLE (Falvo & Johnson, 2006).

Aggregated students. A large portion of the course input is made up of the student participants. The number of students in a course can be small with just a few students, to large with 500 students, and now with MOOCs, the courses can be massive with several thousand students. The number of students in a class affects the class dynamics. With just a few students, an instructor or TA can easily interact with each student. Having thousands of students in a course changes the amount of time an

instructor can spend directly interacting with each individual student. Other, less obvious affects can occur from the class size. For example, the larger a class size, the more frequently students will access the course website (Naveh, Tubin, and Pliskin, 2010). While not the focus of this dissertation, class size can play an important role in course dynamics and thus deserves some further research, especially with the recent excitement around MOOCs. In addition to the effect of the quantity of students, each student has different characteristics that can impact their learning needs, how they interact with the course, and whether they achieve desired outcomes. The differences between students can be wide-ranging from very homogenous to very heterogeneous. Often the instructor will have little or no notice of the characteristics of the student participants. The faculty overseeing a course can add inclusion restrictions on a course by adding prerequisites, such as the completion of prior courses, level of education (i.e. freshman, sophomore, junior, senior standing), or GPA. The aggregate of students is made up of all of the individual student characteristics, which can be internal to the student or can be external. The next couple of sections describe some of these individual characteristics that influence both the individual student and the course. The summation of these characteristics represents a dynamic set of inputs that work synergistically to affect the operation, outputs, and outcomes of the course.

Student internal characteristics. Students enter a course with individual characteristics. One category of student characteristics are internal attributes, which can include personality, age, learning skills, and motivation. This section describes how student internal attributes play a role in how students participate and their performance in an online course. For example, online education has been shown to be a beneficial to the

following types of students: independent and intrinsically motivated learners; learners that prefer something different than in-person courses; and previously unserved inaccessible populations (McIsaac et al., 1999). Hung et al., (2010, p.1080) found that students mostly had "high in computer/Internet self-efficacy, motivation for learning, and online communication self-efficacy and were low in learner control and self-directed learning." However, students from the upper division had "significantly greater readiness in the dimensions of self-directed learning, online communication self-efficacy, motivation for learning, and learner control" (Hung et al., 2010, p.1080). Assessing students ahead of time can instructors understand better how to instruct them during a course or through a program. Instead of starting the student off at zero, a student can be awarded credit for areas that have already been learned (CAEL, 2011). With online education and the potential for modularization, students can be accelerated not only through specific courses, but through specific topics or modules. By examining what students already know before coming into a course, programs can require students to spend less time on areas that they are already competent in. This means more targeted learning for students based on learning needs, rather than rigid curriculum structures. For example, if a student has taken a course that overlaps a required course, students can accelerate to the material that was not known prior to the course. Or if a student fails a course because of a specific section of the course, the term can be spent mastering the material that the student was not understanding, rather than having a student spend time on a broad overview of a course, including things that were already mastered.

Cobb (1997) described how students will make decisions of their uses of media based on their prior learning. Skills in one area could make it more efficient (or less

efficient) to learn using specific media types. For example, good readers may want to read over watching videos because it is more efficient. Or a student that has never taken a course in the subject might have an easier time learning the material from video with illustrations than through static text. Thus, in situations where there is a high degree of learner control, not only does student knowledge affect learning, but self-knowledge about prior learning and what works better could also impact the educational choices that are made by the students.

Table 3.1 displays potential student internal variables and articles that used student internal variables in their studies. These articles were part of the sample of variables used in the literature review aimed at the development of the framework for this dissertation. Some of the articles have significant results, while other articles have variables that were not significant in predicting the way students participate or how well they perform. The table is not meant to summarize all of these findings, but instead, it is meant to show that internal student variables have an established role in online education research. This is especially evidenced by the number of times certain variables appear (and do not appear) in the literature. Maybe more important than showing what has been studied and who has studied it is that the table points to the lack of consistency across studies using student input variables. Additionally, while this list shows a large number of variables, it was not an exhaustive search of the literature as there very well could be additional variables that affect the course and student participation in the course.

Table 3.1
Internal characteristics of students used as variables in studies

Potential Variable	Studies that used as a Variable
General Demographics	Aberson et al (2000a); Ashong and Commander (2012); Barber and Sharkey 2012; Beck and Milligan (2013); Brown et al 2002; Chang et al. (2013); Frey et al. (2003); Mehlenbacher et al (2000); Nguyen, (2008); Stark et al. (2013); Wang, Shannon, & Ross (2013); Weems (2002); Zhang (2005); Foster (2012); Zhang et al. (2006)
Age	Ashong and Commander (2012); Brown et al (2002); Desmarais et al. (1997); Floyd et al (2012); Foster (2012); Ke and Xie (2009); Xu and Jaggars (2013c); Yukselturk and Top (2013)
Sex	Ashong and Commander (2012); Brown et al (2002); Cochran et al. (2012); Floyd et al (2012); Foster (2012); Horvat et al (2012); LaRose et al. (1998); Liu (2012); Navarro and Shoemaker (2000); Shen et al (2013); Xu and Jaggars (2013c); Yukselturk and Top (2013)
Race / Ethnicity	Brown et al (2002); Navarro and Shoemaker (2000); Xu and Jaggars (2013c)
Major	Cochran et al. (2012); Foster (2012); Pontes and Pontes (2013)
Prior Online Courses / Computer Skills	Cochran et al. (2012); Floyd et al (2012); Mehlenbacher et al (2000); Navarro and Shoemaker (2000); Nguyen (2008); Richards et al (1997); Roblyer (1999); Shen et al (2013); Wilkinson et al (2004); Yukselturk and Top (2013); Zhang (2005); Zhang et al. (2006);
Thoughts about Online Course / Technology	Frey et al (2003); Johnson et al. (2013); Kerr et al (2006); Mehlenbacher et al (2000); Richards et al (1997); Wallace and Clariana (2000); Wells (2000); Wilkinson et al (2004)
Learning Styles / Preferences	Day et al (1998); Dwivedi & Bharadwaj (2013); Frey et al (2003); Graf and Kinshuk (2006); Holzhüter et al (2013); Hung et al (2010); Kerr et al 2006; Kuboni (2013); Kuna (2012); Mehlenbacher et al (2000); Schellens et al (2008); Wells (2000); Wilson (2007)
Learning Skills / Study Strategies	Bergamin et al (2012); Clayton et al (2010); Dabbagh and Kitsantas (2013); Gurung et al (2010); Hamilton & Tee (2010); Kerr et al (2006); Lee and Choi (2012); Miller and Pilcher (2002); Wilson (2007)
Time Management	Lee, Choi, and Kim (2013)
Conscientiousness (Personality) / Striving	Arispe and Blake 2012; Do et al. (2013); Keller and Karau (2013); Sitzmann (2012)
Pre-Test / Prior Knowledge / Prior Skill	Al Jarf (2004); Arispe and Blake (2012); Benjamin et al. (2008); Desmarais et al. (1997); Dwivedi & Bharadwaj (2013); Estelami (2014); Hamilton & Tee (2010); Huang, Lin, and Huang (2012); Jang et al. (2005); Kuna (2012); Maki and Maki (2002); Mehlenbacher et al (2000); Pintz and Posey (2013); Schmeeckle (2003); Zhang et al. (2006)
Level of Education	Cochran et al. (2012); Estelami (2014); Hung et al (2010); Keller and Karau (2013); Kuna (2012); LaRose et al. (1998); Navarro and Shoemaker (2000); Shen et al. (2013); Stark et al. (2013)
GPA	Brown et al (2002); Dotterweich and Rochelle (2012); LaRose et al. (1998); Miller and Pilcher (2002); Ridley et al (1998); Tuckman (2007); Wilson et al (2002); Woodward (1998); Xu and Jaggars (2013c)
GRE / SAT / ACT / Other	Brown et al (2002); DeBord et al (2004); Navarro and Shoemaker (2000); Wilson et al (2002); Woodward (1998)
Self-Regulation	Dabbagh and Kitsantas (2013); Dunn (2013); Estelami (2014); Kim et al (2014); Lee, Choi, and Kim (2013); McManus (2000); Sitzmann (2012); Yukselturk and Top (2013)
Locus of Control	Hung et al (2010); Joo, Lim, and Kim (2012); Kerr et al (2006); Lee and Choi (2012); Lee, Choi, and Kim (2013); Weems (2002)

Table 3.1 continued
Internal characteristics of students used as variables in studies

Potential Variable	Studies that used as a Variable
Self-Efficacy	Chang et al. (2013); Clayton et al (2010); Estelami (2014); Hung et al (2010); Joo, Lim, and Kim (2012); Kuo et al. (2013a); Kuo et al. (2013b); Lee, Choi, and Kim (2013); McManus (2000); Sitzmann (2012); Taipajortus et al. (2012a); Taipajortus et al. (2012b); Wang, Shannon, & Ross (2013)
Self-Esteem	Kerr et al (2006)
Anxiety	Dunn (2013)
Motivation	Benbunan-Fich and Hiltz (2003); Chen & Jang (2010); Do et al. (2013); Dunn (2013); Giesbers et al. (2013); Hart (2012a); Hung et al (2010); Jang et al. (2005); Johnson et al. (2013); Joo, Joung, and Sun (2013); Keller and Karau (2013); Kerr et al (2006); Stark et al. (2013); Tuckman (2007)
Goals / Commitment to Class	Clayton et al (2010); Dabbagh and Kitsantas (2013); Dwivedi & Bharadwaj (2013); Estelami (2014); Joo, Joung, and Sun (2013); Kim et al (2014); Sitzmann (2012)
Managing / Reading Emotions	Han and Johnson (2012); Xu, Du, and Fan (2013)
Time Management Skills	Bergamin et al (2012); Hart (2012a); Lee, Choi, and Kim (2013)

Table 3.1 illustrates a starting point to the breadth and diversity of characteristics that have been researched in online education, which points to the amount of variation that can influence individual students experiences. However, what is more troubling is the lack of consistency by which these variables have been researched. At this point, it seems that researchers have little in common in their research of student characteristics of online courses. Further, there has been a lack of organization of how these variables interact with each other as well as the operation and results of the course.

Student external characteristics. Another type of characteristic that students enters the course with is external attributes. These attributes include environmental influences tied to a student, such as family, friends, financial situation, working a job, and physical health. These and other external student attributes can influence student performance in the course. External influences on student experience and performance in online courses needs a little more attention. In some general studies of university students, external influences that have been shown to affect student experience and outcomes. For

example, Brint and Cantwell's (2010) analysis of *the 2006 University of California Undergraduate Experience Survey* found that study time, physical exercise, and volunteering increased academic conscientiousness while off-campus work negatively affected student GPA. Brint and Cantwell (2010) also used *difficult living situation* as a stressor variable and explained that living off or away from campus has been traditionally seen in literature (Astin, 1993; Tinto, 1993) as an obstacle to full college integration. "Students' time flexibility, understood as the capacity to spend time-on-task at different times of the day and week, is reduced by their professional, social, and family commitments" (Romero & Barberá 2011, p.132). Thus, there is a strong possibility that student external characteristics have an impact on online courses.

Table 3.2 shows external students characteristics that have been used in research studies in the past.

Table 3.2
External characteristics of students used as variables in studies

Potential Variable	Studies that used as Variable
Busy Schedule	Trekles & Frampton (2013)
Marriage / Family	Hart (2012a); Keller and Karau (2013); Ladyshewsky and Taplin (2013); Lee, Choi, and Kim (2013); Romero & Barberá (2011)
Friends	Hart (2012a); Romero & Barberá (2011)
Working a Job	Keller and Karau (2013); Ladyshewsky and Taplin (2013); Lee, Choi, and Kim (2013); Richards et al (1997); Romero & Barberá (2011); Sitzmann (2012); Yukselturk and Top (2013)
Owning a Computer	Stark et al. (2013)
Finances / Financial Aid	Barber and Sharkey (2012); Cochran et al. (2012)
Leisure / Social	Romero & Barberá (2011)

As with the Student Internal Characteristics, Table 3.2 illustrates the breadth and diversity of characteristics that have been researched in online education, which points to the amount of variation that can influence individual students experiences. However, what is more troubling is the lack of consistency by which these variables have been

researched. At this point, it seems that researchers have little in common in their research of student characteristics of online courses. Further, there has been a lack of organization of how these variables interact with each other as well as the operation and results of the course.

Operation and Participation

The Operation and Participation section is made up of three subsections: Component-Activity Operation, Aggregated Student Participation, and Individual Student Participation. This section describes how the course operates day-to-day. The Component-Activity Operation sub-section refers to how the course is structured and how it operates. At the more general level, the overall course will have a structure to it. Often, this structure is described in the course syllabus through weekly or module sequencing, the grading scheme, and mandatory versus optional assignments. At a more specific level, the course operates through component-activities. For example, courses may use technologies to create a variety of activities for a course, such as discussion section, replayable videos, or ungraded quizzes. The Component-Activity Operation will vary from course-to-course at both the general level of course organization to the types of component-activities used. This variation is the result of the various influences on the operation of the component-activities, such as the course Inputs (e.g. the course content, the technology used, and instructor enthusiasm), Instructional Decisions that the instructor makes about the course, and how students participate.

Two overlapping subsections in the framework represent student participation in a course: Aggregated Student Participation and Individual Student Participation. These two are overlapping since the whole class is made up of individual students that are

participating in their own ways. Individual students participate by interacting with the component-activities and other students, which in turn affects how students participate. Student participation is also influenced by how their internal and external attributes. Students bring with them characteristics, such as personality, study abilities, motivation, job experience, and prior learning that can influence student participation and learning. Student participation is also influenced by their decisions of how and to what extent to participate.

Operation of the course. This section of the framework describes the operation of the course as a whole. The operation of the course includes the compilation and assembly of the operation of all component-activities in the course. It includes a grading scheme, a designation of mandatory and optional component-activities, and a curricular organization of these component-activities with an inferred sequence. Thus, the general operation of the course seems to involve four main aspects:

- Curricular Organization of the Course
- Grading Scheme for the Course
- Designation of Mandatory and Optional Component-Activities
- Inferred Sequence of the Course

Often, the course syllabus provides an illustration of this general operation of the course. However, using the course syllabus to understand the operation of the course relies on the instructor (or other faculty) to be able to describe the course and it may not include important details that are not obvious or easily overlooked. Additionally, instructors use the syllabus to communicate information to students, so they may purposefully leave out certain types of information that does not meet the goal of communicating the desired information to students. For online and many in-person courses, the structure of the course can be uncovered by examining the Online Learning Environment (OLE) since it

often lists and links materials, content, websites, activities and assignments, and even course grades. Even by examining the syllabus and the OLE, some aspects of how the course operates may not be obvious.

Curricular organization of the course. Curriculum is defined as both the make-up of a single course or the make-up of a combination of multiple courses that make-up a student experience within an institution, department, or program (Anderson and Rogan, 2011). Curriculum is the bond that holds the course together through the design, planning, and implementation of pacing, sequencing, content, and activities. As described in the *Input* subsection, *Course and Component Assembly*, where the control resides for the pacing, sequencing, content, and activities of a course plays a foundational role in how a curriculum is designed and constructed. A higher level of learner-control means the instructor will need to include less design prior to course, module, or topic implementation.

Posner (1992) described four types of curriculum content structures: *discrete, linear, hierarchical,* and *spiral.* These structures were based on assumptions about how students will move through the curriculum. *Discrete* structures are blocks of self-sustaining content and materials. Students can enter discrete content structures at the beginning of any lesson and not have to know the material from other lessons. Posner (1992) used the example of *Sesame Street* to describe this type of structure. The assumption with Sesame Street is that students might not have seen or understood previous episodes or segments, so the design of the show was based on the need for each segment to be self-sustaining. In the *discrete* structure model, instruction doesn't build off of previous material; instead, each lesson is an isolated bubble of instruction. A *linear*

structure is a tightly connected curriculum design. In linear model of curriculum, the instruction of one lesson is highly dependent on the lesson immediately prior. Students must learn the material from one lesson before being able to move onto the next lesson. *Hierarchical* structures are made up of a hybrid of *discrete* and *linear*. In a hierarchical structure, lessons can be learned in isolation at the beginning of a course, but as the course progresses, the lessons begin to rely on previous lessons as prerequisites. The *Spiral* structure is one in which concepts are repeated over an extended period of time. While students might not be capable of understanding all of the pieces of a concept or certain aspects of the concept, some level of representation is understandable to the beginner-level student. For example, students that are just beginning an entry-level statistics might not be able to understand the main concepts underlying central tendency theorem upon first study, but as the course progresses it can be reintroduced periodically and it will become more clear over time.

A course usually has a sequence or regular cycle of operation. Courses are separated into topic modules (often a topic or module lasts for a week or two) and have a beginning, middle, and end. The beginning of the topic area is an introduction, which is followed by activities and assignments meant to help students learn the material, and has a conclusion. Collis and Moonen (2011) described how weekly events were focused around an activity that focuses the attention of the learners:

> The focal event does not have to be face-to-face, although that is a familiar model for both educational institutions and company training. It is something that is prepared for. When participants happen to be at the same location, there is some special interaction between them, and this is something that is followed up. If participants are not at the same location, contacts can be made using technological means, such as audio- or video-conferencing. If participants are not available at the same time, asynchronous contacts focusing on the activities of the focal event can be organized" (Collis and Moonen, 2001, p. 89).

Instructors are more likely to operate within the course based on what they think students will do than on any philosophy of teaching (Eley, 2006).

Young (2004) observed three types of course structuring teaching models: Single Teaching Model; Group Teaching Models; and Cluster Courses Models. The Single Teaching Model is the standard model used in many university in-person and online courses. This model describes a single teacher that is in charge of the course creation and implementation. In this type of model, the instructor for an online course is responsible for and must do all of the work for the course, such as:

> preparing e-materials, setting the course syllabus and recruiting students, teaching content, monitoring work progress, setting discussion topics and responding to questions, facilitating discussion, grading papers and evaluating assignments, making questionnaires and announcements, keeping daily journals, recommending Websites and reading materials, and managing students/classes. (Young, 2004, p. 143).

This type of course requires a lot of time and the sole instructor must be the expert for all aspects of the course.

Under the Group Teaching Models, there are three distinct models: Cooperative Model, Collaborative Model, and Co-Teaching Model. In a Cooperative Course Model, instructors are put in charge of their own section of the course. This means each instructor will teach a specific, module, week, or topic. There might be an organizing instructor, but sub-areas of the course are divided amongst the different cooperative instructors. In the Collaborative Course Model, instructors each contribute to all of the modules, topics, and activities throughout the course. Thus, instead of having a particular area of the course, instructors contribute to all of the course combined. In the Collaborative Model, there is still an overall organizing instructor. The role of this organizing instructor is a little more complicated than the organizing role of the cooperative teaching model since they have to make sure instructors are working together

to create cohesive modules, topics, and activities each week. rather than just cohesive topics and modules for the overall course. In the Co-Teaching model, the instructors contribute to all modules, topics, and activities, and also continue to participate in the instruction through discussions, communication, and activities at the same time as other instructors.

Under the Cluster Courses Models there are two models: United Pedagogical Model and the Central Pedagogical Model. The United Pedagogical Model clusters courses to use the same materials or activities simultaneously in a dynamic way that sometimes allows students to interact with others across courses. There could be a discussion area where students can discuss with each other topics of similar interest. For example, an Asian Art History course could be paired up with a Asian History course which would allow for a discussion of the influences of history on art and art on history. The Central Pedagogical Model uses a similar materials or activities model but in this case, the sharing can happen over time. In this model, an instructor can reuse materials for their multiple courses both during a term and after the term has ended. And they can use that material for other future courses.

Course and assignment pacing can be pre-set by the instructor (Instructor-Controlled) or the instructor or course developer can setup the course so that the pacing is up to the student to decide (Self-Paced: Moore, 2011; Lowenthal, et al. 2009). In cases where the learning is completely independent of a course structure (Self-Directed Learning; Moore, 2011), learning experiences normally fall outside of the educational system. For example, someone trying to learn calculus may choose to buy a calculus

textbook and watch calculus instructional videos for free online. This learner can go as fast or as slow as they like through the material.

Lovett et al. (2008) described Carnegie Mellon's Open Learning Initiative Statistics course as beginning with the "Big Picture", then structuring the rest of the course around it. This conceptual grounding is based on research on how experts process information (Bransford, et al. 2000; Chi, 2006). Experts have constructed their knowledge "around core concepts or 'big ideas' that guide their thinking about their domains" (Bransford, 2000, p. 36). In the statistics course that Lovett et al. (2008) described, students at even a novice level are introduced to course material in a way that is similar to how experts think about statistics.

Multimedia design principles can be used to focus students on the appropriate material so they are not distracted on extraneous features and move toward greater generative learning (Mayer, 2009). For example, "effective instructional information systems must include devices that help learners make their way through complex information (e.g. navigational aids)" (Rouet & Ptelle, 2005, p. 297). Mehlenbacher et al. (2000) wrote,

> We therefore paid careful attention to providing a site that was easy to navigate and that had a simple, visually obvious structure. We anticipated that students might access the site using different browsers and modem speeds, so we avoided the use of elaborate graphics and images to facilitate quick loading. (Mehlenbacher et al., 2000, p.173)

Further, the site was built on "well-documented principles for effective online information" Mehlenbacher et al. (2000, p.173).

Operation of the component-activities. While the *Operation of the Course* is a compilation and assembly of the operation of course as a whole, the component-activities are the specifics. The section of the model designated as the *Operation of the*

Component-Activities describes the operation of the specific online component-activities. Component-activities are a combination of technology/media with an implied or intended action. Using Kozma's (1994) definition of media as having three integrated parts (*technology*, *symbol systems*, and *processing capabilities*), can be seen as media with an emphasis on how it is used. For example, replayable videos for instructor lectures, replayable videos for supplementary information, and articles for supplementary information, can be seen as three separate component-activities for the course. The difference between the two videos is their purpose while the difference between the last ones is the form of the media. The separation between these two components . The difference between replayable videos for supplementary information and articles for supplementary information is the form of media and, potentially, they could have different information. If the supplementary videos and articles had the same or similar information, they could be considered part of the same component-activity. Similarly, multiple forms of media could be combined for a single component-activity. Accordingly, this demonstrates the action being as important as the media for the component-activity.

Because they essentially are the building blocks of the course, the types and implementation of Course *Component-Activities* have a big influence on the processes and outcomes of the course:

> As an implication for program and instructional designers, course activities that were engaging, hands-on, practical, and collaborative were found to encourage students to adopt deeper approaches more often. When courses were consistent and user-friendly, students were able to adopt routines that allowed them to complete coursework in the limited time that they had, given their many professional and personal obligations. However, when due dates were changed frequently, or when too many exams or less clear and engaging projects were given over those that were more complex and authentic, students tended to adopt more surface approaches to learning (Trekles & Frampton, 2013, p.1).

It is not surprising that some of the more frequent topics for online training involve different component technologies, such as online learning environments (OLEs), blogs,

wikis, mobile technologies, and podcasts (Meyer and Murrell, 2014a). Koszalka and Ganesan (2004) created a taxonomy of activity tools in the online environment based on the following: Tool Name; Definition; Primary Type (Information, Instruction/Learning, asynchronous or synchronous communication); Value for Teaching; and Value for Learning. A taxonomy like this can help in the description of courses used in research, as it would provide a potentially systematic documentation method. Additional characteristics and attributes could also be used in the description, such as those provided in chapter 1 of this dissertation.

There are five main types of applied or intended action included in this model: *Activity*, *Assessment, Assignment*, *Course Materials*, *Course Organization.* These implied or intended actions were derived from Yun et al (2013) as part of a comprehensive evaluation of online courses. Tables 3.3, 3.4, 3.5, 3.6, and 3.7 show the different course components that were found by Yun et al. (2013) in their evaluation of 19 online courses. Each of these components were organized into six broad categories: *Activity*, *Assessment, Assignment*, *Course Materials*, *Course Organization* and *Human*. With the exception of *Human* (which has been moved to the subsections of Instructor and Students in the *Input* section of the framework), these broad categories make up the *Component* subsection of the framework presented in this dissertation. As explained earlier in this dissertation (see *Key Characteristics of Online Education* section) the four main characteristics of online education are *distance*, *communication*, *organization and distribution of content*, and *content interaction and assessment*. Evidence of these key characteristics can be seen in the components listed in Tables 3.3 through 3.7. For example, in Table 3.3 there are a number of activities that are communication-based (e.g. online chat, class meeting,

discussion board, discussion section, email, introduction to the course, introduction to a topic, lectures, office hours, peer review, and question and answer) that use online communication software (e.g. online chat rooms, online conferencing software, replayable video, discussion board software, email software, and wikis). These communication technologies indicate a different way of communicating, as indicated in the *Key Characteristics of Online Education* section of this dissertation. Table 3.7 indicates that courses were organized using an Online Learning Environment. Most activities, assignments, assessments, and course materials that were presented online were linked to the OLE and were organized according to module, topic, or unit.

Thus, the OLE allowed for a convenient way to *Organize and Distribute* course content in a compact online location. Tables 3.3, 3.4, 3.5, and 3.6 list a number of activities, course materials, assessments, and assignments that support the *Content Interaction and Assessment* characteristic of online courses. Students interacted with material online through the different communication software (e.g. the content on online conferencing software, discussion board software, and email) and through other software and materials, like replayable videos, PDF viewer software, word processor software, quiz software, electronic portfolio, online textbook, adaptive intelligent tutoring and assessment software, and the OLE for the course).

Some of the activity types consist of: online chat, class meeting, demonstration, discussion board, discussion section, email, introduction to the course, introduction to a topic area within the course, labs, lectures, office hours, peer review, question and answer (discussion board), simulations, social networking, study groups, watching supplementary videos, and taking a survey. The following were some of the types of

technologies that Activity components used in the report by Yun et al (2013): online chat rooms, online conferencing software, discussion board software, email, lab software program, simulation program, survey software, text, replayable video, wiki software, blog software.

Table 3.3
Course activities and the associated technologies from Yun et al. (2013)

Activity Type	Technology/Media Used*
Online Chat	Online Chat Rooms
Class Meeting	Online Conferencing Software; In-Person Meeting Space
Demonstration / Worked-Out Example	PDF viewer software; Word Processor Software; Replayable Video
Discussion Board	Discussion Board Software
Discussion Section	Online Conferencing Software; In-Person Meeting Space
Email	Email Software
Introduction to the Course	Replayable Video
Introduction to a Topic Area within the Course	Replayable Video
Labs	Online Conferencing Software
Lectures	Online Conferencing Software; In-Person Meeting Space; Replayable Video
Lectures with Embedded Notes or Questions	Replayable Video with Interactive Text Capabilities
Office Hours	Online Conferencing Software; In-Person Meeting Space
Peer Review	Online via Email and then On-Computer using Word Processor Software
Question and Answer	Chat Room; Discussion Board
Simulations	Simulation Software
Social Networking	Online Learning Environment
Study Groups	Online Conferencing Software; Wikis; Discussion Boards
Watching Supplementary Videos	Replayable Video
Taking a Survey	Survey Software

* Some courses had one or more in-person activities

Table 3.4
Course assessments and the associated technologies from Yun et al. (2013)

Assessment Type	Technology/Media Used*
Exam (Diagnostic, Midterm, or Final)	Online Proctored Exam Service; In-Person Exam; In-Person Exam Service
Quiz (Graded or Ungraded)	Document (In-Person); Quiz Software; Quiz Software Embedded in Video Software

* Some courses had in-person assessments

Table 3.5
Course assignments and the associated technologies from Yun et al. (2013)

Assignment Type	Technology/Media Used*
Problem Sets	Word Processor Software
Case Study	Word Processor Software
Portfolio	Electronic Portfolio
Field Trip	In-Person Visit; Virtual Tour Software
Games	Game Software
Group Homework	In-Person; Blog; Online Real-Time Document Sharing
Homework	Textbook; Online Textbook; Adaptive Intelligent Tutoring and Assessment Software, Problem-Sets
Presentation	Online Conferencing Software; In-Person Meeting Space
Project	Word Processor Software
Writing Assignment	Blogs, Word Processor Software

* Some courses had in-person assignments

Table 3.6
Course materials and the associated technologies from Yun et al. (2013)

Course Materials	Technology/Media Used*
Syllabus	Text on Online Learning Environment; Word Processor Software; PDF viewer software
Badges	Badge Granting Software
Exam Review Questions	Text; Word Processor Software; PDF viewer software
Introductory / Orientation Materials	Multiple: Text; Word Processor Software; PDF viewer software; Replayable Video
Lecture Notes	Text; Word Processor Software; PDF viewer software
Lecture Slides	Slideshow Presentation Software; PDF viewer software
Online Images	Photo Files displayed on the OLE
Profiles (of Participants)	Profiles on the OLE
Readings	Hard Copy Textbook; Online Textbook; PDF viewer software
Social Network Site	Commercial Social Networking Software
Student-Generated Content	Various Formats and Technology
Summary of Subject	Multiple: Text; Word Processor Software; PDF viewer software; Replayable Video
Textbook	Hard Copy Textbook
Textbook (Online)	Online Textbook

* Some courses had in-person assignments

Table 3.7
Course organization and the associated technologies from Yun et al. (2013)

Course Organization	Technology/Media Used*
Online Learning Environment (OLE)	OLE Software
Modules	OLE Software
Topics	OLE Software
Units	OLE Software

* Some courses had in-person assignments

In addition to the key characteristics of *distance*, *communication*, *organization and distribution of content*, and *content interaction and assessment*, activity-components can be described in terms of media features (presented in the first chapter of this dissertation) of *media*, *synchronicity*, *symmetry / dialogue potential*, *anytime and anywhere*, *multiplicity*, *nonlinearity*, and *control*.

Table 3.8 shows an example of potential classifications of replayable videos and conferencing component-activities using the characteristics and attributes of presented in Chapter 1. A detailed classification of component-activities can be helpful. However, the entire course is not just the sum of its parts. For example, student control of pacing and sequencing might not be recognized by just examining different components. For example, it might be easy to change the pacing of components, such as a videos, however, instructors might assign a specific pacing and sequencing to a topic area that includes all of the component-activities. Therefore, even though the individual component-activity may have the option for student-control, the overall structure of the course might prevent this student-control. Thus, researchers would need to take examine the bigger picture of how the course components fit within the course before describing the components in terms of characteristics and attributes. In other words, the context of the overall course matters.

Table 3.8
Comparison of two component-activities based on online characteristics and media features

	Replayable Video	***Video Conferencing***
Characteristics		
• *Distance*	Potential for Distance	Potential for Distance
• *Communication*	One-Way Communication	Potential for Two-Way Communication using audio, video, and text.
• *Organization and Distribution of Content*	Not a normal source for organization of materials or content	Not a normal source for organization of materials or content
• *Content Interaction and Assessment*	Potential for interaction if there are embedded activities, such as quizzes.	Potential for interaction. For example, an instructor could ask a question and have the students respond through audio, text, or another embedded tool.
Media Features		
• *Media Form*	Video and often with audio and some form of text	Video and often with audio and some form of text.
• *Media Structure*	Depends on other media in the course as it is the degree to which the video relates to other media.	Depends on other media in the course as it is the degree to which the video relates to other media.
• *Synchronicity*	Asynchronous	Synchronous with the potential for recording and asynchronous playback
• *Symmetry / Dialogue Potential*	Asymmetrical	Potential for Symmetry depending on whether the functions for communication are opened to students
• *Anytime and Anywhere*	Anytime and anywhere there is Internet connection (so long as the instructor has provided the link and opened up the video so it can be watched).	Specific time set. Anywhere there is an Internet connection (and a quiet area for any verbal comments made by the students).
• *Multiplicity*	Potential if instructor has posted many videos.	N/A
• *Nonlinearity*	Mostly Linear. Students can skip around in the video.	Mostly Linear. If conversation is made, students can help steer the conversation in certain directions
• *Control - Pacing*	High potential for student control of pacing control. Students can start, stop, and skip through video.	Low potential for student pacing control. Instructors usually control the pacing.
• *Control – Sequencing*	High potential for sequencing control. Students can watch videos when they prefer and watch videos in the order they prefer	Low potential for student sequencing control. The instructor usually sets timing of the conferencing before the course starts.
• *Control – Content*	Low potential for student control of content. The instructors usually set the content of the videos ahead of the course.	Low potential for student control of content. The instructors usually set the content of the videos ahead of the course.
• *Control – Component-Activities*	Depends on whether the instructor makes the assignment mandatory or uses a convergent outcome and tests the material from the video on an exam.	Depends on whether the instructor makes the assignment mandatory or uses a convergent outcome and tests the material from the video on an exam.

Holden and Westfall (2008) described in great detail how certain online components are better suited for certain instructional strategies given the strengths and weaknesses of the media. In one example of how media has certain strengths and weaknesses that match up to instructional strategies, Holden and Westfall (2008) described replayable videos with the strengths of "Videotape, DVD, and (to a lesser extent) Vodcasting, can provide large amounts of full-motion video and high-impact visuals, self-pacing, and continual review of the content"; weaknesses of "Production and distribution costs can be high (especially for tape and DVD), and if content is revised frequently, recurring maintenance costs can also be significant. Additionally, since recorded video does not provide interaction between the instructor and remote students recorded video is often not updated frequently, leading to content becoming outdated depending on the volatility of the subject matter"; and conducive to these learning strategies: "Narration/Description (Lecture), Case Studies, and Illustrations" (Holden and Westfall (2008, p.22). However, they made it clear that media is not just a function of process and what the instructor wants students to do, but instead, "the most important single factor in media selection is the instructional objective, with the end result of improving human performance" (Holden and Westfall, 2008, p.33). Thus, instructors have to make decisions about what types of technologies they want based on the activities they want in the class and how they want those activities to function. The next step in understanding which components for given circumstances is to have a comprehensive rigorous evaluation of various components that can be used in online courses:

> such research can guide decisions about what methods should be used to teach different skills or tasks. As noted, similar research evaluating the effectiveness of e-learning features such as interactivity and immersion for teaching different content would help curriculum planners decide when e-learning is appropriate and what type of e-learning should be used to deliver the features critical to learning in a particular course or program. (Bell & Federman, 2013, p. 177).

Course Components are subsections of a course, which make up activities/assignments, assessments, course organization, and materials. The term Learning Objects is sometimes used for certain types of activity-components. This term is specific in that it refers to mainly reusable technology-based activities (Moore, 2011). However, Course Components is a term used to describe most subsections of a course, including Learning Objects and low-technology based activities. The sequencing of course material and activities can be based on the instincts of the instructor teaching a course (Borrego et al., 2013) Instructors can play a major role in how students will interact with course component, such as the discussion board (Winograd, 2000). Discussion forums that have more teacher presence show greater incidence of students posting critical comments that approach expertise (Lui et al., 2007). The more material that is posted online, the more frequently students will access the course website (Naveh, Tubin, and Pliskin, 2010).

Student participation. One aspect of any type of course is student participation. In order for students to learn, they have to participate in some way. This participation could include anything from conversing with other students to watching video lectures to reading the textbook. Participation can follow the intended activities and assignments that instructors had planned or students could participate in only some of the intended activities. From a Constructivist perspective, learning takes place during an individual's cognitive process interaction with environment, which makes the study of student participation and interaction with component-activities particularly important (Kozma, 1994):

> Specifically, to understand the role of media in learning we must ground a theory of media in the cognitive and social processes by which knowledge is constructed, we must define media in ways

> that are compatible and complementary with these processes, we must conduct research on the mechanisms by which characteristics of media might interact with and influence these processes, and we must design our interventions in ways that embed media in these processes. (Kozma, 1994, p. 8).

Students can also seek out other activities that would enhance their learning in a way that the planned class activities and assignments were not. For example, McIsaac et al., (1999) found that it was a lack of immediate feedback from other students and instructors that were making students feel isolated. Feedback can be planned into the course. Students can participate in the activities that provide feedback or students can seek out social intervention from classmates or people outside of the class. Further, student participation in a course is not necessarily restrained to the learning or learning processes that the instructor had planned but instead, the student is an active agent in the learning process and how they participate, both behaviorally and cognitively could matter more than the component-activities that were planned and provided (Cobb, 1997). Thus, student participation is linked to both the activities that were made available to the students and the students' choices about what to participate in.

Participation is either hidden or observable to the instructor. The observability of student participation changes in online courses from in-person courses. Whereas in an in-person course, an instructor can look about the room, listen, and observe how students are participating. In an online course, much of this physical and audio observation changes. Real-time observation is limited to student activity that occurs via synchronous software. Instructors can also observe asynchronous participation by viewing student usage of asynchronous software, such as discussion boards or adaptive intelligent tutoring and assessment software.

Process Decisions

The Operation and Participation Decisions section is made up of two subsections: Instructional Operation Decisions and Student Participation Decisions. This section describes mainly latent variables related to how the instructor and the individual student make decisions about course processes. The instructor can make Instructional Operation Decisions throughout the lifecycle of the course. This includes decisions about course development and course maintenance as the course moves forward. These operation decisions influence the creation and operation of component-activities, intended class output, and intended class outcomes. And as these are created, they will in turn influence future Instructional Operation Decisions. Additionally, some instructors will monitor the progress of students through component-activity participation, actual student outputs, and actual student outcomes.

Students, on the other hand, make decisions about how they are going to participate based on a variety of other factors. Like the Instructional Operation Decisions that instructors are making throughout the course, these Student Participation Decisions are also latent process variables that students make before and during the operation of the course. Some research has been conducted in this area, such as work on self-determination theory, personalized learning environments, and student dropout. However, because of the potential for a high degree of learner-control (Sitzmann, 2009) and the often-flexible nature of online education (Twigg, 2003), the area of student participation decisions seems to be one of the more important areas to study since students create their own paths of study when the learning environment is online (Fischer, 2012). Further, vast amount of research in online education and the seemingly high degree of importance, this

area focused on student choice seems to have relatively little research. The study proposed elsewhere in this paper looks at this area by examining how students sequence their regular participation in the course. It is believed that the descriptions that students give as to how they are sequencing their activity in the course will unveil underlying decisions made on an evaluation of the most efficient way to proceed. It is hypothesized that students make these weekly sequencing decisions to optimize their effort to get the greatest benefit in terms of their individual output, outcomes, and goals. As the course progresses, students use information about how well they are doing to meet their expectations of output, outcomes, and goals, as well as their experience with participation and their own abilities and personal environment (individual student input) to make further decisions about participation.

Instructional operation decisions. Instructors are able to use pedagogical strategies, student activities, and online technologies to make student learning more efficient. This decision-making impacts the creation and operation of the course and components -- and this impacts student participation. The decisions about the course have to start early as,

> The technology [of online education] allows the same experts who prepared the learning materials also to take command of and guide the learning process (unlike traditional distance teaching, where they were usually not involved in the actual teaching)" (Beller & Or, 2006 ¶9).

And these decisions go even beyond course implementation. One characteristic that is recognized by institutions through teaching awards is the instructor practice of self-evaluation and self-reflection. Instructors that take information from the course, such as student feedback and student success, and use that information in a way that improves the course are recognized at many institutions through teaching awards (Gunn and Fisk, 2013). The information for course improvement can also come from online software:

"Experienced online faculty welcome the additional information generated by learning management systems on intermediate student learning outcomes" (Bacow et al., 2012, p.18). However, learning and instructional efficiencies are not necessarily instinctive to faculty teaching online courses for the first time. It is therefore believed that good faculty training can help increase the time it would take to start increasing these efficiencies (Meyer, 2014a). However, institutions will train faculty on a wide variety of teaching and learning theories, that often do not have the backing of research (Meyer and Murrell, 2014b). Research can aid in the understanding of how to make instruction more efficient for student learning and when different instructional strategies work best. For example, process-oriented worked examples make more efficient instruction for students initially learning a procedure and the concepts behind that procedure. However, these explanations become redundant over time and begin to slow learners as they move toward expertise (van Gog, Paas, & van Merriënboer 2008).

Instructors will monitor information about student performance during the class to adjust their instruction in order to accommodate student learning needs. Instructors can be sensitive to what students are thinking and try to facilitate their course in a way that matches student learning needs. For example, instructors might think about what the students already know, what students will think about during instruction, and what activities will most likely engage students; from these, instructors build internal models about how students learn and use this as a basis for their teaching (Eley, 2006). Instructors may be familiar with learning theory and have a good sense about how students learn. However, they might not know how to teach in a way that will promote desired learning experiences. Instructors can conflicted about how to promote group work

without sacrificing individual student accountability. For example, instructors might understand that groupwork is important but they do not know how to create effective groupwork learning experiences that actually help individual students learn or instructors are unsure how to move away from a lecture-based course into a problem-solving type of course (Borrego et al., 2013). Further, instructors have different beliefs about how a course should be sequenced. For example, some engineering faculty felt that it was better to have material presented in lecture before problem-solving while other faculty thought it was better to have students jump right into problem solving (Borrego et al., 2013). Individual faculty beliefs about sequencing may or may not be aligned with research about the most effective and efficient sequencing of course activities. Additionally, instructors may fail to use the online instructional strategies that students perceive as most beneficial. For example, students seem to want specific instructions to assignments and quick feedback on assignments, however, instructors may not always provide these services to the students. (Frey et al., 2003). Some student needs are not always obvious. For example, students may need help with study and navigation strategies. Instructors can implement interventions that help students learn the material for the specific content area (Fischer, 2012). However, these should be explicit and emphasized since students often do not pay attention to suggested learning strategies (Pujolà, 2002).

Classes in which the instructor has been trained on moderating class discussion boards have class discussions that are more positive and friendly in nature than courses where the instructor has not been trained (Winograd, 2000). Instructors can take different roles in the discussion board environment based on what the instructor has assessed as needed for quality student discussion. For example, based on what they feel the students

need to further the conversation the instructor can act as a classmate, an initiator of discussion, or a discussant (Havard et al 2005). Student discussions that have greater instructor presence have been shown to be more on point and generate more insightful comments than discussions with less instructor presence (Lui et al., 2007). Instructors may want to enter the conversation early so they can motivate students to participate and respond in thoughtful ways (Hou, 2011). Instructors can also task the students to take a self-evaluating role for improving output. For example, students that are asked to self-evaluate their discussions based on the level of critical thinking have seen improvements in their cognitive display during discussion (Valcke et al., 2009). Instructors may need to pay attention to where their students are in terms of learning the material. Beginners are more successful when they are given self-regulating pre-reflective prompts than students with increased expertise (Ifenthaler, 2013). Thus, instructors can better understand what decisions to make by attending to information gained about students and this indicates that instructor decision-making can be linked to student output and outcomes. As students are completing the course, instructors can look at the progression of student output and outcomes to aid in decisions about what changes should be made to the course. While in-person activities require the instructor to gather visual and verbal clues about how students are engaging, instructors using online programs for student activities can now use data analytic tools that create reports and visualizations of student output to make decisions about the course (Lockyer et al, 2013). One area that instructors need to be careful about is how prescriptive course activities can be affecting student motivation. By denying students that ability to make decisions, instructors could inadvertently lower student motivation (Bachman and Stewart, 2011).

Cobb (1997) noted that students make decisions about the efficiency of certain types of media. In other words, some types of media are better for learning than others and, when given a choice, students have to decide what media is better for their learning. However, instructors can limit (or increase) the media options available to students. Further, instructors can make decisions about the media to endorse for the course by either only providing access to certain media or by communicating what they perceive is the better media for learning certain materials in the course. These choices can either help or harm student learning. As the expert in the content area, instructors have certain types of experiential knowledge about what media may be better. However, instructors may also need to take into consideration student abilities as well as types of multimedia combinations and compositions that research has shown to work better.

While there is a lot of literature about what instructors should do there is not a lot of research about what good and bad instructors think about when making decisions of what to actually do. One type of research that could prove very beneficial for this area is to conduct think-alouds during instructors' curriculum development and adjustments during course implementation. While this area could prove very important for online course success, future research for this area goes beyond the scope of this dissertation.

Student participation decisions. As described earlier in the paper (particularly in the sections of *Online Characteristics*, *Operation of the Course*, and *Operation of the Course Components*), online courses can potentially provide students with an abundance of decision-making situations. As illustrated in the *Online Characteristics* section of this paper, there is a high potential for options in online course environments (i.e. multiplicity, nonlinearity, anytime, anywhere) as well as possibilities for student control over their

environment. These options and possibilities for control translate to situations where students will have to make decisions. Online component-technologies offer the possibility of "flexible mode of delivery, flexible access to learning resources, flexible curriculum and assessment, flexible scheduling and flexible study pathways" (Hamilton & Tee, 2010, p.1037), further, online technologies allow for the possibility for a student to "choose the content they want to learn." (Hamilton & Tee, 2010, p.1037). At the same time, online courses also have the possibility of having high instructor control (Lowenthal et al., 2009; Moore et al., 2011) or computer-automated control. Instructors can provide students some level of control over their participation decisions by making some content or component-activities *optional*. Students can also make decisions independently based on the points that instructors set for certain assignments (i.e. how much effort the student is willing to invest for a certain amount of points). Instructors often choose to assign activities and technology tools that students do not prefer (Frey et al., 2003), this lack of preference can sway students to move away from the prescribed curriculum. Because online education offers the possibility of a flexible learning (Hamilton & Tee, 2010; Lowenthal et al., 2009; Moore et al., 2011), there is the potential that students will have to make big decisions in how they learn and what they learn. This need for students to make decisions seems obvious in highly flexible environments but even in courses with a high level of instructor control, students have to make some decisions related to the course and students have to figure out what those decisions are. In addition to decisions about the course there are decisions and circumstances that are not directly related to the course that can affect the student, the experiences they have in the course, and the decisions they make in the course. There are five different types of

decisions that students need to make (see Table 3.9); these decisions are about: Where, When, How, What, Who.

Table 3.3
Types of decisions that students make in online courses

Type of Decision	Participation Decision	Means by Which it Could Impact Output, Outcomes, and Goals
Where	What type of environment that a student will work in.*	• Environment could be distracting or conducive to personal learning abilities and practices. • Environment could be distracting or conducive to synchronous communications.
When	What time of the day and what day of the week to study.	• Certain times could fit better into a students schedule • Certain times could be more conducive or harmful to the learning process.
	How to *Sequence* the learning experience.*	• Certain knowledge may be necessary before moving onto other areas. • Certain learning sequences could make learning more efficient.
How	What *Pace* to work at.*	• Going too fast might mean that students miss important information. • Going too slow might mean that students get stuck in the weeds or forget information as the learning progresses.
	What *Activities*, *Assignments*, and *Assessments* to participate in.*	• Could emphasize learning and practicing of certain knowledge, cognitive processes, or skills. • Certain activities, assignments, and formative assessments could be more aligned with outcomes and summative assessments than others. • Activities that are more aligned with outcomes and summative assessments could make the learning experience more cohesive and enjoyable. • Activities that are more aligned with outcomes and summative assessments could make the learning process more efficient and effective.
What	What *Content* to study.*	• Could emphasize learning and practicing of certain knowledge, cognitive processes, or skills. • Certain content could be more aligned with outcomes and summative assessments than other content. • Content that is more aligned with outcomes and summative assessments could make the learning experience more cohesive and enjoyable. • Content that is more aligned with outcomes and summative assessments could make the learning process more efficient and effective.
Who	Who to study with and interact with regarding the course.*	• Certain students could be more distracting or conducive to learning process than others.

* These decisions are impacted by where curricular control resides (see the *Control* section of this paper).

Students have to make decisions about the component-activities to participate in, how to participate in them, how much effort to put into them, and when they will participate in

them. Decisions students can be influenced by a number of variables, which are represented by other areas of the proposed framework: characteristics they brought with them to the course (*Student Internal Characteristics* and *Student External Characteristics*); the types of component-activities included in the course (*Operation of the Component-Activities*); how the course and components are operated (*Operation of the Course* and *Operation of the Component-Activities*); how much the students have participated and how they interacted with other students and content in the past (*Student Output*); how well they are doing in the course and on specific components (*Student Outcomes*); and whether they are achieving their goals (*Student Goals*). Thus, multiple areas of the framework influence student decisions. These areas are both logically connected to student decisions and have basis in literature.

Connection to student internal and external characteristics. Student participation decisions are influenced by the internal and external characteristics they bring with them and develop during a course. For example, if there a choice between watching an instructional video and reading the textbook, students might watch a video if they are unable to read fast, prefer watching videos, or they have had prior successes with instructional videos. Likewise, a student might choose to read the textbook if they are a fast reader, prefer the text, or it fits better into their schedule. Students could have a job or have other courses that are putting a strain on their schedule, so in this case, the student might have external characteristics that are competing for time with the course. While the logic for the connection between student input characteristics and student decision-making is compelling, research in online education has also shown evidence that there is a connection.

In a review of literature on computer assisted language learning studies, Fischer (2007) found that in the area of student decisions, beginner and lower-level students often make inadequate decisions about their learning processes in online environments and these students at a beginner-level may need more externally controlled environments so their attention is focused. Whereas, more advanced students may benefit from more open environments. Beginner students are unable to adequately assess what they should spend time on, the types of activities they should participate in to boost achievement. Further, all students make only minimal use of some course components as they will often they do the minimal required based on what is needed to finish an assigned task. Thus, students search for the most effective and efficient learning strategies but finding these requires either knowledge of (or experience with) the strategies that are effective and efficient. Sitzmann (2012) used a Generalized Hierarchical Linear Model to predict attrition based on both internal and external characteristics of students. Students were less likely to drop out if they had higher scores on measures of commitment, self-efficacy, and conscientiousness.

Connection to operation of course and operation of the component-activities. Student participation decisions are also influenced by the course and component-activities. Options that are provided by the course are options that students have to make a decision about. If there are optional activities, students have to decide if they will participate. Or there can be choices between different activities, for example, students might be asked to either submit homework problems from the book or complete an online quiz. Even *mandatory* component-activities require some level of student decision-making. Students might decide on the level of effort, when they will participate, and if

they will even participate. Of course, not participating in a *mandatory* component-activity will have consequences, which could include a lowered grade, but it is a decision to be made. As mentioned in the *Control* section, control can be given to students over the about pacing, sequencing, activities, and content. Even student interactions can be goal-oriented, for example, students will interact for the following reasons: get or share information relating to the content and structure of the course; get help on technology; submit homework; participate in the discussions and exchange ideas; and to socialize (McIsaac et al., 1999).

Connection to student output. Student decisions can also be influenced by prior output. Participating in and completing prior assignments and activities can give students a sense of what kinds of work will be expected of them on future assignments. As students successfully (or unsuccessfully) complete assignments, activities, and assessments, they will establish the amount of time and effort it takes for completion. Students can look for information on future decisions from prior amount of participation, how they participated, when they participated, former completion or attrition, the amount of time they invested, and whether they procrastinated. Students could also have put effort into activities that were not prescribed by the course but they felt would benefit their performance, such as making flashcards or self-quizzing. Students may have also found people outside of class to interact with about the course material. While it may not be formal data that the students are drawing from, students remember some of their prior experiences and can draw information for future decisions from them. From prior experiences, students can decide what types of future efforts they will make. Students can make decisions about future amount of participation, how to participate, when to

participate, whether to complete, the amount of time to invest, and whether to procrastinate.

Connection to student outcomes. Students can also have their opinions changed by prior outcomes. As students move through a course, they could successful or unsuccessful on activities and assignments and they may start to develop feelings and opinions about their experiences. As they move through the course and individual experiences in the course, the student will conceptualize opinions about what has led to success and other positive outcomes. Students can use this information to make future decisions about how to be more successful and have other positive future outcomes.

Connection to student goals. Students also make decisions about the course in with conscious and unconscious information about their known and unknown goals. The goals that students have can have a positive or negative relationship to the instructional outcomes. For example, if a student takes a class just to meet new people, they may be more focused on socializing than on learning the material. The participation choices students make may then reflect more of their own goals than meeting and exceeding the expectations of the course.

Making decisions and efficiency evaluation. Ultimately, students have to make decisions about participation. As discussed in the last section students draw from multiple sources of information that are sometimes in conflict with one another. Students might want to do well in the course but they could also have competing commitments and goals. If students want to accomplish all of their goals, including doing well in the course, they will maximize the amount of benefit out of as little activity in the course as possible. For example, when they have an option, students only access material if they believe it to be

beneficial to their performance in a course (Murray et al., 2013). Even the decision to enroll in an online course could be an efficiency decision: "Because of the flexibility needed to balance the competing demands of career, family and educational responsibilities, online and distance education are preferred options to traditional instructional delivery for adult students." (Burnette & Conley, 2013 ¶2). Students will naturally seek the greatest benefit for the lowest commitment of time, effort, and resources.

Cobb (1997) described how students would choose the media form that was most efficient to their learning. Students have to know (consciously or unconsciously) what is more efficient in order to choose the more efficient media form. In some cases, the choice is obvious, such as when a student that can not read musical notes is given a choice between listening to the audio track or reading the musical notes to learn bird calls. Efficiency of media may not be completely obvious as slight changes in audio tone, text placement, or amount of different media can make a big difference in how people process information from multimedia for learning (Mayer, 2005). Thus, in order to make good efficient decisions, students have to know things about themselves, they have to know about the media, and they have to know the forms of media that work best. Further, students have to make these decisions within the context of the course and include information, such as instructor expectations (i.e. does the instructor expect that students will be able to read the musical notes of a song bird or just be able to hear and identify it?)

Sequencing decisions. As part of the decisions that they make about the course, students set daily and weekly routines and sequences. It is hypothesized here that students

will create these sequences as a way of economizing their time and effort. By examining the student weekly routines and sequences, evidence for competing interests and their decision-making based on efficiency should become apparent. As mentioned in the *Control* section of this dissertation, students have control over sequencing and branching of their instruction. Part of the sequencing decisions that students make could be influenced by their schedule for other classes and their work schedule. Other possible influences could be internal. For example, students prefer in-person courses during certain times of the day. Further, students want and find more value in courses on specific days, like the weekend (Mann & Henneberry, 2014).

Output

The Output section is made up of three subsections: Instructional Intended Class Output, Aggregated Class Actual Output, and Individual Student Output. The Output section consists mainly as planned and observable behaviors and products. Similarly to Student Participation student Output represents an aspect of involvement. Output differs from participation in that it represents participation in the past tense. The ways that students participated becomes output after the participation occurs. In some cases, this output can be collected as data through observation, technology-use tracking tools, or student self-reporting. The Instructional Intended Class Output subsection describes what an instructor or course developer intends to happen in a course in regards to student behavior and products. This intended output is informed by and informs instructional operation decisions. The Aggregated Class Actual Output is a combination of all Individual Student Output. The output from individual students will sometimes meet the Instructional Intended Outcomes and there will also sometimes be unintentional outputs.

These are unintentional from the instructor reference in that they were not the intended products or processes of the instruction. For example, students will sometimes seek resources outside of the course to better inform what they might not otherwise understand. Or the students might interact with students in the course or outside of the course through an unintended or unplanned backchannel, such as through social media or meeting face-to-face when there were no planned in-person meetings. This output is influenced by student participation and their decisions to participate. The individual student output affects student participation decisions, individual outcomes, and individual goals.

Instructional intended class output. Instructors plan for students to behave in certain ways in their courses. *Instructional Intended Class Output* represents this preconceived instructor expectation of student behavior. These expectations include how students will have participated, engaged with materials and other people, the amount of activities and assignments they engage in, and the number of tasks completed. For example, instructors might expect students to complete all of the homework, participate in the class discussions, or finish all of the readings. These expectations can be conscious or unconscious, communicated or not communicated to the student. Even when these expectations are not communicated to students, instructors might assume that the activities will be completed. A frequent source of evidence for these expectations is the activities, assignments, and assessments listed in the syllabus. However, instructors do not always express expectations of student behavior to their students. And students can also misinterpret expectations that are communicated by the instructor. For example, students might think that listed readings are optional or supplementary when they are listed on the syllabus but not designated as optional or mandatory. Instead, there are

assumptions made about what students will do. In turn, students have to make assumptions about what kinds of behaviors are expected.

The online education literature does not frequently highlight these instructor expectations. Instead, researchers will list the required and optional activities and assignments. However, researchers often do not provide a full list of activities and assignment or they fail to include what is required versus what is optional. In some cases, the researchers specifically research the usage of certain tools and programs or they examine time spent on activities or assignments.

For example, Stanley (2006) looked at the differences in outcomes of two different sections of a course that required different types of student output. One section had a required quiz each week, the other had a required homework. Stanley (2006) noted that both sections included a textbook, lecture notes, supplemental videos, external links, and a non-required discussion board. It was not stated what the students were expected to do with these materials and software, however, there seemed to be an assumption that students would use these materials as a way to strengthen their knowledge and skills.

Even some of the early online education studies indicated that instructors were able to use student application usage data. For example, McIsaac et al (1999) described data gathered from communication software and time logs. Later studies continued the trend. For example, Lin and Chiu (2013, p.184) described how in their study "course tracking variables refers to number of online sessions, number of original posts created, number of follow-up posts created, number of content pages viewed and number of posts read." Lin and Chiu (2013) used the participation types as output variables and student outcome was measured by the final grade. Instead of assuming that all participation

would mean better performance, Lin and Chiu (2013) used multiple linear regression to determine which of the participation counts (number of online sessions, original posts created, follow-up posts created, posts read, and content viewed) would affect outcomes and found about 16% of the student performance variance was accounted for by student tracking measures.

Often, greater student output is believed to be associated with different outcomes, for example, McIsaac et al (1999) stated,

> the teacher believes that she gets a greater level of commitment with students who participate in the computer mediated environment. She feels that this may primarily be due to the fact that students can be present in the learning environment only when they are ready to participate and contribute to the learning environment. It may again be because of the nature of the mediating environment. (McIsaac et al., 1999, p.128)

Thus, more participation in computer mediated environment was believed to be associated with greater commitment to the course.

Other studies look not just at the amount of student participation, but also what they are engaging with. Some studies have made predictions that online or hybrid education would require less time for students (Lovett, Meyer, and Thille, 2008; Schmeeckle 2003). While Lovett et al (2008) found that the hybrid course that ran half the amount of weeks had greater outcomes than the in-person course, they was also found that students in the hybrid section that practices their skills more frequently using the online software also had greater outcomes than other students in the hybrid course. Schmeeckle (2003) on the other hand compared an online and an in-person section of the same law enforcement non-academic training, where both sections had three days of instruction. Students in the online section of the course were able to self-pace. Schmeeckle (2003) found that online instruction took less time, per student reported time logs.

Class and student output. What students actually do in a course could be quite different from what the instructor intended. The *Aggregated Class Actual Output* represents the enacted output or what students actually did in the course. Student output can include the amount of participation; how the student participated; when they participated; completion of assignments; the amount of time spent on various activities; whether the student procrastinated; and attrition or persistence in the course. Instructors can gather some information on actual student output, such as the types of student data is gathered on whether students participated in activities, how frequently they participated in activities, and the amount of time that students spent on activities. Other output might be more difficult for instructors to gather, such as student interactions with people outside of the class in relation to the subject (backchanneling). Thus student output can be intended or unintended. However, while the instructor had preconceived ideas about how the course should operate, unintended output can also be good for student success.

Instructors can use output data to make instructional choices during the course and after the course has completed. With new data analytics from online tools, instructors can measure different types of output in online environments. Lockyer et al (2013) described six types of data analytics: *reports, social network analysis, student dashboards and monitoring, individual and group monitoring, learning content interaction,* and *discourse analysis*. These analytic tools and techniques track online tool use and engagement with media, the instructor, and other students. Students and instructors can use the results of data analytics to understand when and how to increase learning activity. If conversation or interaction has trended toward instructor-centered,

students and instructors can use that visual information to help guide the interactions into a more student-centered, collaborative experience (Lockyer et al, 2013).

Although large databases and statistical analyses of student participation aids in the understanding of student output and the impact on student outcomes, it could overlook student individual experiences. For example, Lin and Chiu (2013) analyzed a dataset of 528 students that included five participation measures and the final grade as the outcome measure. The five participation measures included number of online sessions, original posts created, follow-up posts created, posts read, and content viewed. A problem with this type of analysis is that it does not look at individual experience. For example, there may be an individual student that mainly just watched the lecture videos and did the homework. This student could have studied intently and received an outstanding grade. This individual experience would be passed over by a large statistical analysis. Further, this study looked at outputs that are often associated used to calculate the course grade or that instructors might believe to be favorable engagement ...(number of online sessions, original posts created, follow-up posts created, posts read, and content viewed) would affect outcomes and found about 16% of the student performance variance was accounted for by student tracking measures.

Meyer (2014a ¶12) defined student learning productivity as, "more, faster, or better learning." Learning Efficiency can be seen as the level at which a student learn more, faster, and better combined. One of the original methods of instructional efficiency was a simple pre-test compared to a post-test measure. An adapted method of instructional efficiency has mainly been a pre-test compared to a combined post-test measure and the time/effort it took to attempt to learn the material. This adapted measure

takes a closer look at cost-benefits and therefore lends itself more to an efficiency definition (van Gog & Paas 2008). Thus, instructors can look for student output to not just be better, but also more and faster.

Outcomes and Goals

The last section of the framework, Outcomes and Goals, is made up of four subsections: Instructional Intended Outcomes, Aggregated Class Actual Outcomes, Individual Student Actual Outcomes, and Individual Student Goals. This section points to the purposes of the course and course participation. The Instructional Intended Outcomes subsection represents what the instructor hopes students will take away from their participation in the course. The Aggregated Class Actual Outcomes subsection consists of an aggregation of the actual course outcomes for individual students. These outcomes can both match the intended outcomes of the instructor and may include unintended outcomes. These unintended outcomes can be both positive and negative. In some situations, students may have truly inspirational moments that affect them for the rest of their lives and these outcomes could go well beyond what the instructor intended. In other cases, students may develop negative unintended outcomes, such as negative feelings about the subject area. These outcomes are often result of outputs in the course, which was the result of student input and participation in the course.

Individual students have goals that are independent of the class. While independent of the class, these Individual Student Goals can match the intended outcomes of the course. In other words, students may have goals that included learning the material or improving self-confidence toward the subject. However, students might also have goals that are not completely aligned, for example, the student might just be

taking the course as a requirement and might not care about actually learning. These goals are sometimes influenced by the results of the course. For example, if students realize they are successful in the work they produce, they may alter their goals to be more in alignment with course goals. Individual student goals are hypothesized to be a major influence on the Student Participation Decisions.

Instructional intended outcomes. Instructional Intended Outcomes are the outcomes that an instructor intends for the course. An instructor might plan for and instruct towards certain outcomes such as for students to learn certain concepts or facts, to develop skills in the area, or have greater appreciation for the subject area. Instructional intended outcomes can be convergent or divergent. Convergent outcomes mean that aim for all students is to reach the specific outcomes. Divergent outcomes mean that students are supposed to have different outcomes based on their experience. These outcomes are sometimes listed on the syllabus and/or the course OLE. However, these outcomes are not always explicitly written out in course materials (i.e. on the syllabus or OLE) and they are often not made available in research articles. Despite whether objectives are listed or not, if the instructor is attempting to have student achieve certain outcomes (explicit or hidden), then these outcomes should be hinted at by the activities, assignments, and assessments in a course. A rational instructor would ask students to participate in activities and assignments that move them more toward the intended outcomes. If the instructor bases the course grade on whether the student has met the intended outcomes or if she/he just wants to know whether the students learned what was intended, then a rational instructor would also use assessments that measure the intended outcomes. Thus, whether implicit or explicit, most courses have some type of

instructional intended outcomes that drive the activities, assignments, and assessments of the course.

Aggregated student outcomes. Regardless of the outcomes intended for a course, student enrollment in a course will result in actual outcomes that may be desired or undesired and can match or not match the *Instructional Intended Outcomes*. Actual student outcomes can be directly related to a course or they could impact other aspects of a student's life. Outcomes can include knowledge or skills, feelings about the course or instructor, feelings about online courses, satisfaction with the course, relationships built with other students, feelings about the subject, changes in self-efficacy, changes in motivation, or changes in attitudes. Data about student outcomes can be collected or outcomes can occur without any observation. Instructors and researchers often measure these outcomes through assessments and surveys. For example, the meta-analysis by Zhao et al (2005, pp. 1844-1845) coded articles of online courses for "the following measures: grades, quizzes, independent/standardized tests, student satisfaction, instructor satisfaction, dropout rate, student evaluation of learning, student evaluation of course, and external evaluation."

Students that experience failures with technology in their online course are more likely to give their instructors lower evaluation ratings. It has been recommended that course and instructor evaluations should scale to account for technology failures (Lan et al., 2003).

Bell and Federman (2013) noted that one of the main points of education was for students to both retain knowledge and transfer that knowledge to other courses and the workplace. Bell and Federman (2013) recommended that future research should focus more effort in this area. While much of the research in online education included student-

learning retention in their outcomes, the assessments used to measure these outcomes occur within a month of the intervention, thereby only testing for short-term retention. Further, online course studies have not spent much time on how learning is applied in the field after the course. This could be a valuable focus for future online education research as this is the ultimate goal of education: that students bring what they learn in the classroom into their lives.

Student goals. Students have multiple goals before and during college (Tinto, 1993). These include both academic and non-academic related goals. These goals can include having good relationships, getting a good GPA, becoming more knowledgeable, and getting a good job after school. Students can also have goals within a single course. These goals can reflect their larger college goals. They may take courses because they want to learn the subject. For social reasons, they might take a course because their friends are taking it or they might take an elective to meet new people. In some cases a student might not be interested in the subject matter but take the course because it fulfills a graduation requirement. Students can also have overlapping goals that might inhibit their performance. For example, a student can be in a relationship or have a family that can take away from study time. Students may also have overlapping goals that can increase their interest in the course. For example, a student may want a job within that particular subject.

Instructor goals. While not always recognized, the instructors also have goals that play a role in how they teach. These goals can be either beneficial or harmful to the operation of the course in pursuit of the instructional intended outcomes. Instructors could be teaching the course because they genuinely want to help students learn the

material or they could be pursuing goals that require them to teach and are less concerned about what students learn. Whatever the reasons for teaching, their goals could be consistent or inconsistent with the aims of the course and student learning.

Bacow (2012) prepared a report on faculty motivations for teaching online and suggested the following motivations from faculty and administrative approaches to increasing motivations and overcoming barriers:

- "Online instruction is alien to most faculty and calls into question the very reason that many pursued an academic career in the first place." (Bacow 2012, p.19)
- "Faculty fear that online instruction will be used to diminish faculty ranks." (Bacow 2012, p.20)
- "Faculty are extremely reluctant to teach courses that they do not 'own.'"(Bacow 2012, p.21)
- "Faculty may be reluctant to embrace a course that does not allow for a high degree of customization in how, what, and when relevant material is presented to their students." (Bacow 2012, p.22)

Incentives that should be provided to faculty to encourage online course creation

- "Provide generous technical support for faculty adopting online teaching." (Bacow 2012, p.23)
- "Provide incentives for faculty." (Bacow 2012, p.24)
- "Make faculty pioneers heroes." (Bacow 2012, p.24)
- "Explicitly confront concerns about faculty size." (Bacow 2012, p.25)
- "Provide a way for faculty to easily customize and exert control over online content developed elsewhere." (Bacow 2012, p.26)

Many of the findings from Bacow (2012) are counter to Orr et al. (2009) who found faculty were more likely to teach online because of altruistic reasons. Perhaps it would be better for administrators to pursue professors that want to improve student learning for intrinsic reasons than to appeal to faculty through financial motivators. Of course, financial incentives can help faculty but if this is the driving force, institutions may get courses that are lackluster. In addition to fostering positive motivation, institutions need to seek out ways of protecting their instructors. Instructors worry about their intellectual property rights when creating online course materials (Twigg, 2000). Any materials

posted online can be easily accessed or re-posted for a wider audience. If the material has not already been covered by copyright or patent, the instructors' ideas can then be used by members of the broad public without reference, credit, or monetary compensation for the instructor.

Something that computer-based instruction (CBI) researchers were concerned about was something called the "John Henry" (compensatory rivalry) confounding effect, which occurred when the instructor in the in-person comparison group worked hard to produce better outcomes than the CBI group (Clark, 1985; Heinich, 1970; Heinich, 1984). Instructors who felt that their job was in direct competition with the CBI. In the present day, if instructors calculate that jobs would be sacrificed if online courses or MOOCs were able to teach more students with fewer instructors, then an instructor was asked by the institution to create an online course, the instructor might be motivated to turn it into a failure. This area would be a little difficult to research given the incentive for the instructor to keep their motivations secret. And the instructor that is motivated to create a failing course would be more motivated to make it a failure to save their colleagues' jobs than their own job since they would probably be continued to be employed so they could keep instructing the online course. Instructors creating online courses may also follow the John Henry affect when deciding the mode of online instruction. For example, if a course was completely autonomous and reusable, then the instructor would no longer be needed after the course was created. Therefore, the instructor might argue for the need to keep the course synchronous and create elements that required a heavy instructor presence. Therefore, it may be up to administrators to appeal to researchers who would rather spend their time on research than teaching a course to create reusable courses that required

minimal instructor presence. This would have to be coupled with the promise that the resources that had been spent on instruction would be redirected to research. Instructors could also create the John Henry confounding effect for reasons beyond job security. Instructors could be motivated to work against online education because of a discomfort with technology, a desire to keep in-person instruction, and feelings of disconnection in online environments.

Instructors were most often dissatisfied with technology problems, no face-to-face contact with students, and the level at which students are involved. The most satisfying aspects of online instruction for these online instructors was the flexibility that online affords, educational access, and the diversity of students in the courses (Wasilik and Bollinger, 2009).

CHAPTER 4: METHODS

The multiple aims of this dissertation required a multifaceted approach to research methods. The proposed framework is meant to be a practical guide to understanding and researching online courses in the face of abundant sources of variation. This empirical portion of the dissertation is meant to show how the framework can be applied and used as both an organizing model and as a way of finding overlooked research areas.

Prior to this dissertation, the author assisted in the evaluation of two online course projects. During the evaluation of courses for two separate projects, a Grounded Theory approach was used to better understand the overall processes involved in online course implementation and this experience helped in the design of the first few iterations of the framework. This Grounded Theory approach continued during an extensive review of the literature. While a Grounded Theory approach avoids prior theory in data analysis (Charmaz, 2001), data can come from a wide range of sources, including academic literature (Waring, 2012). The extensive literature review was the first step in the framework creation and is presented in the prior chapters of this dissertation. The literature review and subsequent organization and coding helped to identify variables involved in online courses and place them in a logical order of influence. It also helped in identifying how variables interact and which variables educators can influence. The next step is to move from a Grounded Theory approach into a more structured investigation of the online course system represented in the framework. This structured investigation began with an attempt to apply this framework and determine if it fits a particular course. A case study approach was used as the method to attempt this fit. Ashley (2012) explained that moving from an exploratory to more structured investigation is a

respectable practice when studying a case or cases. Finally, student portion of the framework is examined in more detail in order to discover some of the variables that influence student success that can and cannot be changed by educators. A special focus is placed on student choice to see how and why students make certain decisions in online courses. A study of student decisions was pursued because of the lack of a clear description of student decisions that impact their experience in online courses. The student portion of the framework is examined through student interviews, surveys, and output data from the online learning environment. A Pragmatic approach was chosen for this study for a number of reasons: the desire for a general framework that can be adapted for particular courses; the realization of abundant variables; and the potential for the framework to change based on the variables presented in a particular course. The framework follows this Pragmatic approach in that it should be adaptable to multiple types of online courses.

Epistemology and Philosophy

This framework was an attempt to appeal to multiple epistemological perspectives. While researchers from different perspectives might not be able to use all parts of the framework for different research projects, researchers can used different parts of the framework and then address how it fits in the system in relation to other perspectives. A Behavioral perspective was valued for the emphasis on what students do. The unit of analysis for Behaviorism is "behavior of the individual" (Schuh & Barab, 2008, p.76). Parts of the framework incorporate output and outcome data, which can be seen as a form of Behavioral measurement. Researchers from a behavioral perspective are more likely to focus just on the output and outcome data offered by a section of the framework. A

Cognitivist perspective matches the framework assertion of the individual's independent agency and some of the possibilities of outcome measures that seek to understand what a student knows. The unit of analysis for Cognitivism is “cognitive structures of the individual” (Schuh & Barab, 2008, p.76). A Cognitive Constructivist perspective can be seen in the area of student and instructor choices and how they make these decisions based on information they are provided from their environment. The unit of analysis for Cognitive Constructivism is “reorganization of mental structures of an individual making sense of the world” (Schuh & Barab, 2008, p.76). A Socio-Cultural researcher may value the framework as a way of understanding an individual in relationship to the environment and culture and the interplay culture and individual that this framework provides. The unit of analysis for Sociocultural perspective is “relation (and processes) between the individual and society” (Schuh & Barab, 2008, p.76). A Situated perspective may also value the framework as a way of explaining how an individual uses objects and others as a cognitive process. The unit of analysis for Situativity perspective is “ecosystem of which the individual is a part” (Schuh & Barab, 2008, p.76). Therefore, this framework can be seen as a compromise between multiple perspectives. However, researchers taking radical epistemological positions may view the framework as being in conflict with their perspective. It is hoped that researchers with different epistemological positions will be able to use the framework as a way of focusing their research while simultaneously understanding how their research fits into a larger system.

All phases of this project were conducted with a Pragmatic philosophical approach. This Pragmatic approach to aims to seek harmony between generalization and particularization:

> This emphasis on situational uniqueness implied that general laws or principles cannot be simply imposed on a situation and used to crank out answers to practical problems. Every situation is unique and requires interpretation, judgment, and possible adaptation to fit its peculiarities to some more general pattern. General patterns also need to be modified in the light of present, particular experience. There is a give and take between general and particular, each informing the other. But the real test of an inquiry is not just its resolution of current uncertainty but whether its results hold up when acted on in the future (Bredo, 2006, p.25).

Taking a Pragmatic view means that the framework presented in this dissertation should not be viewed as infallible and universally applicable across all online courses. Instead, this framework, which was created based on an extensive literature review and online course research experience, should be viewed as a starting point for discussion of research in online courses. Substantial evidence from previous research backs this framework, however, there are potential cases where a course might not exactly fit or might add additional pieces to the framework. In any case, it is worth investigating to what extent the framework works in a single case and in the future, in multiple cases.

Case Study

There are a number of reasons to select case studies, which include the desire to provide detailed information for an individual client; to better understand peculiar instances or phenomena; or other methods such as large quantitative studies that seek generalizability lack reliable or accurate data (Patton, 1990). "The case study approach to qualitative analysis is a specific way of collecting, organizing, and analyzing data" (Patton, 1990, p. 384) and this includes the steps of assembling data, constructing a case record, and writing up the report (Patton, 1990). Yin (2006, 2008) added that case studies include the design of the research. According to Yin, there are a number of steps in the design, implementation, and reporting of a case study: define the case to be studied (Yin, 2006; 2008); decide on whether to study single case or multiple cases within the case study (Yin, 2006; 2008); deciding on whether to adopt a theoretical perspective prior to

the study (Yin, 2006); strengthening evidence for the study (Yin, 2008); analyzing the data (Yin, 2008), preparing a report (Yin, 2006), and reporting the findings (Yin, 2006). When selecting the case, the researcher will face the choice of whether to seek a unique-type case, a typical case, or a longitudinal case. The level of uniqueness may become apparent over a period of time. However, this distinction is important, as the research will have to logically infer the level of generalization of results of the inquiry. This type of generalization is not based on statistical generalization since a case study has no statistical power (Yin, 2006). "Cases can be individuals, programs, institutions, or groups" (Patton, 1990, p.384). However, smaller cases, such as a single school, can be nested within the case study of a district, which could be nested within the case study of a state program, which could then be nested into a case study of a national program (Patton, 1990).

> The parameter of what can be defined as a case-study is fairly comprehensive: "it may be an individual, such as a teacher or student; an institution, such as a school; an event, project or programme within an institution; it may be a policy, or other types of system (Ashley, 2012, p. 102).

While using a single case can provide insight into a phenomenon, researchers must be careful when generalizing because the results may be based on extreme particularism of the single case (Ashley, 2012). Case studies are useful when trying to gather complexities of a shifting system and the interaction of complex individuals within that system (Ashley, 2012).

Patton (1990) suggested maximum variation in case selection when observing new phenomenon in order to capture commonality or generalizable characteristics and also differences or particularities between cases. Yin (2006) noted that there are six main sources of data for case studies: documents, archival records, interviews, direct

observation, participant observation, and physical artifacts. Patton (1990, pp. 385-386) stated that

> case data consists of all the information one has about each case. Each case analysis includes all the interview data, the observational data, the documentary data, impressions and statements of others about the case, and data over time--in effect, all the information one has accumulated about each particular case goes into that case study.

Patton (1990, p.386) then distinguished the type of data one might get from different subjects: "at the individual level data can include clinical records, statistical information about the person, background information, life history profiles, and diaries." Multiple forms of information should be used to gain a better understanding of the case and to triangulate the data so that researchers can find places of contradiction.

When analyzing case study data, it is important to follow a plan for analysis from the beginning of the study. Whether this is to help confirm a theory, answer research questions, or allow for grounded theory. This foresight helps to ensure that the desired data is collected was collected at the time of analysis. One analytic technique involves the use of logic models. In this analytic technique, a logic model would be hypothesized ahead of the study. The case study would be conducted and the results analyzed in order to see whether the case followed the process described by the logic model (Yin, 2006). This type of study would match here because the proposed framework was developed in a logic model format.

Stake (1978) argued that case studies are a preferred method as the case report naturally appeals to readers in a way they can relate to. However, this requires that researchers interpret and present the case in a way that aligns with the audience understanding. People learn more through lived experience than through just a listing of information. Visiting to ancient Greek monuments leaves a lasting impression that a

listing of facts of Ancient Greece is unable to do. Thus, a well-described and documented case study has the potential to offer the audience a more immersed and illustrated understanding of the principles being studied:

> When explanation, propositional knowledge, and law are the aims of an inquiry, the case study will often be at a disadvantage. When the aims are understanding, extension of experience, and increase in conviction in that which is known, the disadvantage disappear (Stake, 1978, p. 6).

Being able to generalize is often one of the more valued abilities in positivistic research. However, only when one is able to understand the particular aspects of when that generalization applies does it become useful in application:

> What becomes useful understanding is a full and thorough knowledge of the particular, recognizing it also in new and foreign contexts. That knowledge is a form of generalization too, not scientific induction but naturalistic generalization, arrived at by recognizing the similarities of objects and issues in and out of context and by sensing the natural covariations of happenings. To generalize this way is to be both intuitive and empirical, and not idiotic. (Stake, 1978, p.5).

It is important not to over-generalize, thus, cases allow information consumers to develop a sense of when certain generalizations apply and when qualities change the situation. Since case studies can be explained in a way that allows for universal understanding through the description of experiences, it has the potential to enjoy a wider audience (Stake, 1978).

Study Purpose

Research of online courses has come from multiple perspectives and has investigated multiple aspects of the courses and those involved in the courses. The research has yet to present a unifying theory that pulls together these perspectives and research aims. This lack of unifying framework could be the reason for such differing perspectives and interpretations on whether online courses work and under what circumstances they work. The first part of this dissertation aimed to create a framework that brought together a wide variety of research so that it could be explained in a simple

visual form. This part of the dissertation identified variables involved in online courses and put them in a logical order of influence. This was completed through experience in online course evaluation projects and a thorough literature review.

The second part of this dissertation will fit this framework to a specific case to see how well the course mapped onto the framework. Because the framework was developed in a logic model format, the study aligns with Yin's (2006) call for the use of logic model as an analytic device. Fitting the framework to a specific case, helps determine if it will work as a representation of a real embodied learning environment. It will also serve as a demonstration for how the framework can be used. Part of this process is determining all of the actors involved in the course and testing what level of influence these actors have on the course. So, using the framework for a specific case both tests the framework and demonstrates methods and functionality.

The third part of this dissertation was to focus on the student portion of the framework for a specific online course, with special attention being placed on Student Experiences and Participation Decisions. Since online courses have great potential for student variation in their participation and outcomes, it is important to understand the variables involved in student participation and outcomes. For this third part, student participation decisions were focused on as an entryway into understanding student experience in online courses. Specifically, the study examines student perceptions of choices and how students make decisions regarding their participation. Because participation is particularly important for student output and outcomes, understanding how students differ in their participation from instructor intentions can help to uncover reasons for variation in student outcomes. It is hypothesized that decisions about

participation are based on a estimation of the most efficient way to complete an online course given internal and external variables, course and component variables, and their goals.

Setting and Sample

In addition to the literature review, the framework was developed while the author was working on two separate online course evaluation projects. The first evaluation involved a number of courses offered on a single subject a multiple community college campuses in the Western United States. The second evaluation involved approximately 20 online courses on a myriad of subjects that were all part of a cross-campus online course initiative. A single course from this second evaluation was also used for the case study and student cases. The case study focused on a single online cross-campus course at a large public university and the equivalent in-person course offered by the same instructor at one campus in the same university system. This particular course was chosen because of level of access provided by the instructor and multiple forms of instructional materials that were available to students. This dissertation used some of the data from the evaluation project.

The course used in the case study focused on applied science and how the world and society was affected by the issues related to the specific subject in science. The course counted towards General Education and writing requirements for the university. Three sections of the course were used for the case study: two online courses and one in-person course. The in-person could also be considered a hybrid course since the students were allowed to watch videos instead of attending lecture. If students from the in-person course watched the online videos, then the only difference between the in-person/hybrid

course and the online course was the in-person discussion section that the in-person course had (the online course had an online discussion section). All sections of the course were taught by the same instructor.

Instrumentation and Materials

The data for this dissertation came from multiple sources: descriptions of the course and component activities; student surveys; student interviews; online learning environment data; student grades; instructor interviews; and an instructor survey. In accordance with IRB and confidentiality agreements, all data and responses were expunged of identifying information and any information from responses that were potentially identifying was generalized to a point that it would no longer be easily identifiable.

Online education articles. In the first of three studies in this dissertation (see the Research Designs section below), a comprehensive literature review and coding was conducted. Articles used for this study were featured in a number of meta-analyses / literature reviews of online education (Bernard et al, 2009; Carroll et al, 2009; Means et al, 2009; Sitzmann et al 2006; Tallent-Runnels et al, 2006). This study reused the articles from these meta-analyses / literature reviews as a source of data for the exploration and confirmation of a framework on online education (see Study 1). Of the 311 articles in these reviews, the author was able to download 196 for review and coding.

Descriptions of the course and components. Information on the course setup and components was collected during the evaluation of the online course initiative. This data included detailed information gathered from the syllabus, the course website, and the instructor's independently created website. From these data sources, a course

characterization was created that detailed how the course was set-up, the technologies used, the activities, assignments, and assessments. The characterization of the course will be used as a way of describing the Component-Activity Operation section of the framework.

Descriptions of the course and component activities were used as a way of mapping the course to the framework, specifically in the area of the component-activity operation. This part of the analysis was mainly a descriptive mapping of the course components to the framework.

Student surveys. The students were surveyed pre-course and post-course. Students who completed the survey were provided extra credit. While the students had to complete the survey for extra credit, they were provided option on the consent page to opt out of research if they chose to. Both surveys took approximately 10-15 minutes to complete and asked a wide range of topics from background information to student experiences in the courses. The pre-course and post-course surveys were created by a team of researchers that were evaluating the effectiveness of a program of online courses. The pre-course survey (See Appendix B for the full survey) was consistent across courses with only minimal changes across courses, such as course identifiers. The post-course survey (See Appendix C for the full survey) had a core set of questions that was asked for all courses but pulled some questions about activity-components from a question bank based on the specific technologies and activities that were implemented in each course. The survey was sent to students in an email and through an announcement by the instructor on the online learning environment. Students were given approximately a week to complete the survey.

The Student Survey data (see Appendix B for pre-course survey; see Appendix C for post-course survey questions) included Likert-type scale items, selection items, and open-ended and short answer type items. The Likert-type scale items were analyzed both across students and individually for each interviewed student as part of the sub-case study that looked at specific student experiences. Open-ended items were coded based according to the themes of individual attributes, experience in the course, circumstances affecting experience, decisions in the course, and outcomes in the course. The survey data will be used as a cross-reference of the interview data.

The data collected from the students through the pre-course survey are self-reported beliefs and opinions and therefore should be viewed with caution as self-reporting is prone to bias and measurement error. However, the data from surveys is of high value because there is little alternative to gathering data that provides insight into student beliefs.

Student interviews. A question on the post-course survey asked students if they would like to participate in an interview for a $15 gift card. Five students that responded with a yes were randomly selected by the evaluation team for an invitation to participate in the interview. These students were contacted through email with a request to participate and an offer for a $15 gift card for participation. Those that responded in a reasonable time were scheduled for an interview. Five interview slots were available per section. If there were still open slots, additional students were contacted until enough students responded to fill the five slots. Five students for each of the three sections (total of 15 students) were interviewed. One of the interviews had a technology failure where

the call was lost halfway through and that first part of the interview. The second half of the interview still yielded

All interviews were conducted over the phone or online through voice conferencing software, no video conferencing was used. The interviews were semi-structured. Each interview used the same base set of questions (Appendix D) with unique follow-up questions for further understanding and clarification. Questions started with questions about the student experience, such as the typical week for the course and how they sequenced their time in the course. This first section was meant to get a sense of how students spent their time in the course and broad overview of how they experienced the course. This broad introduction section was followed by questions about interactions with others in the course, questions about the course activities, questions about the technology in the course, and finally, the students were asked some broad questions about the course, such as overall satisfaction.

Student Interviews will be used to identify student participation decisions. The data from these interviews will also look at the degree to which students deviated from the instructor inferred course sequencing to create their own weekly sequencing of activity for the course.

Interviews used questions in the following topic areas:

- Typical School Week for the Course
- Description of Experiences in Course
- Learning at Own Pace
- Time Spent on Course Each Week
- Strategies
- Interaction Experiences
- Backchannel
- Activities
- Technology

Student interviews were transcribed and the data was analyzed both across students and individually as part of the sub-case study that looked at specific student experiences. Interviews were coded based according to the themes of individual attributes, experience in the course, circumstances affecting experience, decisions in the course, and outcomes in the course. These interviews, along with the student survey data were used to build profiles of the individual student experiences, how they made choices, and their outcomes in the course.

Online learning environment data. Student usage data was gathered from the Online Learning Environment. This data included the student. Times Viewed and Times Participated in different pieces on online learning environment. The student Times Viewed indicates whenever a student viewed a portion of the online learning environment, while the student Times Participated indicates whenever a student manipulated the environment in some way. These items provide an insight into the frequency with which students operated in the online learning environment. While this does not describe all student activity in a course, it does give a sense of the online activity. The Online Learning Environment data was combined with student survey data and student grades for analysis across the course. This data was also used to build profiles for the sub-case study of the students that were interviewed.

It is important to interpret of OLE frequency usage with caution. Because of the way that the OLE gathered data on student usage and the highly diverse nature of the online courses in the program from which this data was gathered, the online learning environment may not be the strongest indicator of student participation in the course. For example, the OLE did not record time spent on any one page in the OLE. Thus, a student

may spend much more time on the OLE than another student that has more frequently clicked on links in the OLE. Also, the OLE only represents part of the online environment that the class hosted, therefore, students could have spent more time on the instructor's personal website, digital textbook, or conferencing software. Students could have also sought additional materials online, such as through search engines or the university library. Finally, online participation is not the only type of participation possible in an online course. Students could have spent more time offline reading, making and using flashcards, or reviewing notes or PDFs. Therefore, data collected from student participation in the Online Learning Environment could not be seen as a definitive source of data on student participation, but rather it was viewed in this dissertation as just one source of student participation. For this reason, the correlation between OLE frequency usage and other sources of data represents a very specific relationship and it is believed that there is a strong possibility that there will be little, if any, statistical correlation between other data sources and the OLE.

Student grades. Final grades were collected for all of the students in each of the sections. This grade data was used as an indicator of the outcome data for the students in the course. While grades do not provide information on specific student outcomes, they can be used as a holistic indicator of student outcomes. Student Grades were combined with student survey data and the online learning environment data for analysis across the course. These grades were also used to build profiles for the sub-case study of the students that were interviewed.

Instructor interviews. Two interviews were conducted with the instructor. The first interview was conducted approximately seven months before the start of the first

section of the course. The second interview was conducted one month before the start of the first section of the course. These interviews were open-ended but were aimed at understanding the instructor goals as well as motivators and barriers to developing and implementing the online course. The instructor interviews were transcribed and analyzed using codes aimed at uncovering their goals as well as motivators and barriers to developing and implementing the online course.

Instructor survey. A short survey was completed by the instructor after completion of all sections of the course. The survey was developed for all instructors involved in the online course initiative and was designed to take approximately 10-15 minutes to complete. The survey asked a wide range of topics from background information to instructor experiences developing and implementing the course. The instructor survey was created by a team of researchers that were evaluating the effectiveness of a program of online courses. There were 52 Likert-Type scale items and 13 open-ended or short-answer items on the survey. The survey was sent to instructors in an email.

The Instructor Survey included Likert-type scale items, selection items, and open-ended and short answer type items. The Likert-type scale items were used to connect to the framework. The open-ended items were coded based on the goals, experiences in the course, circumstances affecting experience, decisions in the course, data that was used to make decisions, and motivators and barriers to developing and implementing the online course.

Instrumentation Summary. In summary, there are different sources of data used in this dissertation. As seen in the next section, *Research Designs*, this data will be used

for three separate studies that answer a variety of research questions. Study 1 uses mainly the academic articles, while both studies 2 and 3 used all of the other data for multiple analyses. Each of the three studies had multiple research questions (see *Research Designs* section below). The table below lists the studies that used the different data source.

Table 4.1

Data sources that were used in the methods utilized to answer research questions.

Data Source	*Study that Used the Data Source*
Online Education Articles	1
Descriptions of the Course and Component Activities	2 & 3
Student Survey	2 & 3
Student Interview	2 & 3
Online Learning Environment	2 & 3
Student Grades	2 & 3
Instructor Interviews	2
Instructor Survey	2

Research Designs

Study 1: Literature review for framework validation. The framework was constructed through the utilization of experience and literature review. The researcher used four years of evaluation of online course experience and three years of experience in non-online course and curriculum development and evaluation. This experience contributed to the initial designs of the framework. However, it was unclear to what extent the framework was accurate and generalizable. This led the researcher to turn to the literature. A literature search was conducted on articles used in meta-analyses and literature reviews. The articles were summarized in detail by the researcher, noting any income, process, and outcome variable, or any other additional potential extraneous

variables described in the article. These article summaries were then coded based on the different sections of the framework.

After the initial coding meant to confirm the prior developed framework, a search for additional articles and a more detailed coding was conducted. This literature search was conducted because of the lack of detailed information about certain portions of the framework. For example, many of the articles mentioned instructor characteristics or decision-making processes, however, few went into great detail describing these sections of the framework because the article (and meta-analyses) were mostly focused on the operation of the course, student participation, student output, and student outcomes. Because most of the studies in these literature reviews and meta-analyses described only certain types of variables, such as student input variables, course composition and components, student output and student outcomes, further searches were conducted based on instructor activity in the course and student decisions. While these pieces of the framework had some presence in the articles from the first set of coding, they were not the focus of many of the articles. Thus, further searches were needed in order to code for more detail and in order to explore the possibility of new sections that were not identified in the original framework. These articles were then summarized and coded with an expanded and unfolding coding system.

Research questions for the literature validation study. The questions that guided the validation of the framework were:

- Is there evidence that the major sections of the framework are represented in the literature?
- What are the variables that make up the different sections of the framework?
- Are there connections between the variables and a logical sequencing to those connections?
- Which variables can educators manipulate?

- What are the variables that are difficult to change?

Data and procedures for framework validation study.

Prior to the pursuit of this dissertation, the author of this dissertation had four years of experience in the evaluation of college-level online education and an additional three years experience in the development and evaluation of college-level non-online education. The online education evaluation experience was for two separate online projects: one was a small-scale evaluation of community college online courses and the other was a large-scale four-year program involving 19 online courses. During this time, a framework of online courses was developed that was meant to illustrate inputs, processes, and results of online courses. Because the development of the framework was based mainly on the researcher's own experience, a natural question of whether the framework is also reflected in the research of others developed. Thus, the first question of this dissertation is:

Research question 1.1: *Is there evidence that the major sections of the framework are represented in the literature?*

This question was researched by examining the extent to which the variables for the framework were reflected in the literature of online education. This first question looked to confirm the major sections of the framework. Thus, the article summaries were only coded for these major sections to determine whether these variables were present in the literature. The codes used for answering this question are presented in the next section (Table 4.3) and directly correspond with the major sections of the framework. The initial coding used e-learning studies that were used as the data for prior literature reviews and meta-analyses (Bernard et al, 2009; Carroll et al, 2009; Means et al, 2009; Sitzmann et al

2006; Tallent-Runnels et al, 2006). Articles from meta-analyses and literature reviews were chosen because of their rigorous inclusion and exclusion criteria for article selection. Any articles that were used in these reviews and could be downloaded through the UCSB library were used in the coding. Dissertations were excluded from the review.

Table 4.2

Number of articles that were downloaded per meta-analysis

Review Publication	*Total Articles in the Review Publication*	*Number of Dissertations*	*Number of Inaccessible Articles*	*Number of Articles Downloaded for this Review*
Bernard et al, 2009	74	25	17	*31*
Carroll et al, 2009	19	0	8	*11*
Means et al, 2009	46	4	7	*35*
Sitzmann et al, 2006	96	17	20	*59*
Tallent-Runnels et al, 2006	76	0	16	*60*
Total	311	46	68	*196*

However, while the total number of articles from the reviews/meta-analyses comes to 196 (out of 311 total used in the literature reviews/meta-analyses), there were 14 instances of overlapping articles (i.e. the same article was used in two different meta-analyses), so, a total of 182 articles were used for the initial review. The number of articles that were coded for a section determined evidence for the existence of the section of the framework. Infrequent usage of a code was used as an indication that the section may not exist. Frequent usage of a code was used as an indicator that the framework section existed. Inconsistent coding between articles was predicted since each article was focused on different variables and therefore, each was likely to omit variables that were not seen as the focus of the article.

While the methods for the first research question were meant to find support for the existence of the various sections in the existing framework, an exploration for additional sections and specific variables within the sections was needed. Thus, the second and third research questions are:

> *Research question 1.2*: *What are the variables that make up the different sections of the framework?*
>
> *Research question 1.3: Are there additional major sections of the framework that were not identified in the original iteration?*

These questions were researched through an exploration of additional variables and major framework sections that could be explained in the literature. These two questions were aimed to determine if additions were needed to the framework. The coding for the first question showed that the original set of articles had a specific focus on students and student outcomes. This limited focus exposed the need for additional articles in order to broaden the review and increase the chance of finding additional variables and major sections. Literature searches were conducted for: all areas of the framework that pertained to the instructor; student external input characteristics; student decision-making; and student goals. As additional variables and sections were discovered, new codes were added and any additional articles that described these variables or potential sections were coded as such. In other words, the coding was dynamically cumulative. All codes were summed across articles. Zhao et al (2005) used a similar technique in their review of distance education as a means of supporting and expanding their framework of research on course effectiveness. However, as explained earlier, this study focused on an expanded framework of online courses.

Because the framework was designed to be dynamic with relationships between the subsections, connections between these subsections would need to be established. The researcher designed the framework with hypotheses about what these relationships were. Subsequently, question four is as follows:

Codes for literature validation. The original set of 182 articles from meta-analyses and literature reviews were summarized and coded with 17 codes that represented the major sections of the framework (see Table 4.3 below). Coding for these research questions was conducted in Microsoft Excel (2011).

Table 4.3

Initial codes used for literature validation

1. Instructor / TA Characteristics Input
2. Subject / Content Input
3. Course Assembly Input
4. Technology Input
5. Student Internal Characteristics Input
6. Student External Characteristics Input
7. Course Characteristics and Operation
8. Course Component Characteristics and Operation
9. Actual Student Participation
10. Instructor Operation Decisions
11. Student Participation Decisions
12. Instructor Intended Output
13. Actual Student Output
14. Instructor Intended Outcomes
15. Actual Student Outcomes
16. Individual Student Goals

After the initial use of these codes, the number of articles was expanded to include articles focused on student choice as well as all areas of the instructor portion of the framework. Very few of the articles used in the reviews/meta-analyses described the different sections of the instructor portion of the framework. This may have been because the reviews/meta-analyses focused on the successful of intended student outcomes and thus, the articles used spent less attention on the instructor experience.

After these codes were used on all of the articles, a recoding was done. This recoding was meant to uncover new sub-codes. The original codes for the major sections of the framework were used as a starting place in the coding process, however, the process of code inclusion was unfolding. As new variables were discovered, they were added as either sub-codes or as new major sections. This expanded list of codes is presented in the Results chapter of this dissertation.

Summary of data and procedures for Study 1. Table 4.4 below illustrates how data was analyzed in relation to the framework research questions.

Table 4.4

Research Questions for Analysis of Literature	*How Literature Data Was Analyzed*
Question 1.1: Is there evidence that all of the major sections of the framework are represented in the literature?	Articles gathered from meta-analyses and each was summarized based on the described input, process, and result variables. Article summaries coded using codes from the main sections of the framework.
Question 1.2: What are the variables that make up the different sections of the framework?	Number of articles expanded to include more focused on faculty and other entities involved in online education. Articles coded using codes from main sections of the framework and additional codes added each time a new variable appeared.
Question 1.3: Are there additional major sections of the framework that were not identified in the original iteration?	Number of articles expanded to include more focused on faculty and other entities involved in online education. Articles coded using codes from main sections of the framework and additional codes added each time a new variable appeared. These codes were then examined to determine whether new major sections for the framework were needed.

Study 2: Course case study. A case study design was used to examine how well an actual course was represented by the online course framework that was designed and described earlier in this dissertation. A single course with a number of sections was used

as the case. The course used in this investigation was part of a large-scale online course initiative. This initiative was evaluated through quantitative and qualitative data gathered from all courses in the initiative. This evaluation collected a large amount of data on the target courses. This case study used both quantitative and qualitative data gathered during the prior evaluation of the online course initiative and used it in a post hoc analysis. Consequently, a large amount of data was gathered for the course used in this case study. Because the data was not gathered specifically for the use of confirmation of the framework, the analysis conducted here in the dissertation used data/variables from the evaluation that naturally inferred the representation of the specific sections of the framework. A positive aspect of this approach was that the data was gathered independent of the framework, and thus the researchers and subjects were less prone to confirmation bias. However, a downside of this approach was that specific questions that would have provided a more efficient one-to-one mapping of framework variables to the course could not be asked of the subjects. Therefore, the analysis of the variables relied on careful post-hoc mapping of the data gathered to the framework sections by the single researcher in this dissertation.

Because the case study was used as method for confirming the framework developed in the prior study, the sections of the framework provided a guideline for both the coding scheme for the qualitative analysis and the latent variables assumed in the quantitative analysis. In other words, the sections of the framework were used as a guide for analyzing the course data. Also noted were any variables not identified during the development of the framework that was discovered during this analysis. This analysis

would provide a starting point for understanding the extent to which the framework could be applied to real courses.

Research questions for the case study. The questions that guided the case study were:

- Are the different portions of the framework described by the subject course?
- Is there anything about the framework that was not described by the subject course?
- Is there anything about the course that was not described by the framework?
- Does the subject course present evidence for the hypothesized connections between the different sections of the framework?

Answering these research questions suggested a need for a variety of data. Because the study of these questions used multiple forms of data, the analysis took multiple forms. While qualitative analysis was used for each of these questions, quantitative analyses were also used for the last research question in this study. For all of the questions, qualitative data was coded using codes that represented different sections of the framework. The codes used for investigating the qualitative data for these questions are presented in Appendix E and correspond directly with the different sections of the framework. These codes were used primarily to code the qualitative data of student and instructor interviews, as well as open-ended responses from the instructor and student surveys. Codes for the analysis of qualitative were applied in the software Dedoose (2016). The first three questions exclusively used qualitative data while the last question in this study used both qualitative and quantitative data. Because the last question was concerned about the links between sections of the framework, the qualitative analysis was meant to uncover overlaps in qualitative data that would suggest connections while the quantitative analysis of the data looked for correlations between data representing

different sections of the framework. Additionally, quantitative analyses were conducted using the framework as the guide for analysis. The procedures and analysis of each question is explained below.

The first study in this dissertation focused on the construction of a framework that explained the inputs, processes, and results of online courses. This theoretical framework was based on experience and literature. However, the extent to which the framework represented an actual course remained unanswered. In order to understand how well the framework reflects an actual course, a case study was implemented. Correspondingly, the first three questions of this second study were:

> *Research question 2.1: Are the different portions of the framework described by the subject course?*
>
> *Research question 2.2: Is there anything about the framework that was not described by the subject course?*
>
> *Research question 2.3: Is there anything about the course that was not described by the framework?*

These questions are presented together because of the timing of the analysis and similarity in how they were investigated. Each of these questions was investigated using qualitative analysis. Multiple sources of qualitative data were used to investigate these questions. These data sources included *descriptions of the course and component activities*; *student interviews*; *the open-ended questions on the student* surveys; *instructor interviews*; and *the open-ended questions on the instructor survey* (see *Instrumentation and Materials* section of this dissertation for descriptions of these data sources). The open-ended questions on the student survey and the instructor interviews were then coded with codes that reflected the different subsections of the framework (see Appendix E and Appendix F for these codes).

The unit of analysis used for coding was *level of meaning*. This unit of analysis was used because it corresponded most closely to the nature of the questions. After the various data sources were coded, frequencies of each of the codes were produced. The frequency of code usage was applied as a type of evidence for the existence of the framework section. High code usage was seen as evidence of section presence, which helped answer question 2.1. Codes that were used less frequently were examined further and this analysis was used to answer question 2.2. In addition to confirming the existence of the different sections and connections of the framework, a confirmation would not be complete without knowing if there were other possible undiscovered sections or subsections. Accordingly, the question 2.3 investigated whether the course data presented evidence for potential additional sections to the framework. While this question was pursued simultaneously to the first two questions of this study, an additional methodological feature was needed. By adding a code of "Not Described by Framework", the analysis of qualitative data could include a comprehensive review of statements that appeared to have not have been represented in the framework. Further, as patterns in the data became evident, additional sub-codes were added.

Table 4.5 summarizes how questions 2.1, 2.2, and 2.3 were researched. Note that the data sources were the same for all three questions; the codes were the same for 2.1 and 2.2 (2.3 had just one code); and the coding for all three questions were conducted at the same time.

Table 4.5
Analysis for Research Questions 2.1, 2.2, and 2.3

Research Question	*Data Sources*	*Procedures*	*Analysis*
2.1: *Are the different portions of the framework*	• Descriptions of the course and component activities • Student Interviews	Coded according to the different sections in the framework. Codes were	Number of times a code was used for the data was seen as an

described by the subject course?	• Student Surveys (Qualitative Sections) • Instructor Interviews • Instructor Survey (Qualitative Sections)	applied and analyzed in Dedoose (2016). Frequencies for code usage were analyzed.	indicator that evidence for the corresponding section of the framework existed within the data
2.2: *Is there anything about the framework that was not described by the subject course?*	• Descriptions of the course and component activities • Student Interviews • Student Surveys (Qualitative Sections) • Instructor Interviews • Instructor Survey (Qualitative Sections)	Coded according to the different sections in the framework. Codes were applied and analyzed in Dedoose(2016). Frequencies for code usage were analyzed.	Codes that were not used or used very little were examined further for examination.
2.3: *Is there anything about the course that was not described by the framework?*	• Descriptions of the course and component activities • Student Interviews • Student Surveys (Qualitative Sections) • Instructor Interviews • Instructor Survey (Qualitative Sections)	Coded according to the different sections in the framework. Codes were analyzed in Dedoose (2016). One code used in the coding of this data was "Not Described by Framework". Comments that were coded with this code were reviewed further.	Comments that were coded with "Not Described by Framework" were examined in relation to the framework.

In addition to describing different segments of an online course, the framework hypothesized relationships between the sections. Thus, the fourth research question for this case study was:

> *Research question 2.4: Does the subject course present evidence for the hypothesized connections between the different sections of the framework?*

The investigation of this question required a slightly different than the prior three questions in this study. Rather than confirming the existence of the subsections of the framework, this investigation of this question aimed to confirm for connections between subsections of the framework. In order to look for the connections, the existence of the subsections in the framework was assumed. The qualitative data analysis used the sample of students that were surveyed. As explained below for method 2.4.A., the qualitative analysis used multiple forms of data and looked for all possible connections that existed

in the framework. This search for all potential connections was possible because of open-ended and potentially wide-ranging nature of the data. Thus, the coding scheme for the qualitative investigation matched the framework sections as the coding for other sections of this paper.

Method 2.4.A: Qualitative investigation of framework connections using all qualitative data. The first part of the investigation of question 2.4 used the same qualitative data used in the first three questions: *descriptions of the course and component activities*; *student interviews*; *the open-ended questions on the student* surveys; *instructor interviews*; and *the open-ended questions on the instructor survey* (see *Instrumentation and Materials* section of this dissertation for descriptions of these data sources). The analysis of this question worked symbiotically with the analysis of the question 2.1 as it used the codes (see Appendix E for codes) and the coding processes. This coding was examined for any overlapping code application. These overlaps were aggregated in Dedoose (2016) and each overlap was examined as a possible evidence of connection between sections. Examples of these overlaps and the corresponding analyses are presented in the *Analysis* section of this dissertation.

Table 4.6

Analyses for Question 2.4: Are the different portions of the framework described by the subject course?

Method	*Data Sources*	*Procedures*	*Analysis*
2.4.	• Descriptions of the course and component activities • Student Interviews • Student Surveys (Qualitative Sections) • Instructor Interviews	Coded according to the different sections in the framework. Codes were analyzed in Dedoose (2016). Codes that overlapped in the units of analysis were further examined.	Comments that suggested direct connections between different sections of the framework were listed and examined in relation to the framework. *Hypothesized Connections*: All hypothesized connections in the framework were explored

• Instructor Survey (Qualitative Sections)

Data and procedures for the case study. Table 4.7 shows how data sources were used in relation to the framework. The case study maps each of these data pieces to the framework. The sub-case studies of students focus on the student portion of the framework.

Table 4.7
Data sources and how they were used in relation to the framework

Data Source	*Use of Data In Relation to the Framework*
Descriptions of the course and component activities	Component-Activity Operation
Student Survey	Technology / Software Students (Internal and External Attributes) Student Participation Actual Student Outcomes
Student Interview	Course Subject Area - Difficulty Technology / Software Students (Internal and External Attributes) Student Participation Student Participation Decisions Actual Student Output Actual Student Outcomes Student Goals
Student Grades	Actual Student Outcomes
Instructor Interviews	Instructor Traits Course Assembly Course Subject Area - Difficulty Instructional Operation Decisions Instructional Intended Class Output Instructional Intended Class Outcomes Instructor Goals
Instructor Survey	Instructor Traits Course Assembly Course Subject Area - Difficulty Instructional Operation Decisions Instructional Intended Class Output Instructional Intended Class Outcomes Instructor Goals

Codes for the case study. The coding scheme for qualitative analysis uses the proposed framework as the guiding structure. Adjustments that were used in the first study were made to the codes for this study. As the coding progressed, additional codes were added when new major sections or major variables were found. The initial coding scheme used the codes in Appendix E. The *Unit of Analysis* used for code application is at the level of meaning. This unit was chosen because the goal of the research is to search for new variables related to the framework and to confirm the framework. Because the research was aimed at searching for concepts in the data, level of meaning

Study 3: Student cases. The focus on student cases was seen as an appropriate follow-up to the course case study as a way of focusing on the student portion of the framework. Because the student cases come from the same course as the general case study, there was overlapping data and codes. Each student was analyzed as an individual sub-case and data was also analyzed across students. This study focus on particular students that were interviewed during the evaluation and broke down their comments into units of analysis and studied these units based on a decision-making and study sequencing framework. To uncover some of the variables from this broad perspective, a mixed methods approach was used. Data was collected from student surveys, student interviews, and the data analytics from the OLE. This data was analyzed using both qualitative coding and quantitative descriptive analyses.

Qualitative coding was conducted on student interviews and the open-ended portions of the student surveys for the student cases. An initial coding was used to explore the student interviews and find important profile variables. After the initial

coding a more focused coding system was developed. The quantitative sections of the student surveys were analyzed in order to help build profiles of the case students. This data was compiled in a descriptive way for each student. The data analytics were summarized in a similar way for each student. The quantitative data was also used as a comparison to other students in the class.

Research questions for student case. The questions that guided the examination of the student portion of the framework were:

- Does the student portion of framework adequately represent the student experiences in the course?
- What influences students to make certain participation decisions?
- How do students incorporate class activities into their weekly routines?

This dissertation has focused on the development and confirmation of a hypothesized framework that represents the inputs, processes, and results of online courses. Thus far, the dissertation has approached this aim with the data gathered from literature and a case study of a course. This study looks more specifically at the student actor and attempts to confirm the student portion of the framework. In order to accomplish this goal of understanding framework representation for the student portion, student cases were used. Therefore, the first question of this study is:

> *Research question 3.1: Does the student portion of framework adequately represent the student experiences in the course?*

This question was pursued through the construction and analysis of student cases. Student subjects used for these cases were selected from the same course that was used as a case in second study of this dissertation. This course had multiple sections, one of which was an in-person version of the course. The students used as subjects for these cases were pulled from both the in-person and online versions of this course. Only students that were

interviewed during the evaluation of the broader online education program were used as cases for this study. Data for these cases came from multiple sources: descriptions of the course and component activities; student interviews; student surveys; the online learning environment; student grades; and coding data based on student interviews and student surveys. Profiles were developed for each student based on this information. This profile construction utilized an analysis of the coding and through supplemental review and analysis of the qualitative and quantitative data. These profiles were constructed to highlight input, process, and outcome data. The cases were then examined for evidence of deviation from the student portion of the framework. Criteria for the accuracy of the framework were based on the degree to which the student cases could be explained by the framework. It was hypothesized that that while the student cases would offer more information and detail about the student learning experience, all of the information and processes explained in the framework would be fit within the broad framework proposed in this dissertation. Descriptions of the differences and modifications to the general framework were made if/when the student cases presented new information or processes that could not be explained by the general framework. Thus, the first question in this study aimed to confirm the student portion of the framework through the comparison of individual cases to the framework.

The theory of choice (see Chapter 2) emphasized the forces of internal and external and the potentials of choice and circumstance. Part of this study is aimed at exploring how the student portions of the framework correspond with this theory of choice and the degree to which actual students follow this theory. The next question of this study focus on variables related to this choice theory.

Research question 3.2: What influences students to make certain participation decisions?

The methods used to answer question 3.2 used multiple sources of data: descriptions of the course and component activities; student interviews; text-based questions on the student surveys; and the coded interview and survey data from interviewed students previously coded in 3.1. The data gathered for the analysis again used only student data from the student subjects used for the methods of question 3.1. The methods used for 3.2 also integrated the use of some of the same codes that were used for the profile construction of the students, particularly, this analysis focused on the *Student Participation Decisions* code and all the child codes (*efficiency criteria*, *pacing decisions*, *sequencing decisions*, *content decisions*, and *component-activity decisions*). These codes were analyzed individually and by comparing them to cross-codes to determine what factors influenced their decision making processes. It was hypothesized that student decisions would be influenced by the areas of the framework represented by the following codes: *Student Internal Characteristics Input*, *Student External Characteristics Input*, *Course Characteristics and Operation* (including any child codes), *Course Component Characteristics and Operation*, *Actual Student Participation* (including any child codes), *Actual Student Output*, *Actual Student Outcomes*, and *Individual Student Goals*. The frequency with which certain variables played a role in student decisions as well as the degree to which those variables influenced student behavior was highlighted. By focusing the analysis on the student participation codes, the variables that influence student decisions should become more apparent. The findings from student decision

One area of the framework that represents dynamic processes and potentially offers an insightful look at the reasons students make decisions is the sequencing

decisions students make. Sequencing decisions results in tangible products as the student will have created a structure from which to work. Therefore, asking students about how they came about to structure their participation in a course could offer specific answers about their decision-making process. This information could be useful in understanding why students make certain decisions but could also be important in understanding how the choices around sequencing can alter the processes with which students participate and learn in the course. Thus, the third question in this study is:

> *Research question 3.3: How do students incorporate class activities into their weekly routines?*

As with the other methods used in this study, the investigation of 3.3 used qualitative methods. Whereas the methods for 3.1 included the construction of student profiles of the interviewed students, a more specific type of profile was constructed here. In order to examine question 3.3, each student was given a course sequencing profile that described how they regularly moved through the course. This sequencing profile was based on a weekly sequencing pattern and was constructed using the case subjects' survey and interview data. Descriptions of the course and component-activities were used as reference to the way students sequenced their learning. However, if a student sequenced their schedule in a pattern that deviated from a weekly pattern, the sequencing profile was constructed as such and this was discussed in results. Differences in how students sequenced their learning would illustrate variations in how the students learned in the course and would point to internal learning habits and preferences as well as external variables that influenced learning. Further, the way students sequenced their learning should be integrated with other learning decisions, such as pacing, content, and activities. The analysis of the sequencing profiles also checked for deviations from the general

framework. However, because the framework is broad, the individual student sequencing will be much more detailed and Because the construction of the sequencing profile relied on data collected for the evaluation of the larger program, certain information may have not been deliberately collected, and thus could be missing.

Codes for student cases. The data used for student case coding included the student interviews and the student surveys. The coding of student cases started with the following codes:

Table 4.8
Preliminary Codes to be used in student cases

Institution Input
Instructor / TA Characteristics Input
Subject / Content Input
Course Assembly Input
Technology Input
Student Class Size Input
Student Internal Characteristics Input
Student External Characteristics Input
Institutional Operation
Course Characteristics and Operation
Pacing
Sequencing
Content
Component-Activity
Course Component Characteristics and Operation
Actual Student Participation
Pacing
Sequencing
Content
Component-Activity
Instructor Operation Decisions
Student Participation Decisions
Efficiency Criteria
Pacing Decisions
Sequencing Decisions
Content Decisions
Component-Activity Decisions
Influence on Decisions
Instructor Output
Actual Student Output
Instructor Outcomes
Actual Student Outcomes
Individual Student Goals
Instructor Goals

Some adjustments were made to these original codes. After Study 2 was completed, the codes were updated to reflect those findings. As the coding progressed, additional variables were added to reflect patterns that began to emerge. The final list and definitions of codes for student interviews are listed in Appendix G.

Summary of data and procedures for Study 3. Table 4.9 below provides summary of how data was analyzed in relation to the student cases research questions.

Table 4.9
Summary of Study 3: Research questions, data sources, procedures, and analyses

Research Question	*Data Sources*	*Procedures*	*Analysis*
3.1: Does the student portion of framework adequately represent the student experiences in the course?	Profiles of each interviewed student were built based on: • Descriptions of the course and component activities • Student Interviews • Student Surveys • Online Learning Environment • Student Grades • Coding data based on student interviews and student surveys	Profiles of students were built using the data sources. These profiles were compared to the student portion of the framework. Part of the data source for the student profiles were based on coding conducted and analyzed in Dedoose (2016).	Analysis was conducted by comparing student profiles to the student portion of the framework. When applicable, descriptions of how the framework was unable to represent the students were provided.
3.2: What influences students to make certain participation decisions?	• Descriptions of the course and component activities • Student Interviews • Student Surveys (Qualitative Sections)	Use of coded interview and survey data from interviewed students previously coded in 3.1.	Coded data specific to *Student Participation Decisions* was examined for framework match.
3.3: How do students incorporate class activities into their weekly routines?	• Descriptions of the course and component activities • Student Interviews Student Surveys (only students that were interviewed)	A student sequencing profile for each of the interviewed students was built based on their responses to questions related to sequencing in the surveys and interviews. This information was compared to the descriptions of the course component-activities.	Comparison between the students was conducted to reveal the different ways students proceeded through the course.

Problems with the Studies

Small study. One potential issue with this study is the size of the study. While the literature review was extensive in the construction of the framework, the size of the case study was relatively small. A single course with three sections (one in-person), with a single instructor was used as the case. Because this is a small study, the results may suggest more particularities than a generalizable conclusions. As this framework is applied to other cases in the future, results from the different cases will allow for a better understanding of when the framework is more generalizable and when it is more particular to the specific case.

Confirmation bias. Another area that could seem to be a potential problem in this study is the possibility of confirmation bias. The problem of confirmation bias occurs when a researcher seeks out evidence to confirm a theory while simultaneously ignoring evidence that opposes the theory. Because the case study uses codes that were based on the framework, this project would seem particularly prone to this form of bias. However, the study is meant to show how the framework can be used as an organizing structure to place research and also look for new interconnected areas of research in online education. The framework is based on both the experience of the researcher and a comprehensive literature review, thus multiple sources were used in the creation of the framework. As the framework is further explored and strong detailed variables and connections are discovered, additional methods such as Structural Equation Modeling can be used in a more confirmatory way.

Single researcher. A single researcher conducted the qualitative coding and analysis of the data for all three areas of this dissertation (literature validation, course

case study validation, student cases validation). The use of only one researcher in both the coding and analysis reduces the likelihood of strong reliability and validity. However, the use of a single researcher was optimal because parts of this study are exploratory and because of the small scope of this dissertation study. Future studies that look at the different aspects of the framework more in-depth would be advised to use more than one researcher for the purposes of inter-rater reliability and analysis.

Use of prior data. Because of the use of data collected prior to the conception of the case study and student cases, the data collected was not targeted specifically for the studies. This post-hoc research was both positive and negative for these two studies. It was negative for these studies because specific questions could not be asked on the surveys or in the interviews in regards to the framework. It was positive because it allowed for the framework to naturally emerge from prior collected data. Because there were some areas of the framework that may not have been explained by the data, future studies can be conducted to specifically target these areas.

Use of article summaries. Because the coding of the articles for Study 1 was conducted on summaries that were compiled ahead of time, it is possible that the researcher missed important variables. The researcher could have been biased in what summarized. However, the researcher aimed at summarizing the main points of the article, and listed all major variables as well as described motivators and inhibitors to course operation. The ability to identify new variables that were not predefined by the framework was demonstrated in the results section as new major sections (unknown to the researcher prior to the coding) were found.

Timing of pre-course survey. Part of the theory driving the analysis for method 2.4 was that the student responses to the pre-course survey corresponded to the *Input* section of the framework. The data variables from the pre-course survey rationally matched *Input* section because student preconceptions and beliefs about the course were theorized as being *Input* characteristics that students had developed prior to entry into the course, and were therefore *Input* variables. However, the pre-course survey was actually administered during the first week of the course. Thus, student opinions on the pre-course survey could have had a combined influence of opinion prior to the course and the result of participation in the course. As a result, the pre-course survey data was not completely *Input* type variables, as conceptualized in this paper. However, because pre-survey administration occurred so closely to the beginning of the quarter, it can be reasoned that student opinion was heavily influenced by prior beliefs and thus, could be considered an *Input* variable. Further, because students did not have much time to experience the different component-activities in the course, their very early opinions could premature and therefore considered *Input* variables. Finally, *Input* variables are not static in time – *Input* variables include such things as *External Characteristics*, such as living environments and work, and thus could continue to influence students throughout the term of the course. Nevertheless, future studies of online courses that follow the framework laid out in this dissertation would benefit from survey data that was collected prior to student entry into the course.

Accuracy of Online Learning Environment system data. Study 2 of this dissertation used the Online Learning Environment (OLE) system data as an indicator of student participation. The frequency data from the OLE was used in statistical regressions

with data from student surveys and student grades. While the OLE frequency data has the appearance of a strong indicator of participation, it was not viewed in this dissertation as a definitive indicator of participation. Rather it could only be viewed as an indicator of a specific type of indicator, namely, the frequency of navigation within the OLE. The need to emphasize the specificity of participation necessitates from the variety of ways that a student could participate in the course. For example, a student could participated in the course by using other online course materials that were not linked to the OLE, such as the digital textbook or the conferencing software. Students could also spend time online looking at course-related websites and articles that were not linked to the OLE software. Students could also participate in the course offline by reading the hard copy of the textbook or by using flashcards or course notes. Further, the OLE did not record time spent on any specific page but rather recorded frequency of page views. Thus, a student could have spent less time on the course website but may have clicked more links. Therefore, the results of any statistical correlation had to be met with skepticism.

Survey Technology. One of the major problems that occurred with the open-ended survey questions was the loss of valuable student response through character cutoff limitations. The Winter surveys completed by the students in both the online and in-person versions of the course had character limitations which meant that their responses were abruptly cutoff after 244 characters. This led to a loss of potentially critical information about student experiences.

CHAPTER 5: RESULTS

The main purpose of this dissertation was to understand the underlying processes and variables involved in online education and fill in some of the gaps in how online education research has been proposed and presented. Earlier in this dissertation, it was noted that there were frequently different variables presented in online education research and the models proposed for online education were often missing a way to account for these variables and multiple processes. The author of this dissertation was involved in one large and one medium-sized online education evaluations. During this time, the author was exposed to both online education practice and literature in the area. However, from his reviews of the literature, it seemed that there were unavoidable gaps in the theory that guided the research and the research itself. In an attempt to bridge these gaps, a framework was developed.

This dissertation is an examination of this framework for confirmation in both the literature and an actual course. The first study presents a set of research questions that explore the variables and processes that have been described in online education literature. In other words, the main purpose of the first study was to validate the framework through a literature base. The next two studies used sets of research questions that explore this framework for the purposes of confirmation and when applicable, extension or reduction. The main purpose of Study 2 was to provide another layer of validation to the framework by demonstrating that the codes that came out of framework (main sections, processes, and variables) would work in an individual class. Meanwhile, the main purpose of Study 3 was to provide the last round of validation by demonstrating the broader framework

could be used at the student level to analyze the student properties and processes in the individual class. In summary, the main purposes of each of the studies were:

- **Study 1 Primary Purpose:** Validate the framework through a literature base
- **Study 2 Primary Purpose:** Validate the framework by demonstrating codes representing main sections and variables of framework represented a course from student and instructor perspectives
- **Study 3 Primary Purpose:** Validate the framework by demonstrating use of codes representing properties and processes for the student portion of the framework was reflected by the perspective of 15 student cases

Taken together, these studies provide validation from a broad perspective across multiple courses and author perspectives, to a single course with raw data, and finally to the perspective and actions of 15 different students.

This chapter describes the results of the three studies in this dissertation. The first study was a review of literature and was used to investigate the larger structure of the framework and identify variables associated with the framework as they were presented in the literature. The second study focused on a particular course as a case study. This case study was used to confirm the framework and was also used to adjust the framework and identify additional processes and variables. The third study focused on the student portion of the framework by using 15 student cases from the same course that was used as a case study in study 2. This third study confirmed the student portion of the framework and identified some of the particular student processes embedded within the student portion of the framework. This three-part process of framework validation was meant to refine a framework that has greater potential for generalization while also accounting for precise processes and variables.

The presentation of each study follows a similar format: an introduction; a review of research questions; a presentation of the data with an accompanying explanation and review; and a summary. Data was presented in the context of the research questions and these are referred to when relevant. In order to better feature and highlight the review of the data, some of the bulk data is listed in appendices. For example, one appendix (Appendix I) provides examples of excerpts from student surveys that were used as evidence to confirm, expand, or reduce the framework. Another appendix (Appendix J) is an expanded and detailed presentation of the week/lesson sequence cycle for each of the students. Finally, this chapter provides a brief review at the end before moving into the discussion of these results in the next chapter.

Chapter 5.1: Results for Study 1 – Literature Validation of Framework

This study reviewed studies in online education and higher education literature as a form of validation for the framework proposed in Chapters 2 and 3. This framework originated from personal experience in the field of online education program evaluation and online education articles. In Chapter 3, it was explained that structure of the framework was based on models already proposed in online and higher education and this resulted in a more holistic framework that enhanced the combined prior efforts of Astin (1993), Bean and Metzner (1985), Tinto (1993), Rovai (2003), Pascarella (1985), Cole (1984 and 1996), Engeström (1997), Hiltz (1993), Benbunan-Fich and Hiltz (2003), Väljataga and Laanpere (2010), Anderson and Rogan (2011), Lowenthal et al. (2009), and Piccoli et al (2001). As a new framework, studies of validation were needed. This study is the first roud of validation that uses literature as a source of data. This allows for a validation that provides insight from the voices of various authors conducting different sets of studies and allows for a look at the variables that have been recognized by these authors. In this way, this study looks at the framework from a broad overview that can be fine tuned through Studies 2 and 3 when there will be a focused examination of a course and students within the course, respectively, through the lens of the framework.

The two main reasons for critically analyzing the literature were to look for evidence of the framework from an expansive sample with studies that had a lot of variation and to benefit both inductively (by searching for additional variables and section) and deductively (by searching for any potential problems with the hypothesized framework). As a result, this study yielded an extensive number of variables, the addition and alteration of specific sections, and the proposal of additional actors. The use of a

quantitative tally of variables is not orthodox in qualitative reviews, this tally provided a value that indicated the focus of studies in online education.

The first portion of this study conducted an initial and expanded review of the literature that was meant to answer question 1:

> **Research question 1.1: Is there evidence that the major sections of the framework are represented in the literature?**

Meanwhile a more detailed view had the main purpose of answering questions 2 and 3:

> **Research question 1.2: What are the variables that make up the different sections of the framework?**

> **Research question 1.3: Are there additional major sections of the framework that were not identified in the original iteration?**

One of the unanticipated results of the second, detailed review was the way helped answer research question 1 in addition to the intended purpose of answering questions 2 and 3. The detailed review helped to establish some aspects of the framework while simultaneously identifying variables and new sections of the framework. And, as suggested earlier, this study served both as a validation of the original framework and a search for evidence that the framework could be adjusted.

The author constructed a framework in order to bridge gaps in online education theory and studies. This first study of the dissertation focused on identifying variables and processes described in online education literature in order to determine evidence that would support, expand, and trim the framework where appropriate. As described in the methods section, the literature used in this review was first limited to the references used in major literature reviews and meta-analyses in the field. After an initial review, the

author realized that there were large pieces still missing from the literature pool that would be needed for holistic framework exploration. The main justification for this conclusion was that each of the literature reviews and meta-analyses used for sources were focused on a specific area of the framework, specifically, they were focused on the immediate variables related to student process and outcome.

The data presented here came from articles gathered first from resources used in well-cited literature reviews and meta-analyses in the field of distance and online education. After an initial review of these sources that focused primarily on student learning outcomes, the search was expanded to include a wider range of articles that focused on different aspects of online education, including faculty development and institutional issues related to online education. These articles were summarized based on variables used in the research and were then categorized as such using a spreadsheet. Each new variable received a new column that was filed under the primary framework variable, such as Input or Outcomes. The data is presented by main framework variables and is analyzed in reference to the research question.

Initial and Expanded Review of Literature

An initial and expanded review of literature was conducted in order to answer question 1.1. These reviews were focused on finding evidence for the major sections of the proposed framework within the literature in order to answer this research question:

> **Research question 1.1: Is there evidence that the major sections of the framework are represented in the literature?**

The initial review of articles revealed that all portions of the framework were represented (see Table 5.1.1). However, some areas of the framework seemed to receive

more attention than others. For example, *Actual Student Outcomes* and *Component Operation* were represented in more than 100 articles. Meanwhile, *Technology*, *Student External Characteristics*, *Student Participation Sequencing*, *Instructional Intended Output*, and *Student Goals* were each represented in less than 20 articles.

The expanded review found greater evidence for the framework, however, there was still some imbalance. For example, *Actual Student Outcomes* had more than 300 articles while *Student Internal Characteristics* and *Component Operation* both had more than 200. Meanwhile, *Student External Characteristics*, *Student Participation Sequencing*, *Instructional Intended Output*, *Instructional Intended Outcomes*, and *Student Goals* each had less than 50 articles. This imbalance could likely have been from the selection of articles used in the expanded review. Despite this, there seemed to be strong evidence that all of the portions of the framework were represented in the literature. The lack of balance in variable selection or description in the articles suggests that either the articles did not identify these variable, did not find them to be important, or the author of this dissertation was incorrectly representing or weighting the variables in the framework.

Table 5.1.1

Initial review of articles for major sections of the framework

Major Section of Framework	Initial Review	Expanded Review
Instructor / TA Characteristics	29	50
Subject / Content	39	60
Course Assembly	38	135
Technology	18	63
Student Internal Characteristics	59	211
Student External Characteristics	10	44
Course Operation	83	157
Component Operation	136	235
Actual Student Participation	43	164
Instructional Operation Decisions	36	109
Student Participation Decisions	55	184
Student Participation Sequencing	12	35
Instructional Intended Output	11	21
Actual Student Outputs	42	170
Instructional Intended Outcomes	24	35
Actual Student Outcomes	146	319
Individual Student Goals	8	29

Detailed Review for Specific Variables and Other Potential Framework Areas

After the review for question, 1.1, a closer examination of literature was conducted. This more detailed review was used to answer questions 1.2 and 1.3 below:

> **Research question 1.2: What are the variables that make up the different sections of the framework?**
>
> **Research question 1.3: Are there additional major sections of the framework that were not identified in the original iteration?**

The detailed review focused on a smaller set of articles (241 total articles: 92 articles from Meta-Analysis; 149 additional articles from Expanded Search). While most articles in the expanded review focused on online, distance, or hybrid education, some articles were not specific to online education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education (as explained earlier in the dissertation as the continuum in the classification of online and in-person courses). This inclusion of articles beyond specifically online education was critical in the development of the framework as the variables used in the study of education as a whole are often studied in general education studies but would also be used in the study of a framework of online education.

The data for this research question is presented first in totals of each section. The section totals were grouped by actor (for example, all student section totals are grouped together). The totals are followed by a more detailed display of each section of the framework. During the review, the articles in the review were summarized based on variables used in the research and they were then categorized as such using a spreadsheet. Each new variable received a new column that was filed under the primary framework variable, such as Input or Outcomes. Each subsequent article that included that variable was counted in the column. This is a summary of the specific variables that were found and a count of the number of articles they appeared in. Below each of the main sections is a list of some of the more detailed variables found during the review. Though care should be given the subjective and laborious nature of the coding articles, it points to the variety of variables that had either been used or described as influential by articles.

Below is a table that shows the total counts of articles that discussed or used variables within the main sections of the framework. These totals are helpful in understanding how the researcher viewed the articles; however, this does not represent the exact total of all potential variables in the articles since they were based on the subjective recognition of the researcher. Therefore, these totals provide some insight into what were recognizable variables but, given that the researcher did not falsely count extra variables or the variables are not mistakenly categorized, these numbers should be seen as a *low count* of variables. While the institution was fairly low in most areas, it should be noted that this whole area of the framework was added only after the original framework had been developed and the review of literature had been almost completed. However, Instructor Intended Output and Instructional Outcomes had very few hits in the literature review. While this finding indicates a weak link in the framework, it should be noted that most of the literature was focused on the course operation, a component operation, and student outcomes. Thus, while these might still be variables for course operation, they were not represented frequently in the literature and may need some reconsideration of the theory driving this area.

Table 5.1.2

Count of variables for the main sections that were found in the literature

	Total	From Original Review List	From Expanded List	From Online	Not Online Specific
	N=241	n=92	n=149	n=209	n=32
Institutional Input	19	10	9	18	1
Institutional Operation	3	1	2	3	0
Institutional Decisions	5	2	3	5	0
Institutional Output	1	0	1	1	0
Institutional Outcomes	2	1	1	2	0
Instructor Input	36	23	13	32	4
Course Operation	56	33	23	50	6
Component Operation	78	47	31	73	5
Instructional Operation Decisions	43	17	26	36	7
Instructor Intended Output	6	4	2	6	0
Instructional Outcomes	5	2	3	5	0
Course Content Input	72	59	13	72	0
Course Assembly Input	98	34	64	86	12
Technology Input	29	16	13	28	1
Student Internal Characteristics	141	53	88	121	20
Student External Characteristics	28	5	23	21	7
Student Participation	67	21	46	53	14
Student Participation Decisions	81	28	53	69	12
Student Sequencing Decisions	31	10	21	27	4
Student Output	49	14	35	40	9
Student Outcomes	114	64	50	105	9

* For a full list of articles with articles in each section, see Appendix H

The Instructor Input section of the framework had a moderate amount of representation in the reviewed literature. At least 36 articles included some form of

Instructor Input (see Table 5.1.3 below). While most of the articles were coded as having either a non-specific or General Instructor or TA Characteristics variable (n=28), many of the articles had more specific variables: Time Commitment, Training for Instruction, Experience, Knowledge, Enthusiasm, Values, Instructional Strategies, Motivation, and Environmental Barriers / Incentives. The detailed variables that were found helped to provide validation to the framework prediction that there are both internal characteristics (experience, knowledge, enthusiasm, values, instructional strategies, and motivation) and external characteristics (time commitment, training for instruction, and environmental barriers / incentives). While the expanded review did not add any additional variables, the additional review helped reinforce some of the variables already found.

Table 5.1.3

List and count of variables for the Instructor Input Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
INTRUCTOR INPUT TOTAL	36	23	13	32	4
General Instructor or TA Characteristics	28	18	10	24	4
Time Commitment	5	3	2	5	0
Training for Instruction	5	2	3	5	0
Experience	2	2	0	2	0
Knowledge	2	2	0	2	0
Enthusiasm	1	1	0	1	0
Values	2	1	1	2	0
Instructional Strategies	7	4	3	6	1
Motivation	6	4	2	6	0
Environmental Barriers / Incentives	8	6	2	8	0

The Course Operation section of the framework had a moderate amount of representation in the reviewed literature. At least 56 articles included some form of Course Operation (see Table 5.1.4 below). While most of the articles were coded as having either a non-specific or General Course variable (n=26), many of the articles had more specific variables: Good Description, Class Size, Buffett / Emporium / Multiplicity, Sequencing of Content, and Stratified Levels of Content. The detailed variables that were found helped to provide validation to the framework for this area. Almost all articles conducting research for an online course provided the class size in the article. From the review of literature, it is clear that Course Operation is an essential aspect, and often a focal point, of online course research.

The Sequencing of Content variable in this section was conceptually similar to Sequencing in the Component Operation section and the Course Assembly section of this framework. However, there are some differences. The Component specific sequencing was focused more on the sequencing of an individual component while Course Operation sequencing focused on the sequencing of the course as a whole with multiple components. And while the Course Assembly sequencing variable was focused on the preparation of the sequencing during the design and creation of the course, the Course Operation focused on actual courses that carried out that sequencing. This reflects the conceptual differences of the three areas and points to how these sections are different. While very similar, there are differences. The Course Operation focused on the operation of the course as a whole, the Component Operation section of the framework is a theoretical representation of individual component-activities, finally, the Course Assembly section focused on the design and creation of the course.

Table 5.1.4

List and count of variables for the Course Operation Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
COURSE OPERATION TOTAL	56	33	23	50	6
Course – General Variable	26	15	11	23	3
Good Description	16	13	3	16	0
Buffett / Emporium / Multiplicity	8	3	5	7	1
Sequencing of Content	17	8	9	14	3
Stratified Levels of Content	2	1	1	2	0

The Component Operation section of the framework had a high level of representation in the reviewed literature. At least 78 articles included some form of Course Operation (see Table 5.1.5 below). While most of the articles were coded as having either a non-specific or General Component-Activity variable (n=30), many of the articles had more specific variables: Type of component-activity, Immediate Feedback, Good Description of component-activity or media, Assignment details, Sequencing, Pacing, Content, Learner-control, Computer-control, and Instructor-control. The detailed variables that were found helped to provide validation to the framework for this area. However, like the course operation section, the articles that were reviewed seemed to have a pattern of providing insufficient information about the component-activities.

The variable Sequencing for this area was similar to the Course Operation variable, Sequencing of Content, however, this one was conceptually different in that it was focused on an individual component, not the whole course. For example, a quiz

could be sequenced so that students could not move on to the next quiz until another was finished, while a course sequencing looks at the sequencing of multiple types of component-activities.

Something that was noteworthy was the lack discussion around issues of control and media. As discussed earlier in this dissertation, control has properties of both *sources* and *types*. *Sources* of control include instructor control, individual learner control, group control (learners), and computer automated control. *Types* of control include pacing sequencing, content, and component-activities. In the review, there seemed to be no mention of the group control as a source of control and there was little to no mention of component-activity control (or it was not recognized as a distinctive source of control). In this review, the different areas of media were not parsed out. Instead, if the media was discussed in detail, it was given a more general coding of "Good description of component-activity or media". However, when there was discussion of media, it was mostly focused on one specific aspect without general coverage of the characteristics of the media. For example, an article might discuss the feedback function of a quiz but not describe what other features the quiz component had. Further, the literature often highlighted only one component-activity in the course without a clear description of any other component-activities in the course. For example, an article might go into great detail about online discussion boards but may fail to mention any other component-activity on the course, such as quizzes, the book, or videos.

In summary, much of the literature lacked good description of component-activities, were inconsistent in the attention given to each component-activity in the course, and missed the description of some characteristics, such as group-control. These

inconsistencies could be the result of the focus of the studies, the difficulty and in providing good description, or different researcher criteria of what a good description entails. Nevertheless, the lack of description of operation of component-activities leaves the reader to only guess what students were doing in the courses.

Table 5.1.5

List and count of variables for the Component Operation Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
COMPONENT OPERATION TOTAL	78	47	31	73	5
Component – General Variable	30	21	9	29	1
Type of component-activity	28	17	11	27	1
Immediate Feedback	7	6	1	7	0
Good Description of component-activity or media	20	16	4	20	0
Assignment details	15	10	5	14	1
Sequencing	9	6	3	8	1
Pacing	4	4	0	4	0
Content	1	1	0	1	0
Learner-control	19	9	10	17	2
Computer-control	1	1	0	1	0
Instructor-control	1	1	0	1	0

The Instructional Decisions section of the framework had a moderate amount of representation in the reviewed literature. At least 43 articles included some form of Instructional Decisions (see Table 5.1.6 below). While most of the articles were coded as having either a non-specific or General Instructional Decisions variable (n=20), many of the articles had more specific variables: Efficiency Evaluation of Instructional Strategies,

Intervention, Support, Instructional Strategies, Learner Monitoring System, Enthusiasm / Emphasis, and Sequencing Decisions. The detailed variables that were found helped to provide validation to the framework for this area. The expanded review revealed one variable: Sequencing Decisions. However, this variable was found in an article that was not online specific. Further, the count for this variable is quite low and this could be researcher error in failing to notice this variable early in the review. From the review of literature, it is clear that Instructional Decisions is an important area of online course research.

One of the more important findings was that there was some validation from the literature that instructors are making some sort of efficiency evaluation for how to conduct a course. This validation helps establish that instructors are at some level conducting a cost-benefit analysis for value added or gained by the investment of time, effort, money, or resources. However, something somewhat surprising was a lack of description about the decisions instructors make in regards to control types. This is a particularly important area of the framework since it places the decisions about how a course will operate into the hands of the instructor, the student, groups of students, or the technology. The lack of discussion instructor decisions about control could suggest that control decisions come from another source, such as the institution, it is not important to discuss, or it is a type of decision that is unconsciously made or has flown under the radar of researchers. This section of instructional decisions could be a particularly important area for understanding why courses operate the way that they do and for what purposes instructors have made certain decisions about how the course will operate.

Table 5.1.6

List and count of variables for the Instructional Decisions Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
INSTRUCTIONAL OPERATION DECISIONS TOTAL	43	17	26	36	7
Instructional Operation Decisions – General Variable	20	8	12	17	3
Efficiency Evaluation of Instructional Strategies	6	4	2	4	2
Intervention	15	4	11	12	3
Support	5	4	1	5	0
Instructional Strategies	10	6	4	9	1
Learner Monitoring System	7	2	5	6	1
Enthusiasm / Emphasis	3	1	2	2	1
Sequencing Decisions	1	0	1	0	1

The Instructor Intended Output section of the framework had a very small amount of representation in the reviewed literature. At least six articles included some form of Instructor Intended Output (see Table 5.1.7 below). No specific variables were identified for this section. The count for this section is quite low and without specific variables, the justification for this section is somewhat questionable. This could be researcher error in recognizing and documenting specific variables for this section. However, like the Instructional Decisions and Instructor Intended Output that preceded this section, the articles rarely documented the thoughts and strategies that an instructor put into the conception and operation of the course. Because Instructor Intended Outcome can also be seen as a latent instructor strategy, specific methods, such as direct interviews or surveys, for documenting instructor's thoughts are needed. From the review of literature, it is

unclear whether the representation of this variable is strong or whether this area needs reconsideration.

Table 5.1.7

List and count of variables for the Instructor Intended Output Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
INSTRUCTOR INTENDED OUTPUT - TOTAL	6	4	2	6	0

The Instructor Intended Outcomes section of the framework also had a very small amount of representation in the reviewed literature. At least five articles included some form of Instructor Intended Outcomes (see Table 5.1.8 below). No specific variables were identified for this section. The count for this section is quite low and without specific variables, the justification for this section is somewhat questionable. This could be researcher error in recognizing and documenting specific variables for this section. However, like the Instructional Decisions that preceded this section, the articles rarely documented the thoughts and strategies that an instructor put into the conception and operation of the course. Because Instructor Intended Output can also be seen as a latent instructor strategy, specific methods, such as direct interviews, for documenting instructor's thoughts are needed. From the review of literature, it is unclear whether the representation of this variable is strong or whether this area needs reconsideration.

Table 5.1.8

List and count of variables for the Instructional Outcomes Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
INSTRUCTIONAL INTENDED OUTCOMES - TOTAL	5	2	3	5	0

The Faculty Goals section of the framework had a very small amount of representation in the reviewed literature. At least two articles included some form of Faculty Goals (see Table 5.1.9 below). No specific variables were identified for this section. The count for this section is quite low and without specific variables, the justification for this section is somewhat questionable. This could be researcher error in recognizing and documenting specific variables for this section. However, like the Instructional Decisions, Instructional Intended Output, and Instructional Intended Outcomes sections that preceded this one, the articles rarely documented the instructor's goals. Because Faculty Goals are often hidden in the mind of the faculty, specific methods, such as direct interviews, for documenting instructor's thoughts are needed. From the review of literature, it is unclear whether the representation of this variable is strong or whether this area needs reconsideration

Table 5.1.9

List and count of variables for the Faculty Goals Section that were found in the literature

	Total	From Original Review List	From Expanded List	From Online	Not Online Specific
	N=241	n=92	n=149	n=209	n=32
FACULTY GOALS TOTAL	2	1	1	2	0

The Course Content Input section of the framework had a large amount of representation in the reviewed literature. At least 72 articles included some form of Course Content Input (see Table 5.1.10 below). While many of the articles were coded as having either a non-specific or General Course Content Input variable (n=12) or they listed the content area (n=63), many of the articles were comparison studies of the same content or described their study as having different levels of content. These numbers are very likely a low count as well. After saturation of the content area of the course being listed (this was almost unanimous across studies), the focus on coding this was no longer a priority. Without this overwhelming evidence from the literature, the importance of course content in how a course functions is appreciable. From the review of literature, Course Content plays an important role in the area of online course research.

Table 5.1.10

List and count of variables for the Course Content Input Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
COURSE CONTENT INPUT TOTAL	72	59	13	72	0
Content – General Variable	12	4	8	12	0
Content Area Listed	63	59	4	63	0
Same content (comparison)	3	2	1	3	0
Levels of Content	2	1	1	2	0

The Course Assembly Input section of the framework had a large amount of representation in the reviewed literature. At least 98 articles included some form of Course Assembly Input (see Table 5.1.11 below). While most of the articles were coded as having either a non-specific or General Course or Component Assembly variable (n=22), many of the articles had more specific variables: LMS description, Institutional issues related to course assembly, Process of design, Alignment, Design for effectiveness, Design for efficiency, Design for flexibility or learner convenience, Design for visual appeal, Sequencing material, Multimedia, Virtual reality / manipulation, Levels of content, UDL style / learner options. The detailed variables that were found helped to provide validation to the framework for this area. The expanded review revealed two variables: Alignment and Design for Visual Appeal. From the review of literature, it is convincing that Course Assembly (Input) is an important area of online course research.

One area that has some overlap with other areas in the paper was that of Sequencing of Material. While other areas are similar, the focus of this section was on

articles that described sequencing of content during the course set-up, not necessarily the actual course operation. Many of the articles reviewed did not talk about a specific course but rather discussed a system or theory that could be applied to the design and creation of a course.

Another problem with the coding of this section was lack of coding for the process involved in putting together a course, which was partially because most of the articles reviewed did not focus on this area. This section has some overlap with instructor's operation decisions and the institution's operation decisions. While the substance of the decisions was evident here (i.e. the decisions of how to design a course or layer content), the actual process of the decisions was not conveyed. Many of these articles were written from the point of view of the researcher and the researcher, not the instructor or institution, made the decisions. Thus, the decision process that an instructor goes through when creating and implementing a course were not conveyed in most of these articles.

Many of the articles conveyed the decision processes made by the people creating the Learning Management System or other forms of media. This idea points to a more complicated process of course assembly, one in which the decision process for course assembly is potentially shared between three or more actors: the instructor, the developer of media, and the institution that sometimes pays for and hosts the media. This sharing of the decision process could be complicated. In some instances, the institution has more control over the assembly of the course, choosing design, content, and format. In other instances, the instructor is given complete freedom over design, content, and format and may only seek assistance from the university in providing assistance with technology or

media. Independent developers could have very little influence or their work could be very substantial in the design, content, and format. Instructors could use out of the box media that has predetermined content and actions that respond to student behavior. In other cases, the instructor could create all or most of the media with minimal influence from developers. The process of deciding who has control over these elements could occur through careful thought by the various stakeholders with a focus on effectiveness and efficiency or could be the decided without much thought at all.

The effort involved in putting together an online course has been described by many articles as being much more laborious and time-consuming for the instructor than an in-person course. However, as noted in the prior paragraph, the development of an online course can vary according to whether the control over course development resides in the instructor's hands or if the institution or developer has more control. And who has the control over development also indicates how much each stakeholder will have invested in the course development. Thus, part of the development process is deciding what are sources of the time, effort, money, and resources that will be used for course creation.

Table 5.1.11

List and count of variables for the Course Assembly Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
COURSE ASSEMBLY - TOTAL	98	34	64	86	12
Course / Component Assembly – General Variable	22	11	11	21	1
LMS description	20	2	18	19	1
Institutional issues related to course assembly	13	7	6	12	1
Process of design	6	3	3	5	1
Alignment	3	0	3	3	0
Design for effectiveness	12	2	10	10	2
Design for efficiency	14	2	12	9	5
Design for flexibility or learner convenience	20	5	15	16	4
Design for visual appeal	2	0	2	2	0
Sequencing material	17	5	12	12	5
Multimedia	7	4	3	7	0
Virtual reality / manipulation	2	2	0	2	0
Levels of content	5	1	4	5	0
UDL style / learner options	17	8	9	15	2

The Technology Input section of the framework had a moderate amount of representation in the reviewed literature. At least 29 articles included some form Technology Input (see Table 5.1.12 below). While many of the articles were coded as having either a non-specific or General Technology Input variable (n=6), many of the articles had more specific variables: Adaptive Environments, Data / Learner Monitoring, Technology Limitations, and Technology Problems. The detailed variables that were found helped to provide validation to the framework for this area. From the review of

literature, it is apparent that Technology Input is an important area of online course research.

This section overlaps with Course Assembly and Course Operation. Some aspects of technology such as design, media, and alignment are closely aligned to the assembly of the course and the operation of the course. The adaptive environments variable describes not a simple input variable but the actual way the media interacts with students as they move through an activity or a course. Technology input can originate from outside vendors, from the institution, or even from the instructor. Because of this, connections between these areas should be examined. Further, reconceptualization of these areas may be needed and could have implications for the layout of the framework.

Table 5.1.12

List and count of variables for the Technology Input Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
TECHNOLOGY - TOTAL	29	16	13	28	1
Technology – General Variable	6	5	1	6	0
Adaptive Environments	13	4	9	12	1
Data / Learner Monitoring	5	3	2	5	0
Technology Limitations	6	5	1	6	0
Technology Problems	7	6	1	7	0

The Student Internal Characteristics section of the framework had a very large amount of representation in the reviewed literature. At least 141 articles included some form of Student Internal Characteristics (see Table 5.1.13 below). While many of the

articles were coded as having either a non-specific or General Student Internal Characteristics variable (n=24), many of the articles had more specific variables: Basic Demographics, Age, Sex, Race / Ethnicity / Culture, Major, Prior online courses (Computer Skills), Thoughts about Online Course / Tech, Learning styles, Learning Skills / Study Strategies, Time management, Conscientiousness (personality) / striving, Feelings about Course / Subject, Pre-test / prior knowledge, Experience, Level of education, Level of expertise, GPA, GRE / SAT / ACT / Other, Self-Regulation, Locus of Control, Self-efficacy, Self-esteem, Anxiety, Attitudes, Motivation, Goals / Commitment to Class, Spirituality, Managing Emotions / Reading Emotions, Time management skills. The detailed variables that were found helped to provide validation to the framework for this area. The expanded review revealed multiple variables: Time management, self-esteem, and spirituality. Time management was represented by a larger number of articles (n=8) than the other variables found in the expanded review. From the review of literature, there was substantial evidence that Student Internal Characteristics is an important area of online course research.

As mentioned earlier in this dissertation, there is a wide range of internal student characteristics that have been used by the online education literature. The collection of these variables, as displayed in Table 5.1.13 hints at this variety. This helps to validate the student internal attributes section of the framework but it also leaves room for interpretation as to which variables are important and when they are important for student learning in the online environment. Some of the internal attributes seem more obvious in how they might affect student success in a course, such as prior knowledge in the subject

area. However, truly understanding the effect that each of these characteristics have on course outcomes requires more analysis.

Table 5.1.13

List and count of variables for the Student Internal Characteristics Input Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
STUDENT INTERNAL - TOTAL	141	53	88	121	20
Student Internal – General Variable	24	12	12	23	1
Basic Demographics	22	12	10	19	3
Age	10	3	7	10	0
Sex	16	8	8	16	0
Race / Ethnicity / Culture	5	3	2	4	1
Major	3	1	2	3	0
Prior online courses (Computer Skills)	15	11	4	15	0
Thoughts about Online Course / Tech	9	7	2	9	0
Learning styles	22	10	12	20	2
Learning Skills / Study Strategies	18	3	15	12	6
Time management	8	0	8	3	5
Conscientiousness (personality) / striving	6	1	5	4	2
Feelings about Course / Subject	1	1	0	1	0
Pre-test / prior knowledge	29	19	10	28	1
Experience	9	2	7	6	3
Level of education	20	2	18	15	5
Level of expertise	8	1	7	4	4
GPA	17	8	9	12	5
GRE / SAT / ACT / Other	5	5	0	5	0
Self-Regulation	8	1	7	7	1
Locus of Control	7	1	6	7	0
Self-efficacy	15	1	14	14	1
Self-esteem	1	0	1	1	0
Anxiety	4	1	3	2	2
Attitudes	3	2	1	2	1
Motivation	23	6	17	19	4
Goals / Commitment to Class	13	2	11	9	4
Spirituality	1	0	1	0	1
Managing Emotions / Reading Emotions	2	1	1	2	0

The Student External Characteristics section of the framework had a moderate amount of representation in the reviewed literature. At least 28 articles included some form of Student External Characteristics (see Table 5.1.14 below). While most of the articles were coded as having either a non-specific or General Student External Characteristics variable (n=11), many of the articles had more specific variables: Busy Schedule, Marriage / Family, Friends, Involvement On-Campus, Working a Job, Living on or Off-Campus, Owning a Computer, Finances / Financial Aid, Leisure / Social, Sleep, Drinking, Health, Diet. The detailed variables that were found helped to provide validation to the framework for this area. The expanded review revealed a number of variables: friends, involvement on-campus, leisure / social, sleep, drinking, health and diet. These variables are important to consider. Questions remain about why so few articles included some of them. This lack of inclusion could have been for a number of reasons, such as research goals, lack of material importance in the outcomes of a course, or unintentional omission on the part of researchers to identify the variables. Nonetheless, these variables could be important in influencing student outcomes and there is little research to support or refute this. From the review of literature, it is evident that Student External Characteristics is an important area of online course research.

As mentioned earlier in this dissertation, there is a wide range of external student characteristics that have been used by the online education literature. The collection of these variables, as displayed in Table 5.1.14 hints at this variety. This helps to validate the student external attributes section of the framework but it also leaves room for interpretation as to which variables are important and when they are important for student learning in the online environment. Some of the external attributes seem more obvious in

how they might affect student success in a course, such as working a job or having a busy schedule. However, truly understanding the effect that each of these characteristics have on course outcomes requires more analysis.

Table 5.1.14

List and count of variables for the Student External Characteristics Input Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
STUDENT EXTERNAL - TOTAL	28	5	23	21	7
Student External – General Variable	11	2	9	8	3
Busy Schedule	2	1	1	2	0
Marriage / Family	7	1	6	7	0
Friends	4	0	4	3	1
Involvement On-Campus	1	0	1	0	1
Working a Job	14	3	11	9	5
Living On or Off-Campus	2	1	1	1	1
Owning a Computer	5	2	3	3	2
Finances / Financial Aid	4	1	3	3	1
Leisure / Social	6	0	6	1	5
Sleep	1	0	1	0	1
Drinking	1	0	1	0	1
Health	1	0	1	0	1
Diet	1	0	1	0	1

The Student Participation section of the framework had a large amount of representation in the reviewed literature. At least 67 articles included some form of Student Participation (see Table 5.1.15 below). While many of the articles were coded as having either a non-specific or General Student Participation variable (n=14), many of the articles had more specific variables: Amount of participation, Type of Interaction

(SC, SS, SI), Communication, How Student is Experiencing, How Student is Engaging, and Studying Alone. The detailed variables that were found helped to provide validation to the framework for this area. The variable with the most representation in the reviewed literature was Type of Interaction and was closely followed by Amount of Participation.

The first variable, Type of Interaction, represented articles that placed some attention on who and what students were interacting with (e.g. Student-to-Computer, Student-to-Student, or Student-to-Instructor). These often differed depending on the article and the theory of the researchers, for example, McIsaac et al (1999) described four types of interaction: Learner-to-Instructor; Learner-to-Learner; Learner-to-Content; and Learner-to-Interface. Bernard et al. (2009) used three interaction types for their meta-analysis: Student-to-Student; Student-to-Teacher; and Student-to-Content. Koory (2003) named four types of "encounters" for learning: alone, one-to-one, one-to many, and many-to many. Many articles discussed *computer-mediated communication*, which describes the mode of human-to-human interaction. However, this distinction was not always communicated in the literature, thus it was hard to tell when student-to-student or student-to-instructor interaction was computer mediated. Further, it was not always clear when student interaction with content was computer-mediated.

This computer-mediated interaction not only indicates the mode with which a student participates, it points to the change that online education brings. Unless there is some sort of back channeling where the student meets with the instructor or students in an in-person setting (or books, printed material, or field-work), all interactions occur through the computer. If Type of Interaction represents how a student participates, then Amount of Participation represents a measure of magnitude, or how much, of that

participation. Amount of Participation can be measured in the amount of time-on-task. However, the amount of effort a student exerts could be a more challenging measurement task.

The expanded review revealed one variable: Communication. The count for this variable is quite low and this could be researcher error in failing to notice this variable early in the review. However, Communication represents a type of participation that somewhat overlaps the Type of Interaction variable. From the review of literature, there is strong evidence that Student Participation is an important area of online course research.

Further, while the research zeitgeist seems to be expounding the virtues of working and studying in groups, some of the articles in this search made the claim that studying alone is actually superior to group study. This could have important implications for online courses where the means for communication can be different than in-person courses and the argument against online education has focused on the difficulty in creating human-to-human interactive experiences. If independent learning is indeed beneficial for certain courses or subject areas, then a goal of online education research should be to find when students learn best on their own.

While many articles might not have discussed student participation, there was an underlying assumption that students would participate in the course or component-activity. While this is somewhat obvious for the cause and effect of learning, it is precisely this assumption that could be misguiding the academic field of online education. More precisely, because it is assumed that students will participate in the online course, understanding how students participate and to what extent they participate

was frequently not examined. Thus, the underlying assumption was that students all participated in the manner that was theorized by the instructors/researchers. This assumption could cause errors in the analyses of studies. Therefore, understanding how students participate is critical in understanding online courses.

Table 5.1.15

List and count of variables for the Student Participation Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
STUDENT PARTICIPATION TOTAL	67	21	46	53	14
Student Participation – General Variable	14	5	9	12	2
Amount of participation	30	7	23	18	12
Type of Interaction (SC, SS, SI)	35	14	21	33	2
Communication	1	1	0	1	0
How Student is Experiencing	6	1	5	5	1
How Student is Engaging	13	3	10	12	1
Studying Alone	4	3	1	3	1

The Student Participation Decisions section of the framework had a large amount of representation in the reviewed literature. At least 81 articles included some form of Student Participation Decisions (see Table 5.1.16 below). While most of the articles were coded as having either a non-specific or General Student Participation Decisions variable (n=35), many of the articles had more specific variables: Self-Determination, Learner Control, Content Decision, Component-Activity Decision, Efficiency Evaluation, Self-Regulation / Assessment, Novices making decisions, Efficiency, Online for Subject-

Areas, Type of Interaction (SC, SS, SI), Making Decisions about Environment, and Deciding Online or In-Person.

Evidence for Efficiency Evaluation was not clear-cut but hints to this process were made in the literature. For example, McIsaac et al. (1999) described how the actions of students were often goal oriented serving specific purposes, such as: get or share information relating to the content and structure of the course; get help on technology; submit homework; participate in the discussions and exchange ideas; and socialize. The detailed variables that were found helped to provide validation to the framework for this area. In their findings, Ladyshewsky and Taplin (2013, p.41) wrote,

> The research shared in this study, along with findings from other research, suggests that students still predominately prefer FF [Face-to-Face] instruction. Work, travel, lifestyle and geographical distance, however, force students into alternative modes of delivery such as FO [Fully Online] and INT [Time Intensive study]. For some students, this is less than optimal but necessary if they are to obtain an advanced education.

Thus, Ladyshewsky and Taplin (2013) provide support for the idea of efficiency criteria. Students choose to study in certain ways to meet their goals while minimizing costs. Choices can be for multiple purposes, such as accomplishing goals or simply for personal preference. For example, Bernard et al (2009) found that students preferred the in-person version of the course more than synchronous online learning experiences.

The expanded review revealed two variables: Novices making decisions and Choosing online for certain subject areas. Both of these variables could also be considered processes. For example, Väljataga and Laanpere (2010) explained how certain skills were needed to complete some assignments. The prediction of the ability to complete assignments can influence the choices a student will make. Meanwhile, Desmarais et al. (1997) found that students either move through the course in the way theorized by the course designers or they were "chaotic" in their approach. Students that

were new to the course navigated in a more chaotic way. However, as the course progressed, student behavior became more linear. Desmarais et al. (1997) suggested that as the students became more familiar with the potentials of the software, they were less likely to go out and explore all of the potentials of the software. Younger students were more chaotic than older students and subject beginners were more chaotic than the more proficient students.

Table 5.1.16

List and count of variables for the Student Participation Decisions Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
STUDENT PARTICIPATION DECISIONS TOTAL	81	28	53	69	12
Student Decisions – General Variable	35	17	18	30	5
Self-Determination	6	1	5	5	1
Learner Control	28	12	16	27	1
Efficiency Evaluation	22	7	15	15	7
Self-Regulation / Assessment	14	3	11	12	2
Novices making decisions	4	0	4	3	1
Efficiency	18	4	14	10	8
Online for Subject-Areas	2	0	2	2	0
Type of Interaction (SC, SS, SI)	6	3	3	5	1
Making Decisions about Environment	11	2	9	8	3
Deciding Online or In-Person	7	1	6	7	0

The Student Sequencing Decisions section of the framework had a moderate amount of representation in the reviewed literature. At least 31 articles included some form of Student Sequencing Decisions (see Table 5.1.17 below). While most of the

articles were coded as having either a non-specific or General Student Sequencing Decisions variable (n=14), many of the articles were coded with more specific variables: Times of the Day, Scheduling / Flexibility, Learner Control of Timing, Sequencing, Pace, and Decisions about Timing. The detailed variables that were found helped to provide validation to the framework for this area.

One aspect of this area that became more apparent as time went on was how much overlap there was with other temporal control variables such as timing and pacing. This is not too surprising as these variables have theoretical similarities and in some ways depend on one another. However, it also became apparent that *Timing* was distinguishable from *Pacing* and *Sequencing*. Further, it was determined that each of these issues of control are important in student decision-making. While decisions around sequencing can help researchers understand each of these other areas of control, the framework does not reflect the importance of each of these issues of control. From the review of literature, it became evident that Student Sequencing Decisions, while important, was part of a greater area of decision-making that area of online course research.

Table 5.1.17

List and count of variables for the Student Sequencing Decisions Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
STUDENT SEQUENCING DECISIONS - TOTAL	31	10	21	27	4
Sequencing Decisions – General Variable	14	4	10	11	3
Times of the Day	4	1	3	4	0
Scheduling / Flexibility	7	2	5	6	1
Learner Control of Timing	18	8	10	16	2
Sequencing	2	1	1	2	0
Pace	4	2	2	3	1
Decisions about Timing	8	3	5	8	0

The Student Output section of the framework had a large amount of representation in the reviewed literature. At least 49 articles included some form of Student Output (see Table 5.1.18 below). While many of the articles were coded as having either a non-specific or General Student Output variable (n=9), most of the articles had more specific variables: Amount of output / participation, How Student Participated, When Participated / Procrastination, Back-channeling, Attrition / Persistence, and Output Efficiency. The detailed variables that were found helped to provide validation to the framework for this area. The expanded review revealed one variable: back-channeling. An example of back-channeling was given by, Ke and Xie (2009) in their study of classroom collaboration through discussion posts, more deep and impactful communication occurred through other means, such as meeting face-to-face, over the phone, or through email. This is important for the output area because it shows

not only a form of participation and output, it describes output that is difficult to measure as it not captured in any systematic way. Most of the other variables are a list of tangible output that can be systematically captured, such as amount of output, how students participated, when they participated, and if they persisted. The backchannel variable points out that there are some aspects of each of these other variables that are difficult to capture data for. From the review of literature, it is clear that Student Output is an important area of online course research

Table 5.1.18

List and count of variables for the Student Output Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
STUDENT OUTPUT - TOTAL	49	14	35	40	9
Class & Student Output – General Variable	9	5	4	9	0
Amount of output / participation	24	6	18	16	8
How Student Participated	14	4	10	13	1
When Participated / Procrastination	6	1	5	3	3
Back-channeling	3	0	3	3	0
Attrition / Persistence	10	3	7	9	1
Output Efficiency	3	2	1	3	0

The Student Outcomes section of the framework had a very large amount of representation in the reviewed literature. At least 114 articles included some form of Student Outcomes (see Table 5.1.19 below). While some of the articles were coded as having either a non-specific or General Student Outcomes variable (n=18), most of the articles had more specific variables: Feelings about Online Course, Feelings about the

Course / Component, Transfer, Efficiency, Knowledge / Skill, Satisfaction, Self-Reported Learning, Peer Assessment, Feeling Connected w Others, Quality, Access, Feelings about Subject, Post Self-Efficacy, Motivation, Attitudes, Anxiety, etc., and Evaluation of Course / Instructor. The detailed variables that were found helped to provide validation to the framework for this area. The expanded review revealed three variables: quality, access, and feelings about the subject. Further, the count for these variables is quite low - this could be researcher error in failing to notice this variable early in the review. The two outcome variables coded the most from the articles were knowledge and satisfaction. When comparing the measurement of student results sections, student outcomes had much more representation in the literature than output. From the review of literature, it is clear that Student Outcomes is an important area of online course research.

Table 5.1.19

List and count of variables for the Student Outcomes Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
STUDENT OUTCOMES – TOTAL	114	64	50	105	9
Student Outcomes – General Variable	18	6	12	17	1
Feelings about Online Courses	9	6	3	9	0
Feelings about the Course / Component	15	12	3	15	0
Transfer	5	1	4	4	1
Efficiency	5	1	4	2	3
Knowledge / Skill	75	53	22	71	4
Satisfaction	49	29	20	48	1
Self-Reported Learning	12	9	3	12	0
Peer Assessment	1	1	0	1	0
Feeling Connected with Others	11	7	4	11	0
Quality	1	1	0	1	0
Access	1	1	0	1	0
Feelings about Subject	1	1	0	1	0
Post Self-Efficacy, Motivation, Attitudes, Anxiety, etc.	5	4	1	5	0
Evaluation of Course / Instructor	10	8	2	10	0

The Student Goals section of the framework had a small amount of representation in the reviewed literature. At least 14 articles included some form of Student Goals (see Table 5.1.20 below). While some of the articles were coded as having either a non-specific or General Student Goals variable (n=7), it was found that student goals could be broken down into two main types: Goals Outside Academia and Goals Inside Class. In addition to the low count of articles discussing or researching Student Goals, the nature of student of student goals were called into question as many of the articles suggested

that goals were an internal characteristic of the student. This suggests that some of the models that presented student goals as an extension of student outcomes might not be compatible with the findings here. Indeed, this suggests that student goals are an internal (input) characteristic of the student that could play a prominent role in their decisions about the course. Thus student goals seems to be better suited in the input area as a student internal characteristic and/or as criteria for participation decisions. The placement of goals in criteria for efficiency evaluation would fall in line with the research of some of the papers in this review, such as McIsaac et al. (1999) and Ladyshewsky and Taplin (2013). This also seems to make more theoretical sense and could be replaced with a section geared more towards what the actual long-term implications are, such as the actual impacts of the course on the student.

Table 5.1.20

List and count of variables for the Student Goals Section that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
STUDENT GOALS - TOTAL	14	4	10	8	6
Student Goals – General Variable	7	2	5	5	2
Goals Outside Academia	7	2	5	2	5
Goals Inside Class	6	2	4	3	3

New Actor in the Framework

As the review progressed, it became apparent that the institution played not only a critical peripheral role in the support of online courses but can also play an intrinsic role with the potential to disrupt the classroom experience that has traditionally been seen as a transaction between student and instructor. Because of the high potential for direct influence on online courses, the Institution has been added to the framework as an additional actor.

The formatting of a course can be highly influenced by the institution, for example Schneider and Germann (1999, p.45) discussed the online learning environment to be uniform across online courses at one institution, “CU-Denver currently uses an outside vendor for the CU-Online program. Although each faculty member may design his or her course content differently, all the classes use the same delivery system, which is a Web-based, interactive program.” Further, Schneider and Germann (1999, p.45) explained that while online courses may have some freedom of pacing, they are subject to the same course timeline as other university courses, “Although students may log on at any time to get assignments or post comments in the threaded discussions, they also have assignments due at the same time and work through the class on the regular university semester schedule, which makes the course a paced delivery method."

Bacow et al (2012) interviewed institutional leaders involved in online course development. Leaders discussed the importance of institutions in confronting faculty fears, such as:

- "Online instruction is alien to most faculty and calls into question the very reason that many pursued an academic career in the first place." (p.19)
- "Faculty fear that online instruction will be used to diminish faculty ranks." (p.20)

- "Preparing a course online requires a much higher initial investment of time by a faculty member than teaching the same course in a traditional format." (p.21)
- "Faculty are extremely reluctant to teach courses that they do not 'own.'"(p.21)
- "Faculty may be reluctant to embrace a course that does not allow for a high degree of customization in how, what, and when relevant material is presented to their students." (p.22)

Because it is often the goal and initiative of the institution to create online programs and courses, building and supporting online courses then logically follows this catalyst. The institutional leaders from the Bacow et al (2012) study offered some advice for passing this motivation onto faculty:

- "Provide generous technical support for faculty adopting online teaching." (p.23)
- "Provide incentives for faculty." (p.24)
- "Make faculty pioneers heroes." (p.24)
- "Explicitly confront concerns about faculty size." (p.25)
- "Provide a way for faculty to easily customize and exert control over online content developed elsewhere." (p.26)

Even early studies of online education looked at the role of institutions. For example, Jones and Gower (1997, p.5) surveyed the regents in Tennessee and found that the top five concerns for providing support for online education included: “providing course materials for students, training faculty, ease of system operation, services [support], and cost effectiveness”. These variables point to resource, financial, and infrastructure support in the form of institutional input and institutional operation. Clearly, there are decisions that institutions need to make about this type of support, especially when an outcome variable, as identified in this and other articles (Meyer, 2005; Meyer, 2014), is cost effectiveness.

Another early study clearly showed the link between the institution and the faculty teaching the course. Because faculty have career goals that are clearly attached to

the institution in which they are employed needed support was described by (Rockwell, Schauer, Fritz, and Marx, 1999, ¶ 40):

> The major perceived obstacles relate to time requirements, developing effective technology skills, and assistance and support needs. Monetary awards for faculty and the cost to the student were seen as neither an incentive nor an obstacle. Faculty are divided on how they see distance teaching affecting their yearly evaluation process and their promotion/tenure needs; about 40% see it as an incentive while about 30% see it as an obstacle. For administration and faculty to effectively work together in the future to build curriculums that are offered through distance delivery, the incentives that encourage faculty to teach via distance can to be spotlighted and the obstacles that discourage faculty need to be diminished.

The institution can therefore, play a pivotal role in the cost-benefit analysis that an individual instructor makes when deciding to teach a course. For example, from their survey of instructors and departmental leaders, Orr et al. (2009) found that instructors have felt departmental leadership support is highly important for creating online courses. Some faculty were very supportive of online course creation, others were just permissive. Leadership often did not understand the issues around online education, were not aware of the benefits, were not connected to other online efforts on-campus, and were not aware of the effort it took on the part of faculty in creating a good online course (Orr et al., 2009).

Institutional support is often described by online education articles that are not focused on the institution, for example, Bocchi (et al 2004, p. 251) explained, "The University System of Georgia has been instrumental in supporting faculty members with training and design services, licensing and hosting our courseware, and providing technical support services to students and faculty members." Other studies focused primarily on different types of support, such as Meyer's (2014) study that focused on faculty training. Meanwhile, Roby et al (2013) found six main areas where "a university

administration can partner closely with instructors to enhance the student experience in their online courses and afford online instructors with adequate assistance”:

- "Provide required meeting times before course registration begins" p.34
- "Offer technical support to students and instructors" p.34
- "Ensure that instructional design and material development resources are made available"p.34
- "Allow instructors to teach interesting courses that encourage undergraduate research" p.35
- "Develop policies that acknowledge the amount of preparation, facilitation, and contact hours required of online instructors" p.35
- "Identify (and adhere to) the most effective class size for an online course" p.35

Thus, the research clearly shows that institutions play a role in both the foundational support for online courses and can directly influence how instructors perform in online courses. For these reasons, the Institution has been added as an additional actor to the framework for online courses. As an additional actor in the framework the Institution is thus represented in all five major areas of the framework. From the articles that have described the role of the institution in online courses, some initial variables and actions have been identified for further investigation. Table 5.1.21 illustrates the Institution as represented in these major areas along with more specific variables and actions that were found in the literature. These variables were added as examples to the areas as they appropriately fit the framework.

Table 5.1.21

Variables in literature related to the Institution

Institutional Input	Institutional Operation	Institutional Decisions	Institutional Output	Institutional Outcomes
• Money • Technology and Support • General Infrastructure • Brick and Mortar • Administration (e.g. Registration) • Pedagogical Support Systems • Faculty Incentivizing • Learner Support	• Registration / Enrollment • Allocation Resources • Maintain Support for Course Infrastructure, Instructors, and Students • Direct Influence on Course Operation	• Funding • Resource Allocation • Continuation • Marketing • If, When, How, Where, and at What Level to Play a Role in Course Implementation, Funding, Instructor Training, Infrastructure,	• Courses Supported • Courses Completed • Credits Awarded • Grades Awarded • Evaluation Conducted	• Retention • Satisfaction • Student GPA • Accessible Course • Monetary and resource cost effectiveness

Below in Table 5.2.22 are a count of the articles that studied variables related to the various institutional sections of the framework. What stands out from this table is how low the counts are for each of the sections. This low count can be partially attributed to the late addition of Institution to the framework as an actor. It can also be attributed to original focus of the articles search and subsequent searches. However, this also points to how the literature has separated institutions from the research of online courses. Inclusion of Institution in an online education research is either focused on the processes of the institution in supporting online courses or articles add the institution in as a side note. Despite the low counts, including the institution as an actor with the same main sections as other actors in the framework (Input, Decisions, Operation, Output, and Outcomes) are important in understanding the variables and processes involved in course administration.

Finding the particular variables and processes in relation to the framework will be important for future studies.

Table 5.1.22

List and count of variables for the Institutional Sections that were found in the literature

	Total N=241	From Original Review List n=92	From Expanded List n=149	From Online n=209	Not Online Specific n=32
INSTITUTION INPUT TOTAL	19	10	9	18	1
Institutional Input	3	3	0	3	0
Money	4	1	3	4	0
Technology	2	1	1	2	0
Gen Infrastructure	1	1	0	1	0
Tech Support	3	1	2	3	0
Pedagogical Support	8	2	6	8	0
Training for Instructors	5	1	4	5	0
Learner Support	1	1	0	1	0
Institutional Assembly of Course	14	8	6	13	1
INSTITUTIONAL OPERATION TOTAL	3	1	2	3	0
Allocation Resources	3	1	2	3	0
Maintain Support	1	0	1	1	0
INSTITUTIONAL DECISIONS - TOTAL	5	2	3	5	0
Funding	2	1	1	2	0
Resource Allocation	4	1	3	4	0
Continuation	2	1	1	2	0
Marketing	2	1	1	2	0
INSTITUTIONAL OUTPUT TOTAL	1	0	1	1	0
Courses Supported	1	0	1	1	0
Courses Completed	1	0	1	1	0
INSTITUTIONAL OUTCOMES TOTAL	2	1	1	2	0
Institutional Outcomes – General Variable	1	1	0	1	0
Satisfaction	1	0	1	1	0
Accessible Course	1	0	1	1	0
Monetary	1	0	1	1	0
INSTITUTIONAL GOALS - TOTAL	3	2	1	3	0
Access	2	1	1	2	0
Money (Savings & Revenue)	2	1	1	2	0
Quality	2	1	1	2	0
Reputation	1	0	1	1	0

Results Summary for Study 1

The purpose of this study was to review studies in the literature as a means of providing validation to the framework proposed in Chapters 2 and 3 of this dissertation. The conceptualization of the framework relied on the experience of this researcher and articles about online education. As explained at the beginning of Chapter 3, this conceptualization was based on models already proposed for online education and higher education and resulted in a framework that combined many of the concepts of these models, which include Astin (1993), Bean and Metzner (1985), Tinto (1993), Rovai (2003), Pascarella (1985), Cole (1984 and 1996), Engeström (1997), Hiltz (1993), Benbunan-Fich and Hiltz (2003), Väljataga and Laanpere (2010), Anderson and Rogan (2011), Lowenthal et al. (2009), and Piccoli et al (2001). Because the framework was conceptualized by personal experience and through prior developed models, validation was needed. This study provided the first round of validation and framework modification through a reference of how online courses were being researched, what variables were being used, and how researchers were describing the processes of online education.

There were two main reasons for using the method of critically analyzing the literature. The first is that by reviewing studies of online courses, and subsequently also in-person courses, this study could look for evidence of the framework from an expansive sample. The studies had a lot of variation, for example, they ranged from big courses to small courses and from science courses to literature courses. The other reasoning is that the study benefits from both inductive and deductive processes. Inductively, the search and review of the articles set out to find as many additional variables and sections as

possible. However, an initial framework was already in place, thus, any data (or lack of data) that countered the framework would signal a potential problem with the already existing framework. Through this process, an extensive number of variables were found, specific sections had to be added, moved, or removed, and additional actors were proposed. While the quantitative aspect of locating numbers of variables is not orthodox in qualitative reviews, the numbers provide the value of indicating what the discussion of online education seems to be focused on. The initial review was conducted to answer question 1: whether the major sections of the framework were represented in the literature. The detailed review of the literature was conducted to investigate questions 2 and 3: what variables make up the different sections of the framework and whether there were other sections not represented by the original version of the framework, respectively. One of the unanticipated results of the detailed review was the way helped answer research question 1 in addition to the intended purpose of answering questions 2 and 3. The detailed review helped to establish some aspects of the framework while simultaneously identifying variables and new sections of the framework. Thus, this study was meant as a both a validation of the original framework and a search for evidence that the framework could be adjusted.

From the review, it became apparent that the literature showed stronger support for some sections of the framework, moderate support for other sections, and some areas were lacking evidence in the literature and hinted at the need for revision. The two biggest findings of the study led to the introduction of the need to explore institution as an actor and media as an independent artifact. Other findings include low counts of articles that discussed instructional output, instructional outcomes, instructor goals, and

student goals. These, other findings, and framework modifications are discussed further below.

Framework support. Overall, the framework has a substantial amount of support. Some areas of the framework were discussed by the literature more than others. Further, some of the literature supported areas of the framework through their description and study of online courses. Below are some of major points of support for the framework:

- **Major framework areas:** The framework had representation for each of the major areas of the framework: Input; Operation and Participation; Operation and Participation Decisions; Output; and Outcomes and Goals.

- **Actors in the framework:** The two actors represented in the framework, instructor and student, were represented in the literature.

- **Sections in the framework**: Generally, there seemed to be broad support for the different sections of the framework. The student sections and the composition area of the instructor had the greatest support. However, there were some areas that lacked support. The number of articles that discussed instructor output, outcomes, and goals were alarmingly low. Further, the results for these instructor areas that did come from the literature did not match with the conceptual framework. As explained later, this led to a reconceptualization of how these sections should be represented.

Section variables. It was discovered that there were sub-variables that made up each of the sections. Some sections had a large number of variables while others had fewer. Also, there seemed to be many variables that were regularly repeated across articles. For example, most articles that focused on student output used variables that related to either student learning or student satisfaction. However, there were more variables that were used infrequently. This irregularity could mean that researchers were inconsistent in their research focus or variables were relevant in some environments but not in others. If the variables were relevant for some environments but not others, there is little in the literature that points to how to determine when this is the case. Further, there

is little information about why instructors were inconsistent in the variables that were included.

Framework adjustments. Some of the sections that were added entailed minor revisions, while others implied extensive additions to the framework. The more minor changes entailed re-ordering and reconceptualization for a specific actor. Major changes included a split between instructor and media, which created the independent artifact of media, and the addition of an impermanent actor (institution). As a result of the review, the following areas of the framework needed closer review for potential adjustment:

- **Additional Actors.** The study provided evidence that there was as separation of media from instructors. And there appeared to be interaction from the institution in a way that could be represented as an actor.

- **Institution as an impermanent Actor:** The conclusion for the need to explore the institution as an actor resulted from finding that institutions could play not just a contextual role but a direct role in the operation of the course. This finding contradicted the original postulation that the institution played a supporting role for instructors but was not involved in the construction or implementation of the course. From the literature, it became clear that the line between support and involvement was not always clear nor did institutions follow a strict supporting role but instead could be heavily invested and proactive in the development and operation of online courses. Because online courses differ in their relationships with the institution (e.g. some institutions may be more involved in development and operation, some are less involved, and some online courses might not occur within an institution at all), the role of institution as an actor is impermanent. The representation and depth of investigation as an actor should be appropriate to the given situation.

- **Media as an Independent Artifact:** The realization of the need to explore media as an independent artifact resulted the finding that media may not originate from the instructor. In the original conceptualization, the instructor controlled the media that was part of the official course. However, after the review, it became clear that the instructor might not be the only actor to add the media to the course. It was found that the institution could also add official media to the course. Student interaction with media does not have to occur in the presence of the instructor, even when the media has original authoring from the instructor. Further, there may be no instructor at all in an online course as the course could be completely automated.

- **Instructor Independence:** The instructor was portrayed in the original framework as an instrument of student learning. However, the literature described a more nuanced instructor that reflected naturalism. The representation of the instructor in the literature was one that more closely resembled the student portion of the framework, an instructor with his/her own output, outcomes, and goals. These Instead of viewing the instructor as an agent of the course, the instructor should be viewed as having his/her own agency. This adjustment also had implication on the participation and participation decisions sections for the instructor. As an actor with independent output, outcomes, and goals, the instructor then makes decisions in line with this independence. The instructor was thus extracted from the combination of instructor and media as course operation. Further, any intended output or outcomes for students would be part of the instructor decision process. Goals would be an internal input characteristic. And overall, the instructor in an updated framework would reflect an independent individual that may or may not strictly wish for positive outcomes for the course.

- **Instructor was removed as a permanent feature from framework while Media was added as a permanent feature:** In the original framework, the instructor and media were intertwined. From this review, the framework of an online course would always contain some form of media. However, there might not always be an instructor in the course. Therefore, the instructor has to be designated as a recurring actor that is added when there is an instructor for the course. While for now, most courses retain an instructor; the regularity of an instructor might be disrupted in the future.

General observations. In addition to the major observations about the framework that were discussed above, there were a number of additional observations during the review of literature. These findings are displayed below. The findings were organized per actor with a follow-up section for findings that had implications on the framework.

Instructors. The instructor was one of the original actors in the framework but was represented as being integrally connected with course operation and media. One of the findings from this review was that this representation needed to be separated. Further, as explained above, the instructor was eliminated as a permanent actor in the framework since not all online courses require an instructor. Other findings for the instructor are discussed below.

Main findings for Instructors:

- Lack of discussion around the instructor role for the operation of different properties of the media, how they are chosen, and how they are developed.

- The instructor input area had multiple variables. And there was clear evidence that there were both internal and external input variables

- Low count of articles investigating Instructor Intended Output, Instructor Intended Outcomes, and Instructor Goals

- There was some discussion in the articles about how much a course costs the instructor in terms of time and effort.

Implications of study for the instructor portion of the framework:

- While an instructor is common in both in-person and online courses, online courses has made the position of an instructor unnecessary. An online course can and has run without an instructor. Computer and Internet enhancements can perform many of the actions that once required an instructor. Therefore, the representation of instructor in an online course has to be one of impermanence. An instructor would only be added to the framework when appropriate to the educational situation. However, because of the traditional role that an instructor has played historically in courses, the sheer importance of the instructor role in many courses, and because many or most online courses still have an instructor, the investigation of a course instructor remains undeniably important.

- *Intended* Output and Outcomes were placed incorrectly in the framework – should actually be a part of Instructor Operation Decisions

- The instructor portion of the framework should be represented from a naturalism perspective of an individual rather than an optimistic perspective of how course *should* operate. Instructor should have participation, output, outcomes, and goals that are independent of the course operation and the ideal interests of the student. These should be more related to what the instructor experienced in the course, not the functioning of the course or media or the intended results of students.

- The discussion of time and effort for the instructor in the articles suggests instructors may conduct an internal efficiency evaluation on the operation of and participation in an online course.

Media. Media was not an individual entity in the original version of the framework. Instead, the question of whether media was an actor or an artifact was left open. In the visual representation of the original framework, the instructor was intertwined with media in the operation of the course. This representation changed when

it became clear that others could be responsible for the creation and operation of media. As a result of this study, media has earned a permanent place in the framework as independent. Meanwhile, the instructor, which had previously been listed as a permanent actor in the framework, was designated as an impermanent actor.

Main findings for media:

- Lack of discussion around the different properties of the media, how they are chosen, and how they are developed.
- Some variables overlap into different sections, such as sequencing and possibly other issues of control.
- Some overlap between Course Assembly Input and Instructor Operation Decisions and also with Institution Operation Decisions.
- Technology input has substantial overlap with the Course Assembly area
- Few articles provided a good description of what occurred in the course.
- Course operation was a focal point of most online education research

Implications of study for the media portion of the framework:

- Media should be independent from the instructor
- Potential connections between different sections of the framework on issues of control
- There could be a connection between the Assembly of the course with Instructor Operation Decisions as well as with Institution Operation Decisions.
- Assembly of some of the media, selection of that media, and technology input seems to be interplay between the instructor, the institution, and the media developer
- Particularly in an online environment where there may be less off-the-cuff instruction, the assembly of the course often has substantial influence on the operation of the course. Thus, the actors that assemble the course could have a substantial influence on the operation of the course

Students. Students are an essential part of online education. They are a permanent actor in the framework. Without a student there would not be any education occurring.

The study found students to have the most focus and this focus was mainly directed at the outcomes. Below are other findings for students.

Main findings for students:

- The student actor received the most attention from articles, as student learning seems to be the aim of most online education research
- Except for student goals, all sections of students had a moderate to a very large number of variables found in the literature
- A very large number of articles had used or described variables related to student internal characteristics (input) and student outcomes (results)
- There is a wide range of potential student internal and external characteristics that could affect the performance of a course
- There is still a lack of consensus on how to describe the interaction between different actors, especially when media mediates the interaction.
- Accurately measuring participation, such as time-on-task and especially effort, can be a difficult and convoluted task for researchers
- Communication was an important variable discovered for the student participation area, however, this process variable overlapped with interaction types
- Some articles countered the soup du jour argument that all courses should have a heavy human-to-human interactive component and claimed that independent individual learning is sometimes better for learning course material
- Many articles do not discuss student participation and may possibly be assuming that participation is consistent across students and reflects the ideals of the researcher
- There was little but strong evidence that students are making participation decisions.
- Through the expanded review, more articles about student decisions were discovered
- Student Sequencing Decisions were highly related to other the other temporal issues, such as pacing
- Student decision-making around temporal issues seems to be highly related to the way in which control is allocated for the respective properties.

- There could be hidden student output that is not recorded through data-capturing mechanisms and may lie outside of the expected course experience (such as students spontaneously studying together). And this type of output could be deeper and more impactful on the learning experience

- There were multiple outcome variables. This probably related to the selection of articles from meta-analyses and literature reviews focused on student learning. The more popular outcome variables from these articles were knowledge and satisfaction.

- Student goals had little representation in the articles

Implications of study for the student portion of the framework:

- Possibility that location, component-activities, and content are also related to control

- Contradictory to other education models used as inspiration used for this framework, student goals seems to be an internal (input) characteristic and used as part of the decision-making process.

Institution. The institution was added as an additional actor as a result of this study. In the original framework, the institution was listed as context but through this study, it was realized that institutions could have a more hands-on role. However, while the institution fits in the framework as an actor, the institution is left out of the framework as a permanent actor. The decision to leave the institution out as a permanent actor comes from the potential that online courses do not necessarily need to be part of an institution. Thus, online courses do not always have to happen within the context of an institution nor do they have to interact with an institution as an actor.

Main findings for institution:

- Articles suggested that the institution has more than just a contextual role but instead can play a more involved role that directly impacts the way a course is set-up and operates.

- There was little representation of institution in the articles. This low count most likely came from two main factors. First, the institution was added as an actor only after the review started. Second, the articles mainly came from meta-

analyses and literature reviews that examined student outcomes resulting from an online instructional intervention.

- Institutions play a foundational role in course creation and administration.

- Institutions can influence how instructors operate and participate in online courses.

Implications of study for the student portion of the framework:

- Institution as an additional but occasional actor in the framework when appropriate.

Chapter 5.2: Results for Study 2 - Course Case Study

This case study of an individual course with an in-person and two online iterations was conducted with the main purpose of validating the framework proposed in Chapters 2 and 3 of this dissertation. This framework was formed through personal experience evaluating online education programs and with reference to online education literature. A holistic framework was formed with a structure provided by a synthesis of prior models and frameworks of online and higher education that included Astin (1993), Bean and Metzner (1985), Tinto (1993), Rovai (2003), Pascarella (1985), Cole (1984 and 1996), Engeström (1997), Hiltz (1993), Benbunan-Fich and Hiltz (2003), Väljataga and Laanpere (2010), Anderson and Rogan (2011), Lowenthal et al. (2009), and Piccoli et al (2001). Naturally, this newly formulated framework would need validation. In Study 1, the first round of validation came from a review of online education literature. That review provided validation at a broad level that accounted for multiple environments and interventions. It also allowed for some adjustments to the framework leading up to this study. Study 2 is the second round of validation that closely examines one course for a more focused validation. This close examination of a single course provided validation from a primary and embodied source.

This second study of the dissertation was meant to provide a more intimate examination of the online course framework developed and explored earlier in the dissertation. Data was collected from a single course over two separate terms with a total of three separate sections. This course was particularly useful in examining the framework in the way it granted student control over various aspects course. The students in the online and in-person sections were provided the exact same learning activities with

the exception of the lecture and discussion. The *in-person course students* were able to attend the *in-person lecture* if they wanted to but this was not required. For the once-per week discussion sections, the *in-person students* were required to attend *in-person discussion section* with other students and the Teaching Assistant while the *online students* were required to attend a *synchronous online discussion* with video, audio, and text-based media that that connected them virtually with other students and the Teaching Assistant. Additionally, both the online and in-person courses provided multiple ways of learning content information (in addition to the lecture and discussion, there was a textbook, replayable online lecture videos, lecture transcripts, quizzes, assignments, and review materials). Thus, both the online and in-person courses fostered a situation in which students would need to make multiple participation decisions. This course case study provided an ideal context in which the framework could be examined for overall structure and sections as well as individual variables and processes.

The data presented here came from a single course with three different sections: two online and one in-person. Descriptions of the operation of the course and operation of course components (See Appendix A) were used for reference. Most of the data analysis came from student responses to a post course survey and three instructor interviews. These sources of data were coded using a set of codes based on the proposed framework. As the coding progressed and patterns emerged, additional codes were added. The added codes helped establish new sections of the framework as well as more detailed variables embedded in the framework sections.

The coding of student surveys looked at all parts of the framework. Some aspects of the framework had strong support from student statements. Other parts of the

framework had very little evidence from open-ended responses that students gave on the surveys. While code numbers would seem like an obvious indication of whether the framework feature actually exists, the interpretation is not straightforward. For example, some of the more conceptual aspects of the framework, such as Instructor Operation Decisions and Instructor Intended Output have very low numbers. However, some of the component-activities, such as Office Hours and Video Transcripts also had very low numbers. Even though there were very low numbers for the component-activities, it does not mean that these processes or properties were not present in the course; it could mean students did not feel they should or needed to discuss them on the survey. The code numbers for the framework can be more difficult to interpret since they are somewhat abstract. There is no definite number that provides "proof" that the section exists or does not exist. However, the numbers help give some indication of where attention needs to be placed.

For the main framework areas, a low number could indicate that the section of the framework does not exist in the form that this framework presents, students were unable to observe that area, the students did not communicate their observation, or the investigator was unable to code the area correctly. All of main sections of the framework had moderate to high coding numbers except for these five areas: Instructor Operation Decisions, Instructor Intended Output, Instructor Goals, Instructor Intended Outcomes, and Student Goals. Four of these involve instructor processes that could likely be hidden from the students. And even the instructor may not be aware of them or be readily presenting them without prompt. Thus, these four sections of the framework would need further interpretation.

When examining the one low section that is a characteristic of the student (Student Goals), it becomes apparent that this section of the framework is somewhat problematic. First, a goal can be interpreted as both an internal and external characteristic. The internal characteristic is a source of motivation and drive; it is that desired end result. This definition would put the goal as a Student Internal Characteristic Input variable. The other definition is an actual positive result. This dual definition presents a problem in the flow of the framework. And because it has already been acknowledge that the outcomes can be both intended and unintended, the final link should match this. As a result, Goals would be changed to a specific variable and has been moved to the Input area as an Internal Input Characteristic. The term "Impact" was used as a replacement for the ultimate result, what the outcome course experiences will lead to. This section was therefore renamed to "Impacts and Goal Attainment" and refers to whether students reach their internal goals, the impacts the student has on their future world, and the impacts that the course has on the student.

As indicated in the previous study, the actor role that an instructor has in the framework should separate the instructor as an individual. Thus, the instructor should have his/her own output and outcomes. The low scoring "Intended Output" and "Intended Outcomes" would result in a change to "Instructor Output" and "Instructor Outcomes" and are indicators of the results of the actual instructor, not the instructor's intentions for student learning. Instructor Goals, like student goals explained in the previous paragraph, would be moved to an internal characteristic while "Impacts and Goal Attainment" replaces Instructor Goals as the ultimate result for the instructor. And as with the student Impact and Goal Attainment section, impact refers to both the impacts that an instructor

has on their future world as a result of the course and the impact that the course has had on them. Finally, for the Instructor Operation Decisions, a different methodology is needed to examine the actual thought processes of the instructor rather than students' thoughts about them.

Below are the results of the coding of the student survey and is followed by the coding for the instructor interviews. This is then followed up by a summary of the analysis. In the summary, changes to the framework, as described above are more thoroughly explained and examined. The summary included both the changes above and other changes discovered during the analysis of results.

Analysis of the Student Survey

The open-ended questions for the student survey were coded based on the framework. This coding helped to address the first research question that asks whether there is evidence that the main elements of the framework represent the actual substance of the course:

Research Question 2.1: Are the different portions of the framework described by the subject course?.

The next section is analysis of this question based on the comments that students made on open-ended response questions in a survey. Each piece of the framework has been given a definition, an example from the student responses, and then is followed by a coding summary. The coding summary presents the count for number of times that each code was matched with excerpts of student comments in the survey.

The first analysis looks at the main sections of the framework (primary codes) and followed by an analysis of subsections of the framework (subcodes). These codes and

sample excerpts are presented below in Table 5.2.1. The comments that students made provided good insight into their experiences.

Table 5.2.1
Definitions and examples of *framework main section*

Framework Area	Definition	Example of Student Excerpt*
Institutional Issues	Any reference to institutional inputs, processes, or results. Institutional input being any time, effort, money, or resource that the institution invests in the facilitation of a course. Institutional processes being any process that the institution engages (decisions and operation/participation) in relation to the course. Results being any output or outcome for an institution that relates to the course.	Subject 003 (Excerpt 2256-2396): "I've noticed it's getting harder to get a reasonable schedule going after the recurring budget cuts and an online class solves this problem."
Instructor / TA Characteristics Input	Any reference to input variables related to the instructor or TA input characteristics. These characteristics refer to any permanent or semi-permanent characteristic that the instructor brings to the course upon entry or developed during the course.	Subject 030 (Excerpt 7190-7305): "[The professor] was a good instructor and was very passionate. I only wished that some of his students were as passionate as he is."
Subject / Content Input	Any reference to the subject or content of the course.	Subject 105 (Excerpt 1565-1649): "I would not take my core classes online due to the difficulty of the subject matter." (When asked "What would be the main reason for not taking an online course at [this university] in the future?")
Course Assembly Input	Any reference to the creation of the course. This could refer to any processes or resources allotted to course development.	Subject 010 (Excerpt 3233-3438): "Regarding transcripts and interactive lectures, make sure the reading transcripts correspond with the correct interactive lectures. A few transcripts were for different lectures which confused me at first."
Technology Input	Any reference to the technology infrastructure. This could refer to localized or external infrastructure that supports the course.	Subject 195 (Excerpt 2141-2319): "Weak internet can prohibit me from truning [sic] in assignments in time. Internet can drop so all online work could be deleted. Computer could have problems. Online site could be down." (When asked "What would be the main reason for not taking an online course at [this university] in the future?")
Students (Combined)	Any reference to the combination of all or multiple students in a class, such as class size or how other students in the class might influence an individual student.	Subject 028 (Excerpt 6739-6826): "Participating was made easier with the smaller class size and with the TAs' initiation."

Table 5.2.1 Continued
Definitions and examples of *framework main section*

Framework Area	Definition	Example of Student Excerpt*
Student Internal Characteristics Input	Any reference to internal characteristics of the student. These characteristics refer to any permanent or semi-permanent characteristic that the student brings to the course upon entry or has developed during the course. This includes (but not limited to) characteristics such as goals, interests, learning preferences, and prior learning.	Subject 006 (Excerpt 8458-8569): "The biggest challenge was accepting a whole new way to learn. The new learning method took a while to adapt to."
Student External Characteristics Input	Any reference to external characteristics of the student. This includes (but not limited to) characteristics such as home environment, friends, and home distance from the university.	Subject 040 (Excerpt 1709-1946): "I tend to get distracted with the online sessions because I am in an environment where I can get distracted more easily." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Course Characteristics and Operation	Any reference to characteristics or operation of the course. This includes any general characteristics or operations related to the course, such as when the course is offered or the format of the course overall.	Subject 10 (Excerpt 6597-6933): [This course] is a very important class. I am glad that i am taking it and i think that it should be a required course for all students.
Component Characteristics and Operation	Any reference to the characteristics or operation of a specific course component-activity, such as an assignment, a reading, a quiz, or a discussion section	Subject 30 (Excerpt 1806-2009): discussion sections were very slow moving and I felt that they were somewhat of a waste of time.
Actual Instructor Participation	Anything that refers to the actual participation of the instructor or TA in the course	Subject 097 (Excerpt 6161-6376): "I attempted to meet with my TA twice and both times we made an appointment and both times he did not show up. This made it extremely difficult for me to get help from him and talk about how I could improve my grade." (When asked, "Is there anything else you would like to share with us about this course that we haven't already asked?")
Actual Student Participation	Any reference to how a student actually participated	Subject 098 (Excerpt 5868-5914): "online discussions frequently slipped my mind."
Instructor Operation Decisions	Any reference to an instructor making decisions about the course	Subject 171 (Excerpt 6529-6683): "Work on the midterm to match it with the rest of the class. You can't grade everything reasonably and then grade the midterm really hard. That isn't fair."

Table 5.2.1 Continued
Definitions and examples of *model main section*

Framework Area	Definition	Example of Student Excerpt*
Student Participation Decisions	Any reference to a student making decisions about the course	Subject 34 (Excerpt 6367-6852): "Really want to emphasize that the flexibility of the course helped out because I have a curve of tons of homework at a certain point of the week and nothing to do on the other days so the ability to choose whenever to do the work was extremely helpful."
Efficiency Evaluation	Any reference to making an evaluation of efficiency in relation to participation.	Subject 184 (Excerpt 6945-7124): "homework assignments were too many. one quiz + one essay per week doesnt [sic] do justice to 3 units, if the class was worth 4 units, all the homework assignments would have made sense." (When asked, "Is there anything else you would like to share with us about this course that we haven't already asked?")
Instructor Intended Output	Any reference to the output intended by the instructor. The intended output being what the instructor intends the student expend on the course in product-form.	Subject 220 (Excerpt 1566-1803): There was a lot more busy work involved just to prove that I watched the internet lectures. Very time consuming and not necessary.
Actual Student Output	Any reference to actual student output. Student output being any student expenditure, such as time, effort, money, or resources that concludes in product form and can be observed through methods such as direct measurement or self-reporting.	Subject 224 (Excerpt 6803-7067): "This class required way to much work for a typical 3 unit class."
Instructor Goals	Any reference to instructor goals.	No excerpts found in student comments
Instructor Intended Outcomes	Any reference to the outcomes for students that are intended by the instructor. Student outcomes being any gains the student has had in the course, either positive or negative, and can be observed through methods such as direct measurement or self-reporting.	Subject 007 (Excerpt 6630-6831): "Quizzes and tests focused on inane bits of information straight from the book. Students were rewarded for memorizing tidbits of trivia from the text rather than understanding the concepts of the class."
Actual Student Outcomes	Any reference to the actual student outcomes. Student outcomes being any gains the student has had in the course, either positive or negative, and can be observed through methods such as direct measurement or self-reporting.	Subject 136 (Excerpt 6995-7093): "This course was one of the most fun and interesting that I have ever taken at [at this university]" (When asked, "Is there anything else you would like to share with us about this course that we haven't already asked?")

Table 5.2.1 Continued
Definitions and examples of *framework main section*

Framework Area	Definition	Example of Student Excerpt*
Individual Student Goals	Any reference to student goals. Student goals being any manifested motivations, aims, or purposes of a student.	Subject 004 (Excerpt 1808=2078) "The main reason for not taking an online course at [this university] in the future would simply be if I have no reason to take a class. If there are no units or graduation requirements I need that can be satisfied by an online course, than I won't take an online course."

*More examples of student excerpts are displayed in Appendix I

The example excerpts above provide insight into how the student experience relates to the framework and how students experienced the course. There were few qualitative differences between the online and in-person students but one area that can differ between online and in-person was technology. While most of the course was the same between the two groups, there were some differences. Subject 125, who was an in-person student, stated (Excerpt 2105-2147), "Projector would not work in class one day." For all of the potential technology failures that can occur online, other technology failures can occur in-person. However, whereas in an online course a technology failure could result in the shutdown of participation, in an in-person course, the instructor or TA can improvise with other technology or through simple discussion. This improvisation might not be possible in an online course where the only connection a student has with the course and the material is through technology.

The table below displays the code count for codes that represented the main portions of framework. Table 5.2.2 below shows fairly good coverage of the different portions of the framework. Areas that tended to have higher code counts were sections that directly related to the student (such as participation, participation decisions, output, outcomes, and input characteristics), observable characteristics related to the instructor

(such as instructor input and instructor participation), and especially issues related to the activities and media in the course (see course and component characteristics and operation, course assembly, and technology input). The areas that had the least comments were those about instructor intended output, instructor intended outcomes, and instructor goals. This was not surprising given that students usually have little chance of observing this. However, another area that had little student comment was student goals. This was surprising, given that student goals can be self-reported and student goals are often referenced in literature on students. It must be noted here that the analysis made for this dissertation was post hoc and had little connection with the design of the questions, thus, better designed questions that asked specifically about instructor intentions and goals or student goals may have found better responses from students taking the survey. Nevertheless, the code counts here give a sense of the raw experience of the student. A very low count could indicate that the idea was not connected to the student experience.

Table 5.2.2
Code usage for *framework main section*

Framework Area	All Courses		Online Only		In-Person Only	
	Excerpts	Students	Excerpts	Students	Excerpts	Students
Institutional Issues	56	50	19	17	37	33
Instructor / TA Characteristics Input	38	36	11	10	27	26
Subject / Content Input	36	29	26	19	10	10
Course Assembly Input	129	76	45	29	84	47
Technology Input	246	148	104	64	142	84
Students (Combined)	34	29	16	11	18	18
Student Internal Characteristics Input	93	66	39	25	54	41
Student External Characteristics Input	101	80	52	41	49	39
Course Characteristics and Operation	398	178	148	72	250	106
Component Characteristics and Operation	376	149	125	57	251	92
Actual Instructor Participation	89	68	28	26	61	42
Actual Student Participation	204	114	80	48	124	66
Instructor Operation Decisions	7	4	0	0	7	4
Student Participation Decisions	386	185	156	79	230	106
Efficiency Evaluation	253	150	119	70	134	80
Instructor Intended Output	4	3	2	1	2	2
Actual Student Output	61	49	28	22	33	27
Instructor Goals	0	0	0	0	0	0
Instructor Intended Outcomes	6	6	2	2	4	4
Actual Student Outcomes	128	82	38	30	90	52
Individual Student Goals	12	12	10	10	2	2

Some of the codes above had subcodes. Some of these subcodes were a part of the coding scheme from the beginning; others were added as the coding progressed. The subcodes ranged from Level 2 to Level 4. Thus, some of the subcodes had subcodes of their own subcodes and so on. The following sections present these varying levels of subcodes. What immediately follows are the subcodes of the student characteristic codes that

presented in the framework main section: first, the subcodes for *Student Internal Characteristics Input*; second, the subcodes for *Student External Characteristics Input*.

Table 5.2.3
Definitions and examples of *student internal characteristics*

Framework Area	Definition	Example of Student Excerpt*
Background and Abilities	Any reference to a student's background or abilities, such as academic major or ability to perform in a specific subject area upon entry in the course.	Subject 168 (Excerpt 6599-6859): "It is very hard and is graded like a 4 unit class. The professor does not assume that we may not have a background in the field of study and teaches as if we were all science majors." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Compatibility for Learning Environment or Instructional Practice	Any reference to a student having a compatibility to a learning environment or instructional practice	Subject 197 (Excerpt 2149-2353): "I learn better in person than online. I prefer the lecture room environment, it keeps me focused." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Interest in Subject or Learning Intervention	Any reference to a student having interest in the subject or learning intervention upon entry in the course.	Subject 102 (Excerpt 651-802): "something new, plus good topic" (When responding to, "Why did you choose to take the online version of this course?")
Motivation / Focus / Time Management	Any reference to an individual's motivation, focus, or time management.	Subject 217 (2489-2683): "It'll be easier to manage time and it's better for people who work/concentrate better alone" (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")
Preference for Learning Environment	Any reference to a preference for a learning environment	Subject 010 (1813-1946): "i prefer in-class learning" (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Prior Experience	Any reference to a student having a certain prior experience.	Subject 009 (1561-1715): "Entirely depends on course material, but I'd say I wouldn't take an online course in the future because I'm more familiar with courses that are in-person."

*More examples of student excerpts are displayed in Appendix I

After the initial coding of student internal characteristics, a second round of coding was conducted to find more specific variables. From this second round of coding, six variables or sub-codes emerged. Of these codes, the code with the most hits was *Motivation / Focus / Time Management*. Other codes had low to moderate usage but the low usages is reasonable, given these are subcodes for a larger umbrella code and describe individual personal influences on their experience or future experiences in an online course. As reflected in the examples given in Table 5.2.3 above, these variables most frequently appeared when the students were discussing why they would or why they would not participate in an online course at the same university in the future.

Table 5.2.4
Code usage for *student internal characteristics*

Framework Area	All Courses		Online Only		In-Person Only	
	Excerpts	Students	Excerpts	Students	Excerpts	Students
Background and Abilities	8	8	5	5	3	3
Compatibility for Learning Environment or Instructional Practice	20	19	6	6	14	13
Interest in Subject or Learning Intervention	10	9	8	7	2	2
Motivation / Focus / Time Management	40	32	16	13	24	19
Preference for Learning Environment	24	23	6	6	18	17
Prior Experience	5	5	3	3	2	2

Like student internal characteristics, a second round of coding for student external characteristics was conducted to break down the primary code into more specific variables. Five main variables or sub-codes emerged during this second round of coding. Below are the definitions and examples of each student external characteristics subcode.

Table 5.2.5
Definitions and examples of *student external characteristics*

Framework Area	Definition	Example of Student Excerpt*
Distance from University	Any reference to the physical distance a student is from the university.	Subject 165 (Excerpt 1954-2094): "It is convenient as one doesn't have to go all the way to campus just to attend lecture, especially for those who live far away from campus." (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")
Money or Resources	Any references to a student's money or resources.	Subject 085 (Excerpt 1563-1694): "My internet too slow :(" (When responding to, "Please describe how the technology failed.")
Personal Environment	Any reference to a student's personal or home environment (e.g. distractions, lack of distractions, lack of community).	Subject 173 (Excerpt 1565-1713): "dont have the privacy for online lectures" (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Requirements for Graduation	Any reference to having requirements for graduation or already fulfilling those requirements.	Subject 151 (Excerpt 2452-2608): "It was a required class that was only offered online." (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")
Time Conflicts	Any reference to times conflicts, such as other courses, work, family, or pets.	Subject 159 (Excerpt 1801-1994): "I work full time so I will choose online over in-person just because of scheduling issues." (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")

*More examples of student excerpts are displayed in Appendix I

The subcode with the most usage was *Time Conflicts*. Like the *Motivation / Focus / Time Management* subcode for student internal characteristics, the *Times Conflicts* subcode was used most often in response to the question asking students the main reason to take an online course at this university in the future. Other codes had low to moderate usage but the low usages is reasonable, given these are subcodes for a larger umbrella code and describe individual personal influences on their experience or future experiences in an online course.

Table 5.2.6
Code usage for *student external characteristics*

Framework Area	All Courses		Online Only		In-Person Only	
	Excerpts	Students	Excerpts	Students	Excerpts	Students
Distance from University	5	5	0	0	5	5
Money or Resources	18	17	10	9	8	8
Personal Environment	12	11	4	4	8	7
Requirements for Graduation	12	11	7	6	5	5
Time Conflicts	60	57	34	32	26	25

As opposed to discussing broader topics, such as online education in general or the course as a whole, many of the statements made by the students referred to a specific component-activity. These specific component-activities were coded individually based on when students discussed them in the survey. Below are the definitions and examples of each component-activity subcode.

Table 5.2.7
Definitions and examples of *component-activities*

Framework Area	Definition	Example of Student Excerpt*
Course Website	Any reference to the course website.	Subject 218 (2409-2570): "The class course website would not be working at times which impacted my homework and essays I had to write."
External Website	Any reference to an external website(s).	Subject 158 (2727-2864): "We weren't able to access the sites we needed to research in order to do our homework"
Quizzes	Any reference to the course quizzes.	Subject 228 (2846-2879): "The quizzes had the wrong answers"
Piazza	Any reference to Piazza	Subject 130 (7111-7398): "I think Piazza is a good way for students to initiate communication with other students and instructor/TA. I DO NOT think piazza is a good way for instructors/TA to initiate contact with students."
Discussion Section	Any reference to the discussion section	Subject 218 (5925-6162): "If the TAs could talk more about the material [during discussion] we were going to cover in the next lecture to prepare us, it would be more helpful."
In-Person Lecture	Any reference to an in-person lecture(s)	Subject 222 (6529-6584): "videos were often better than going to class sometimes."
Replayable Videos	Any reference to a replayable video(s)	Subject 102 (3288-3606): "The interactive lectures cover too much information, and to be honest, it is hard to know what is really important, sometimes you guys throw some words or concepts that to me and other students really had no much importance with the subject."
Assignment	Any reference to an assignment(s)	Subject 196 (6939-7214): "there were too many assignments assigned other than that the course was fun"
Adobe Connect	Any reference to Adobe Connect	Subject 220 (2202-2319): "Connection to the Adobe connect dropped out or produced no sound."
Midterm / Final	Any reference to the Midterm or Final	Subject 142 (6834-7214): "the course did not teach any useful larger concepts or really test our understanding but instead tested how many useless details about random stuff we remembered from the readings"
Textbook / Readings	Any reference to the textbook or other readings	Subject 093 (6557-7001): "I sometimes preferred the readings over watching lectures. It may have been because he was talking too fast in the videos for me to take notes and most of it was similar wording to what it said in the book."

Table 5.2.7 Continued
Definitions and examples of *component-activities*

Framework Area	Definition	Example of Student Excerpt*
Office Hours	Any reference to the office hours	Subject 001 (5441-5554): "My TA wasn't on Adobe Connect during office hours, though if I e-mailed in advance I'm sure it would have worked."
Email	Any reference to email	Subject 156 (3561-3701): "Make mailtool and access to contact information for TA's better"
Chat Room	Any reference to chat rooms	Subject 054 (2613-2771) "The students and I did not know how to work the online chat room but after we did it was all working fine."
Practice Problems	Any reference to practice problems	Subject 125 (2819-2919): "More practice problems." (When responding to the question, "Do you have any suggestions for improving the online course website?")
Grade Postings / Grading	Any reference to grade postings on the course website or grading in general	Subject 099 (2976-3175): "grading needs to be faster. didn't get most of my grades (and still not 4/5 of the essays) till the day before finals week"
Video Transcripts	Any reference to the video transcripts	Subject 178 (2611-2726): "Some of the transcripts in the videos are not the correct ones."

Below in Table 5.2.8 with the number of times each code was used to code the statements that students made in the survey. *Course Website* was the most frequently used code with 124 excerpts and was closely followed by *Discussion Section* with 96 code excerpts. Other notable codes were *Quizzes* (52 excerpts), *Adobe Connect* (39 excerpts), *Replayable Videos* (33 excerpts), *Piazza* (29 excerpts), *Assignment* (21 excerpts), *External Website* (17 excerpts), and *In-Person Lecture* (16 excerpts).

Table 5.2.8
Code usage for *component-activities*

Framework Area	All Courses		Online Only		In-Person Only	
	Excerpts	Students	Excerpts	Students	Excerpts	Students
Course Website	124	87	29	21	95	66
External Website	17	17	0	0	17	17
Quizzes	52	41	11	10	41	31
Piazza	29	25	9	7	20	18
Discussion Section	96	69	49	30	47	39
In-Person Lecture	16	14	6	5	10	9
Replayable Videos	33	28	18	15	15	13
Assignment	21	19	7	6	14	13
Adobe Connect	39	30	33	25	6	5
Midterm / Final	8	8	4	4	4	4
Textbook / Readings	5	5	3	3	2	2
Office Hours	2	2	2	2	0	0
Email	10	8	7	6	3	2
Chat Room	3	3	3	3	0	0
Practice Problems	2	2	0	0	2	2
Grade Postings / Grading	14	12	3	3	11	9
Video Transcripts	4	4	1	1	3	3

Key Online Features are the second *Course Characteristics and Operation* subcodes presented below (see Table 5.2.9). As explained in the introduction to this dissertation, these features form the cornerstone of what makes online education. *Key Online Features* were coded individually based on when students discussed them in the survey. While these codes represent the concept of what makes an online course, online, each of these codes are grounded in real substantive variables and can be seen as such in student comments. Below are the definitions and examples of each component-activity subcode.

Table 5.2.9
Definitions and examples of *key online features*

Framework Area	Definition	Example of Student Excerpt*
Distance	Any reference to learning at a distance	Subject 034 (Excerpt 1789-2008): "If I do not have the time to physically sit in class for a certain period of time everyday." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Communication	Any reference to communication in the course	Subject 196 (Excerpt 2336-2576) "less time needs to be put in, plus the website allowed to contact the peers through piazza if any problems on assignments were encountered"
Organization and Distribution of Content	Any reference to organization and/or distribution of the content of the course	Subject 041 (Excerpt 6320-6440): "The course was interesting; however, I feel that having it online depletes the amount of information we as students get." (When asked, "Is there anything else you would like to share with us about this course that we haven't already asked?")
Content Interaction	Any reference to content interaction	Subject 177 (Excerpt 6972-7097) Overall, I felt that the online resources that were provided were very helpful, especially the videos and the video questions
Assessment	Any reference to assessment (formative or summative)	Subject 222 (Excerpt 2102-2151): "i was taking a quiz and the website kicked me out."

*More examples of student excerpts are displayed in Appendix I

Each of these codes had fairly strong usage, which suggests the conceptual idea of Key Online Features has strong representation in the thoughts and experiences of both online and in-person students. Further exploration of how the experiences between online and in-person students in this area is needed. Communication had especially strong usage and as the coding progressed, it became apparent that more information about communication would be useful. For example, many students sometimes commented on communication breakdown or simply commented on interaction or presence. Thus, *Communication* was recoded using these variables and this coding is described and analyzed below.

Table 5.2.10
Code usage for *key online features*

Framework Area	All Courses		Online Only		In-Person Only	
	Excerpts	Students	Excerpts	Students	Excerpts	Students
Distance	74	64	30	26	44	38
Communication	157	96	96	53	61	43
Organization and Distribution of Content	74	54	32	24	42	30
Content Interaction	38	32	18	14	20	18
Assessment	50	39	10	9	40	30

Communication was recoded with additional subcodes. Two very clear variables emerged: *Communication Breakdown* and *Interaction or Presence*. These variables stood out because of the sheer number of students that either complained about a breakdown in communication or because of their interaction (or lack of interaction) with others in the course. However, other communication variables may be waiting to be discovered. Though, for the student responses to this survey, two main variables materialized.

Table 5.2.11
Definitions and examples of *communication variables*

Framework Area	Definition	Example of Student Excerpt*
Communication Breakdown	Any reference to a communication breakdown, meaning, anytime there was a failure to communicate due to circumstances such as personal issues, lack of access, or technology failure.	Subject 100 (1565-1829): "Lack of communication from my past TA. HAd to send three emails before I got a response in a 2 week span. e-mailed me other stuff while avoiding my question." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Interaction or Presence	Any reference to interaction or presence, meaning, anytime a student mentioned a non-descript interaction or a presence that suggests either embodied interaction or a deep personal connection between two or more actors	Subject 021 (1564-1747): "Interactive human discourse and being present at a lecture, being able to ask questions at the end of class are important factors in a class that I wasn't able to do in online course"

Both of the communication variables had somewhat high usage. These high numbers are remarkable given that they are subcodes. Communication Breakdown is especially high in the online course group, suggesting that these students actually experienced communication breakdown or had their opinion about communication influenced by their online course experience. It could also have been the nature of the questions since students were more likely to rely on online communication tools, they were more likely to comment on them and discuss circumstances in which they experienced communication breakdown.

Table 5.2.12
Code usage for *communication variables*

Framework Area	All Courses		Online Only		In-Person Only	
	Excerpts	Students	Excerpts	Students	Excerpts	Students
Communication Breakdown	79	58	58	43	21	15
Interaction or Presence	45	41	18	17	27	24

The third set of subcodes, under the *Course Characteristics and Operation* section, is *Control*. As explained in the introduction, the area of Control has instructional relevance, particularly for online and distance education, where the level of independence can easily fluctuate. The first Code, Control, was used as a parent code for the other control codes. Most excerpts that were coded with any of the subsequent codes were also coded with Control. This is why the count for the Control code is so much higher than the other codes in this area.

Table 5.2.13
Definitions and examples of *control*

Framework Area	Definition	Example of Student Excerpt*
Control	Any reference to a source or type of control. A source of control being the entity that is in control (e.g. institution, instructor, media, student, or a group of students). A type of control being the way an entity or process is controlled (e.g. location, timing, pacing, sequencing, content, or component-activity)	Subject 013 (Excerpt 3183-3259): "Perhaps separating the Lectures into weeks as a suggestion not a requirement"
Location	Any reference to the control issue of location but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students)	Subject 229 (Excerpt 2377-2484): "Don't have to leave your room. Good if you had a far away place that took a long time to get to class from." " (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Timing	Any reference to the control issue of timing but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students).	Subject 030 (Excerpt 2047-2391): "It is nice to schedule studying and seeing lectures on my own time. It allowed me to focus on this class when I needed to but I could also ignore it at times if my other classes were being very demanding during a certain time in the quarter."
Pacing	Any reference to the control issue of pacing but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students).	Subject 005 (Excerpt 1706-1881): "Allows more effective use of my time, and are usually given the opportunity to get ahead in the course instead of having to go at the pace the in person courses usually require"
Sequencing	Any reference to the control issue of sequencing but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students)	Subject 006 (Excerpt 8795-9138): "At the very least, the chronological and orderly listing of required viewing modules and readings, the sequential importance of Exercises leading up to Essays, and the visibly undeniable due dates of any and all activities spell out the academic expectations of the student (in terms of materials to learn and homework/assignments to turn in)."
Content	Any reference to the control issue of content but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students)	Subject 218 (Excerpt 5407-5606): "It would be great if it let me fastforward [sic] the sessions so I do not have to watch the whole recording."
Component-Activity	Any reference to the control issue of component-activity but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students)	Subject 095 (Excerpt 6399-6567) "I didn't use piazza unless it was required to communicate with other students"

*More examples of student excerpts are displayed in Appendix I

While the numbers appear equal between online and in-person courses, the number of online students that took the post-course survey was about three quarters the number of in-person students that took the post-course survey. While it might not be a significant difference, the online students commented more on most issues of control. One might not expect this kind of difference in student comments about control in courses that were identical except for the optional in-person lecture and the online versus in-person discussion. From these numbers alone, it would be difficult to comment on why there was a difference in code counts. However, when students talked about control, they sometimes talked about how much control they had and in other cases, the students talked about the desirability of having more control. Because some of the questions were posed for conceptual comment (i.e. "What would be the main reason for taking an online course at [this university] in the future?"), students in the in-person class were able to comment about their perceptions of online courses. Thus, the format that the student actually took the course in might not reflect the comments that they made about online courses. These perceptions could have developed over time from other experiences in online courses or things they had heard about online courses. However, the opinions of students about what makes an online course desirable and their experiences in an in-person course is also valuable in determining the relevance of different sections of the framework.

Some of the control codes were used less frequently than the others. Students moderately discussed controlling location and component-activities and talked very little about Sequencing and Content. Students in the in-person course talked slightly more about location than the online students. As explained earlier, the discussion of control might not necessarily be reflective of the students' experience in this course, but instead

could be a hypothetical about their beliefs. Further, because control might not be a reference to student control, the range of discussion can include the lack of student control or could reflect a different source of control, such as instructor, institution, or media. For example, control of location, could be a reference of students discussing their understanding of online courses. Also, students in the in-person course had the option to not attend the lecture and part of the justification was that they could control the location of their viewing of lecture material through video usage.

The control code that was used the most was Timing and followed next by Pacing. These temporal issues are similar, one having to do with the time at which participation or learning will occur, the other the speed with which one will participate. Sequencing, the other temporal type of control, which signifies order of participation, was commented on by fewer students and less frequently. This could signify that either the control type is not an issue that students are concerned with or the open-ended questions used on the survey were more suggestive of timing and pacing types of control. Students might not be concerned with sequencing because it is not a priority for them or it is an issue they have conceptualized. However, as described earlier, sequencing can have a large impact on how well students learn material. Thus, students might not be aware of how important sequencing could potentially be on learning.

Another possibility for the differences for some of the code differences is that location, timing, and pacing (the three highest used control codes) have larger impacts on life outside of the course. This means that students could be commenting on these areas of control because they may impact other external goals or interests that they might have. As explained in other parts of this dissertation, students make efficiency evaluations

based on the competing interests of the value they see in the course and the value they see outside of the course.

Table 5.2.14
Code usage for *control*

Framework Area	All Courses		Online Only		In-Person Only	
	Excerpts	Students	Excerpts	Students	Excerpts	Students
Control	175	125	85	56	90	69
Location	38	35	15	13	23	22
Timing	96	88	46	41	50	47
Pacing	56	52	32	28	24	24
Sequencing	13	10	9	6	4	4
Content	14	9	9	5	5	4
Component-Activity	33	26	17	12	16	14

The fourth set of subcodes for *Course Characteristics and Operation* is *Features of Curriculum and Content*. These codes were used to note when a student commented about specific curriculum and content features of the course. The table below defines and gives examples of each of these codes related to *Features of Curriculum and Content*.

Table 5.2.15
Definitions and examples of *Features of Curriculum and Content*

Framework Area	Definition	Example of Student Excerpt*
Accuracy of Information or Assessments	Any reference to the level of accuracy of information presented in the course or the accuracy of assessments.	Subject 165 (Excerpt 2665-2746): "The answers to the quiz questions would be wrong sometimes or it was graded wrong" (When responding to, "Please describe how the technology failed.")
Alignment	Any reference to the alignment of two or more of the following: subject/content, material, component activities, assessment, or course outcomes.	Subject 171 (Excerpt 6529-6683): "Work on the midterm to match it with the rest of the class. You can't grade everything reasonably and then grade the midterm really hard. That isn't fair." (When responding to, "Is there anything else you would like to share with us about this course that we haven't already asked")
Amount of Work	Any reference to the amount of work that students are required to put into the course, especially when in comparison to normal work per course.	Subject 224 (Excerpt 6803-7067): "This class required way to much work for a typical 3 unit class." (When responding to, "Is there anything else you would like to share with us about this course that we haven't already asked")
Complex or Difficult	Any reference to the material being complex or difficult.	Subject 102 (Excerpt 1837-2000): "I felt that the material was too much, and some were really dense with information, didn't really allowed me to finish all or completely understand the right material. I honestly thought it was all important." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Navigation or Organization	Any reference to actual or ideal form of how the course is organized online or how users are navigating the material.	Subject 095 (Excerpt 3167-3362): "I thought the online course website was fairly well laid out, I would have a difficult time offering any improvements." (When responding to, Do you have any suggestions for improving the course website?")
Other Curriculum and Content Features	Any reference to curriculum or content features that is not represented by sub-codes.	Subject 210 (2240-2353): "Apart from your TA (the one I saw in person for discussion sections), the rest of the course was very disjointed."

*More examples of student excerpts are displayed in Appendix I

The codes for *Features of Curriculum and Content* had low to moderate usage. Except for the *Accuracy of Information or Assessments*, each of the codes in this area were fairly evenly distributed between the online and in-person respondents. This probably has little to do with the course type though, given they were exposed to the

same interventions except for the lecture and the discussion section and none of the in-person students commented about the accuracy of the lecture. What is important is that students were noticing these curricular and content features and often commented on the influence these features had on their experience or on their decision to enroll in a specific version of the course. Thus students were interacting with the course curriculum and content and this interaction seems to have an effect on student results and future student decisions.

Table 5.2.16
Code usage for *Features of Curriculum and Content*

Framework Area	All Courses		Online Only		In-Person Only	
	Excerpts	Students	Excerpts	Students	Excerpts	Students
Accuracy of Information or Assessments	17	15	2	2	15	13
Alignment	17	16	6	6	11	10
Amount of Work	27	23	9	9	18	14
Complex or Difficult	15	11	10	6	5	5
Navigation or Organization	31	21	17	13	14	8
Other Curriculum and Content Features	48	39	13	12	35	27

The fifth set of subcodes for *Course Characteristics and Operation* is *Media*. These codes were used to mark comments that individuals made specifically about media characteristics. In the table below, each of these codes are defined and an example of each is given. These codes were used to mark when students described these specific characteristics of media.

Table 5.2.17
Definitions and examples of *media*

Framework Area	Definition	Example of Student Excerpt*
Media Form	Any reference to the properties of media, such as how text is displayed, static image, moving image, sound	Subject 093 (Excerpt 6557-7001) I sometimes preferred the readings over watching lectures. It may have been because he was talking too fast in the videos for me to take notes and most of it was similar wording to what it said in the book.
Synchronicity	Any reference to synchronicity, which means the timing of actor-to-actor information transfer through media in terms of both immediacy and automation	Subject 006 (Excerpt 7867-8094): "Piazza is a great way to post non-immediate announcements, but not the best place to make time-sensitive requests from other classmates. Piazza performance is only as good as the frequency of those who actively log and read it."
Symmetry	Any reference to symmetry or the degree to which there is two-way interaction or dialogue	Subject 006 (Excerpt 8570-8794): "The almost one-way learning (through videos and reading) with a lag time of at least a day for human interaction (via online discussion and online office hours) made me question whether my efforts were too little or too much."
Anytime or Anywhere	Any reference to the anytime or anywhere nature of online course or component-activities.	Subject 030 (Excerpt 2047-2391): It is nice to schedule studying and seeing lectures on my own time. It allowed me to focus on this class when I needed to but I could also ignore it at times if my other classes were being very demanding during a certain time in the quarter.
Multiplicity	Any reference to multiplicity. Multiplicity mainly refers to the range in which different contexts, media, formats, activities, and assessments convey equivalent content.	Subject 093 (Excerpt 6557-7001): "I sometimes preferred the readings over watching lectures. It may have been because he was talking too fast in the videos for me to take notes and most of it was similar wording to what it said in the book." (When responding to the question, "Is there anything else you would like to share with us about this course that we haven't already asked?")
Non-linearity	Any reference to linearity or nonlinearity in a course. This means, the extent to which a medium has dimensional navigation potentials, such as moving forward and backward in a book or conducting a search on a web browser.	Subject 137 (Excerpt 2520-2602): "I can use ctrl-F to find key words I needed more information about in transcripts"

*More examples of student excerpts are displayed in Appendix I

An important finding related to this section that was not expressed in the quantitative output was a comment by one student. Subject 222 (Excerpt 5955-6123)

made a very simple comment about the question and answer software the class was using: "the questions are not always answered but I really liked the anonymous option". This comment suggested that a form of media had a purpose, operation, and outcomes. In other words, this comment suggested that a form of media had many of the same characteristics as the other actors in the framework. While it had already been accepted that media had an input and operation section, this comment opened up the possibility that media should be treated as an a separate actor with output and outcomes. Further, with advances in technology, it is not hard to imagine the potential for media to make decisions beyond what has been programmed. This is an important finding because it suggests another actor to be added to the framework: Media.

There were more codes used in the area of Anytime or Anywhere than the other codes. This appears to be one of the main issues that students have to adjust to when taking an online course. However, it is also what students see as one of the main benefits as well. As the coding progressed, the research found the Control types of Timing and Location. As explained below, Anytime or Anywhere code applications were recoded with Timing and Location control codes. This reapplication almost completely overlapped the Anytime or Anywhere code applications. The combination code applications of Control for Timing and Location code overlapped with almost all of the Anytime or Anywhere codes. Thus, the relevance of Anytime or Anywhere may need reexamination. Further, while the code was meant to be used in relation to media, the application of the code appears to have overshot this charge and excerpts were coded with Anytime or Anywhere whenever the general concept of Anytime or Anywhere was suggested.

Aside from the high code counts for Anytime or Anywhere, the codes in this section are relatively low. However, all were used a number of times. The low count does not necessarily indicate a lack of presence in the course since questions about these aspects of media were not specifically asked in the survey. Instead, that all of the codes were used indicates that each of these items were real phenomena that the students observed or experienced and had enough of an impact to independently comment on.

Table 5.2.18
Code usage for *media*

Framework Area	All Courses		Online Only		In-Person Only	
	Excerpts	Students	Excerpts	Students	Excerpts	Students
Media Form	15	12	5	5	10	7
Synchronicity	11	8	6	4	5	4
Symmetry	12	8	7	5	5	3
Anytime or Anywhere	119	111	57	54	62	57
Multiplicity	14	12	3	2	11	10
Non-linearity	16	13	6	5	10	8

Part of the decision making process is making a decision. If a decision is to be made, ultimately it will be made. Even if a student is unable or unwilling to make a choice, a decision has been made (either to not participate or to participate in the default mode). Many of the statements that students made on the survey were not fully developed decisions, thus the codes “Towards In-Person” and “Towards Online” were used to indicate both actual decisions that students made about whether to participate in in-person or online (respectively) activities or courses and when they were leaning toward making those decisions. Further, the student comments were coded for whether they were making a participation decision regarding a course as a whole (such as enrolling in this or another online course) or participating in a particular component-activity. Table 5.2.19 below

gives a definition for each of these codes and an example of a student statement that matched the code.

Table 5.2.19
Definitions and examples of *student participation decisions*

Framework Area	Definition	Example of Student Excerpt*
Participation Decision in Course	Any reference to an individual making a decision to or not to participate in a course. This could be an actual decision or a hypothetical future decision.	Subject 220 (6533-6977): "Overall, I will not be taking another online course. It was too much busywork and required too much energy and effort to make sure that I was connected to Adobe connect at the right times, in the right place."
Towards In-Person	Any reference to an individual making a decision (or stating a preference) to participate in an in-person course or component-activity. This could be an actual decision or a hypothetical future decision.	Subject 229 (2146-2340): "Needing to be somewhere with wifi, outside of a classroom and not being able to focus." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Towards Online	Any reference to an individual making a decision (or stating a preference) to participate in an online course or component-activity. This could be an actual decision or a hypothetical future decision.	Subject 229 (2377-2587): "Don't have to leave your room. Good if you had a far away place that took a long time to get to class from." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Participation Decision in Component-Activity	Any reference to an individual making a decision to or not to participate in a component-activity. This could be an actual decision or a hypothetical future decision.	Subject 095 (6399-6597): "I didn't use piazza unless it was required to communicate with other students"

*More examples of student excerpts are displayed in Appendix I

The table below shows the count of codes related to participation decisions. The first code indicates when a student discussed making a decision to participate in a course. The second and third codes, "Towards In-person" and "Towards Online" indicate when a student made a decision (or a hypothetical decision) that endorses in-person or online formats, respectively. These three codes had a large amount of usage. This heavy usage is probably the result of the nature of the questions (students were asked to comment on why they would and why they would not participate in online courses in the future). The last code is "Participation Decision in a Component-Activity", which indicated when a

student was making a decision to participate or not participate in a component-activity. Surprisingly, this code had a very low count. This low count was probably the result of the questions (or lack of specific) the students were asked in the survey. The analysis of student cases (Study 3) goes further into how and why students participated in specific component-activities.

Towards online and Towards In-person were used as the codes because many of the questions were hypotheticals or asking students what they would do in the future. This is a limitation of the study in that it is unclear what decision a student will actually make in the future. Nevertheless, the combination of a student's efficiency evaluation (described in a later section) and the participation (illustrated here) gives insight into the rational thinking that students have when making decisions about how and why to participate.

Table 5.2.20
Code usage for *student participation decisions*

Framework Area	All Courses		Online Only		In-Person Only	
	Excerpts	Students	Excerpts	Students	Excerpts	Students
Participation Decision in Course	306	162	97	57	209	105
Towards In-Person	192	158	74	63	118	95
Towards Online	194	169	82	71	112	98
Participation Decision in Component-Activity	40	29	17	10	23	19

Efficiency Criteria. When asked about how to improve the discussion board in the class, Subject 027 (Excerpt 6037-6225) stated "Just not enough interest in the student body for it to work. If everybody used it, it would be fine, but it wasn't promoted enough. Maybe incentives... extra credit? Participation grade?" This statement is not just an opinion about how the discussion boards did not work as a result of lack of participation; this statement is a speculation about how students would decide to participate. Here the

student suggests that the course needs to make the participation more appealing through incentives. This suggests that the student views the students in the class are using some kind of efficiency criteria to decide when to participate. This statement by a student is just one example of how students were weighing the costs and benefits of participating as criteria for making the decision to actually participate.

The codes used for efficiency evaluation evolved over the course of coding. This area code area originally started without any criteria. Prior to the coding, the researcher had considered a theory that students would describe some level of cost-benefit analysis, particularly that of time, effort, money, and resources (as costs) and content learning (as a benefit). However, as coding moved forward, patterns of efficiency criteria began to emerge. And each comment related to criteria could be identified as relating to seven categories: *Access, Content Learning, Contribution to Goals or Interests, Affect Satisfaction, Process Performance, Time / Effort,* or *Money / Resources*. Below are the definitions for these variables and example of a coded student excerpt.

Table 5.2.21
Definitions and examples of *Efficiency Criteria*

Framework Area	Definition	Example of Student Excerpt*
Access	Any reference to the ability to use or interact with materials, component-activities, or content in the course and/or the level at which this access occurs.	Subject 220 (1841-1981): "Could access it whenever I wanted to." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Content Learning	Any reference to the degree to which a student would learn the content in a course.	Subject 141 (2141-2333): "I would think the material would be better taught in a person to person interaction."
Contribution to Goals or Interests	Any reference to the degree to which participation would contribute to the individual's goals or interests.	Subject 033 (1926-2100): "good for adding along G.E.'s to the unit pool" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Affect Satisfaction	Any reference to an individual being emotionally satisfied, happy, or content with participation.	Subject 215 (Excerpt 1565-1766): "Doesn't feel like a class. I enjoy the experience of going to a classroom and being involved. Taking a course online, you can learn the same material, but it is not enjoyable. Not necessary. Why online?"
Process Performance	Any reference to the degree with which an activity runs as intended without unintended or unexpected hold-ups or setbacks.	Subject 205 (Excerpt 2106-2198): "I heard the online course was having technical difficulties." (When asked, "Why did you choose to take the in-person course rather than the online version of the course?")
Time / Effort	Any reference to the amount of time or effort an individual invests or expends on participation	Subject 220 (6533-6977): "Overall, I will not be taking another online course. It was too much busywork and required too much energy and effort to make sure that I was connected to Adobe connect at the right times, in the right place"
Money / Resources	Any reference to the amount of money or resources an individual invests or expends on participation	Subject 210 (1565-1735): "Having to buy the headphones in order to take the online class." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")

*More examples of student excerpts are displayed in Appendix I

The examples above show the various ways student decisions can be influenced. Some of these influences are less obvious. For example, when responding to the survey question about why they would not take an online course in the future, Subject 096 (Excerpt 1564-1582) said, [it was] "hard to contact the TA." And later when discussing what else they would like to say about their experience in the course, this same person

(Subject 096; Excerpt 6161-6376) said, “I attempted to meet with my TA twice and both times we made an appointment and both times he did not show up. This made it extremely difficult for me to get help from him and talk about how I could improve my grade.” The teaching assistant caused this failure of process by not communicating with the student but this might not have occurred in an in-person course because the student could have approached the teaching assistant after discussion or in the lecture. Here, we can see the student use the process performance criteria (as described above) to make a decision about whether to enroll in an online course in the future.

The distribution of the application of these codes is uneven. The codes most used were Access, Time/Effort, and Process Performance. Two of the codes represented costs to the student: Time/Effort and Money/Resources. The other codes represented either positive-aiming outcomes (Affect Satisfaction, Content Learning, Contribution to Goals / Interests) or operational functions (Access and Process Performance). These operational functions were added to the efficiency evaluation because positive comments seemed to contribute to positive outcomes, a seamless process for learning without instructional, learning, or infrastructural setbacks, and/or little cost. Negative comments seemed to suggest negative outcomes, a disordered process, and/or high cost. In other words, positive comments seemed to signal a high gain, a smooth process, and/or a low cost. Negative comments seemed to signal low gain, a difficult process, and/or a high cost.

Costs: Time-effort and money-resources. One aspect of an efficiency evaluation that began to emerge was that of costs. Students discussed costs in terms of time and effort or money and resources. These two areas of costs presented themselves as distinct.

The expenditure of *time* and *effort* seem to be closely related but somewhat distinct. In this investigation, *time* and *effort* were not separated, as the distinction between the two was subjective. At the far end of *time* expenditure could be an example of watching television. While watching television, time is spent but not much effort is exerted. At the far end of effort is an example of solving a very difficult problem. In this case, there might be little time spent solving the problem, however, tremendous effort is exerted in solving the problem. An example in the center of this continuum may include solving a number of semi-difficult problems. In this case, there is a moderate amount of time and effort exerted in completing a task. However, the distinction between these two is difficult to determine as an external observer and can be even more difficult in ambiguous situations. For example, when a student attends a discussion section, they expending some time, however, the amount of effort they are putting into the situation might not be readily observable. Or a student might be able to complete a redundant set of tasks for class while they are paying attention to a video or podcast outside of class. In future studies, this distinction may be more important since a student could potentially put in a lot of time into study but not effort and thus not reach the desired outcomes. From the code count table below, we can see that this area is very high and equally distributed between online and in-person students. This suggests that despite the format of the course, many students were concerned about time-effort.

Similar to the Time-Effort continuum, *money* and *resources* have a close relationship that would be difficult to separate. Thus, they were left as a single variable. However, unlike *time-effort*, not as many students discussed *money-resources*. This could have been a product of the questions asked or this sample of students were not as

concerned about costs in terms of *money-resources*. Or perhaps, *money-resources* is a cost that is calculated at a broader level, such as for the whole term, whole academic year, or whole academic career at a school. Students may not have had to invest as much (or anything) in terms of money-resources for a single course when it was grouped within a whole schedule of courses that the student was taking as part of regular tuition. Further, the resources a student may have needed to take an online course could already have been on hand.

Gains: Content learning, contribution to goals or interests, and affect satisfaction. The second part of an efficiency evaluation is the determination of the gains. While students might have many reasons for taking a course or a section, it seemed that the students in the course studied in this course gave three potential gains: Content learning, contribution to goals or interests, and affect satisfaction.

Content Learning had a high hits for both online and in-person students, suggesting that this is an important gain for students regardless of the mode of instruction. And because it was used in the context of efficiency criteria, it suggests that students were making decisions based on whether or not they would learn the material.

Contribution to Goals or Interests had a low to moderate number of hits. However, it is clear that the online students were discussing this more than the in-person students. The lower count in this area suggests that students were less concerned about how their participation in this course or in a specific intervention affected their movement towards goals and interests. Or the questions may not have elicited comments about goals or interests.

Affect Satisfaction had a moderate number of hits. Somewhat surprisingly, students' emotional satisfaction was discussed more often than their goals and interests. Perhaps this suggests the course in question had less to do with helping achieve goals and interests than their immediate desire to go smoothly through a course they were required to take. However, because of the range of questions, students may have been commenting more on their immediate experience or perceived experience in a course than on any additional or long-term benefits.

Operational functions: Access and process performance. The last part of the efficiency evaluation is determining the degree to which outcomes can be accomplished through the given means and how swimmingly that process will go. How seamlessly a student is able to move through the course without logistical hang-ups is referred to here as operational function. There were two main variables found that related to operational functions: *Access* and *Process Performance*.

The *Access* code had a very high application count that was fairly evenly distributed between online and in-person students. The route to the learning process seemed to be an issue that resonated with multiple students. With that many hits, *Access* was a natural place to look for sub-codes, and as the next section explains, there were clear types of *Access* that emerged.

The other operational function found in this study was *Process Performance*. This code was also used in abundance and was used slightly more by the in-person students. Thus, students also thought it was important how well the instructional and learning process would go once the course was underway. Putting the two operational functions together, essentially, if students feel that they are not going to be able get to the learning

process in a smooth manner or if they think that the process will be unnecessarily laborious or time-consuming, then a negative perception will ensue and they may be less likely to pursue that avenue of learning.

Table 5.2.22
Code usage for *Efficiency Criteria*

Framework Area	All Courses		Online Only		In-Person Only	
	Excerpts	Students	Excerpts	Students	Excerpts	Students
Access	214	156	91	67	123	89
Content Learning	88	71	34	28	54	43
Contribution to Goals or Interests	27	24	18	15	9	9
Affect Satisfaction	49	41	18	12	31	29
Process Performance	117	93	42	32	75	61
Time / Effort	163	111	64	43	99	68
Money / Resources	18	18	6	6	12	12

Types of Access. As the coding progressed, it became apparent that students were talking about different types of access as criteria for participation decisions. It is important to distinguish between these because they are quite different forms of access. However, because students often would just say "Access" or "Convenience" in the survey, the specification of access could not be identified. This means that future studies may want to specify the types of access that make up their decision criteria and ask specifically what students mean when they discuss access and convenience.

The codes were used in varying amounts: Fit with Schedule was high; Place Access, Interaction / Communication, and Course Format were moderate; Other External Possibilities and Course Offering were low. That Fit with Schedule was the highest used code is interesting since it has little to do with the format of the course. Students often discussed Course Offering as a reason for enrolling in the course or why they might take an online course again. This could relate to the issue of online courses in that if online

courses are implemented, there may be more course offerings. However, in many of the student comments, the students were not discriminating; they would explain that they enrolled in the in-person and online versions of the course because it fit their schedule.

Place Access, Interaction / Communication, and Course Format each had moderate usage. Place Access most often indicated students' perception or experience that they could access the course in any location. Conversely, this code would indicate when students chose not to enroll in the in-person course because they had to be at a particular place at a particular time. Interaction / Communication referred to students being able to accessibly communicate or interact with others in the course. In the survey responses, students would often lament the inability to "interact" or easily communicate in online courses. This was the one access code that was more often used as justification for choosing in-person over online courses. Course Format, the last moderately used Access code was also commonly used as justification for in-person over online courses, however, this code was split as many students had differing preferences for modes of instruction (vacillating between online and in-person formats). Below is a table with the definition and example of each of these access codes.

As a note, many students stated that they took the course out of convenience or flexibility, often using just one work to describe this decision criterion. In these cases, the code used was just the General Access code. These comments were not sub-coded as they were too general to know specifically what the student was referring to. Future studies may want to determine what students mean by convenience or flexibility.

Table 5.2.23
Definitions and examples of *Types of Access*

Framework Area	Definition	Example of Student Excerpt*
Place Access	Any reference to the degree to which one was able to use or interact with the course, materials, component-activities, or content from a desired location.	Subject 195 (Excerpt 2464-2604): "Don't have to get up and get to class" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Interaction / Commun-ication	Any reference to the degree to which one was able to communicate or interact with others in the course.	Subject 155 (1566-1757): "It is harder to make friends or interact with other people when the course is online." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Course Format	Any reference to the degree to which one was able to use the format that she/he perceived as most suitable to their wants/needs.	Subject 175 (1795-2009): "I liked that I could watch lectures when it was convenient for me and was able to rewind if i missed something." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Fit with Schedule	Any reference to the degree to which the course fit in with other activities in the schedule/calendar of an individual.	Subject 034 (6367-6852): "Really want to emphasize that the flexibility of the course helped out because I have a curve of tons of homework at a certain point of the week and nothing to do on the other days so the ability to choose whenever to do the work was extremely helpful."
Other External Possibilities	Any reference to the degree to which participation would have an impact in being able to participate or take advantage of possibilities outside of the course.	Subject 228 (2397-2601): "Being able to watch the lectures online when I miss class (a common occurrence for a varsity athlete)"
Course Offering	Any reference to the offering of a course at the university.	Subject 003 (2256-2396): "I've noticed it's getting harder to get a reasonable schedule going after the recurring budget cuts and an online class solves this problem."

*More examples of student excerpts are displayed in Appendix I

All of the Access codes have some overlap. For example, Fit with Schedule indicates the need to be at a particular place at a particular time, even if that particular place is in a location where Internet can be accessed. Fit with Schedule also has some overlap with Other External Opportunities, since having a course that fits a schedule allows one to take advantage of the other possibilities that already fit in the schedule. Also Course Offering fits with Fit with Schedule, since the offering of the course happens

to be at a time (or is not at a time) when the student can enroll. While there is overlap, making a distinction between these issues provides an enhanced perspective on what is driving the access issue and what pushes students to choose different course formats.

Table 5.2.24
Code usage for *Types of Access*

Framework Area	All Courses		Online Only		In-Person Only	
	Excerpts	Students	Excerpts	Students	Excerpts	Students
Place Access	44	39	15	13	29	26
Interaction / Communication	35	35	14	14	21	21
Course Format	36	32	16	14	20	18
Fit with Schedule	108	103	49	49	59	57
Other External Possibilities	9	9	4	4	5	5
Course Offering	9	9	5	5	4	4

The Evaluation codes were used to describe how students evaluated the course, portions of the course, or hypotheticals of either of these. While the section earlier described the actual participation decisions, this section describes evaluation. The *Positive Online* code indicates that a student had discussed online courses in a positive way. Similarly, *Negative Online* indicated negative perceptions of online; Positive In-person indicated positive perceptions of in-person courses; Negative In-person indicated negative perceptions about in-person courses.

Table 5.2.25
Definitions and examples of *Evaluation*

Framework Area	Definition	Example of Student Excerpt*
Positive Online	Any comment that suggests a positive regard for an online course(s)	Subject 183 (1814-2027): "Online courses make it easier to manage my time, especially if I am taking hard core classes towards my major."
Negative Online	Any comment that suggests a negative regard for an online course(s)	Subject 227 (1566-1873): "The lack of face-to-face interaction with an online course is a big turnoff. It is important to my learning to have the back and forth discussion that you can really only have in and in-person course."
Positive In-Person	Any comment that suggests a positive regard for an in-person course(s)	Subject 095 (1810-2037): "Attending lectures keeps me on pace with the class, and reminders make more of a difference to me if they are in person."
Negative In-Person	Any comment that suggests a negative regard for an in-person course(s)	Subject 148 (2323-2467): "don't have to sit in a huge lecture hall" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Positive Component Activity	Any comment that suggests a positive regard for a component-activity	Subject 093 (6557-7001): "I sometimes preferred the readings over watching lectures. It may have been because he was talking too fast in the videos for me to take notes and most of it was similar wording to what it said in the book."
Negative Component Activity	Any comment that suggests a negative regard for a component-activity	Subject 142 (6834-7214): "Quizzes and tests focused on inane bits of information straight from the book. Students were rewarded for memorizing tidbits of trivia from the text rather than understanding the concepts of the class."
Positive In-Person Component Activity	Any comment that suggests a positive regard for an in-person component-activity	Subject 091 (1814-1958): "I learn better when I attend lectures"
Positive Online Component Activity	Any comment that suggests a positive regard for an online component-activity	Subject 222 (6529-6584): "videos were often better than going to class sometimes."
Negative Online Component-Activity	Any comment that suggests a negative regard for an online component-activity	Subject 209 (2583-2661): "almost every quiz was bugged, requiring constant re-evaluating of the scores."
Negative In-Person Component-Activity	Any comment that suggests a negative regard for an in-person component-activity	Subject 220 (5414-5708): "T.A. and students did not want to talk to each other. Felt like we (students) were just sitting and listening and once a question came up, everyone coward until someone else answered it." (When responding to the question, "Is there anything else you would like to say about your experiences attending discussion sections?")

*More examples of student excerpts are displayed in Appendix I

There were a large number of comments that gave positive and negative evaluations of online courses; moderate number of positive in-person courses; and a low number of negative in-person courses. Part of the skew in comments was most likely an artifact of the survey; students were prompted to discuss online courses, so they would mainly use in-person courses as a reference. Future studies would benefit from looking at where the evaluation of students is aimed.

Table 5.2.26
Code usage for *Evaluation*

Framework Area	All Courses		Online Only		In-Person Only	
	Excerpts	Students	Excerpts	Students	Excerpts	Students
Positive Online	190	162	78	67	112	95
Negative Online	152	130	61	52	91	78
Positive In-Person	55	53	18	18	37	35
Negative In-Person	5	5	2	2	3	3
Positive Component-Activity (General)	7	7	4	4	3	3
Positive In-Person Component-Activity	33	28	4	4	29	24
Positive Online Component-Activity	45	35	21	18	24	17
Negative Component-Activity (General)	9	7	5	3	4	4
Negative In-Person Component-Activity	34	28	7	6	27	22
Negative Online Component-Activity	236	130	88	46	148	84
Idea for Improvement	45	33	18	14	27	19

Potential Framework Changes base on Student Surveys

While the primary purpose of the coding was to answer question 2.1, it also allowed for the analysis of questions 2.2 and 2.3.

- *Course case study question 2.2: Is there anything about the framework that was not described by the subject course?*

- *Course case study question 2.3: Is there anything about the course that was not described by the framework?*

Many sub-codes were added to the coding after the coding began. As specific properties and processes that fell within a main code became apparent from the student comments, a new code was added. Some of these sub-codes include *Control of Timing* (as described below), *Control of Location*, *Access Types*, *Student Participation* sub-codes, *Student Evaluation* sub-codes, some *Curriculum and Content* sub-codes (such as *Amount of Work* and *Complex or Difficult*), and most of *Student Input* sub-codes. And a major area that was excluded from the model was the way the instructor interacted with the course; this exclusion is explored more below.

Instructor Participation. The original conceptualization of the framework pushed to operation of the course to the instructor. In hindsight, something that was quite obviously excluded from to the framework was how the instructor actually participated in the course. The need to add this new area of the framework became apparent in the coding of the very first subject. In an open-ended response to conferencing software on the post-course survey, Subject 001 (excerpt 5441-5554) stated, "My TA wasn't on [the conferencing software] during office hours, though if I e-mailed in advance I'm sure it would have worked." In this statement, we can see the student-making note of the actual participation of the instructor. Below are some excerpts that show that students were noticing the influence of instructor participation.

Table 5.2.27
Example excerpts of Actual Instructor Participation

Location	Example Excerpt
Subject 001 (Excerpt 5441-5554)	"My TA wasn't on [the conferencing software] during office hours, though if I e-mailed in advance I'm sure it would have worked."
Subject 003 (Excerpt 1807-2074)	"Our instructor is probably one of the better professors I've had at [this university]. The nature of this class minimizes the time we spend with him and I don't feel like I'm getting my money's worth by taking this course even though it's well thought out in general."
Subject 010 (Excerpt 2352-2427)	"i think my TA had a difficult time playing a video for us during discussion"
Subject 028 (Excerpt 6739-6826)	"Participating was made easier with the smaller class size and with the TAs' initiation."

Student Personal Theory Development. Students make predictions about their own participation and the participation of others in the course. For example, many of the students discussed how much work they had put in to the course and how few units they were receiving for the course. Subject 157 explained, "it [the course] should be more than 3 units. we are putting in a lot of work to be in this class (i mean completeing [sic] a lot of hw) and I should be getting at least 4 units for that." The student is making an efficiency evaluation of their work completed in the course and analyzing how much effort they have put into the course (Actual Student Output) compared to the units they will be receiving (Actual Student Outcomes) and see that it does not match up. However, because students are often unable to drop a course and sign up for a new course without repercussions (e.g. falling behind in the other class, possibly losing financial aid for having too few units if they just drop the course, being past the add/drop period), they continue with the course knowing they are putting in more effort into the course than the perceived value.

Timing and the separation from Pacing, and Sequencing. Pacing is the rate at which course material is taught and learned. Sequencing is the order in which material is

taught and learned in relation to other material in the course. Timing is the moment in which material is taught and learned in relation to world in general. This study showed a clear separation between the three temporal types of control. Future studies should look at this further. However, both the evidence from this study and a strong supporting theory provides compelling support for adding Control of Timing to future versions of the framework.

Connections

The last research question was an inquiry into the connections between different areas of the framework:

- *Course case study question 2.4: Does the subject course present evidence for the hypothesized connections between the different sections of the model*

The coding showed a number of potential connections. However, because of the nature of the student survey, future research would need to explore these connections further using additional, more directed methods. Below are some examples of the potential connections that were found in the student surveys:

- Institutional Issues – Course Operation: "I've noticed it's getting harder to get a reasonable schedule going after the recurring budget cuts and an online class solves this problem." Subject 003 (Excerpt 2256-2396)
- Course Assembly Input – Component Characteristics and Operation – Actual Student Participation: "Regarding transcripts and interactive lectures, make sure the reading transcripts correspond with the correct interactive lectures. A few transcripts were for different lectures which confused me at first." Subject 010 (Excerpt 3233-3438)
- Technology Input – Actual Student Participation: "Internet disconnected a few times when I was trying to speak to the class and I realized after I spoke for a minute no one could hear me so it complicated things a little." Subject 003 (Excerpt 2720-2891)
- Technology Input – Actual Student Participation: "Also, during online discussion, poor or non-existent audio normalization presents a challenge when listening to participants. Some participants have microphone broadcast volumes that are too

loud and some that are too soft, where taking turns on the mic is also a scramble with how fast you can adjust your headset volumes." Subject 006 (Excerpt 2824-3147)

- Symmetry – Student Participation Decisions (Efficiency Criteria): "The almost one-way learning (through videos and reading) with a lag time of at least a day for human interaction (via online discussion and online office hours) made me question whether my efforts were too little or too much." Subject 006 (Excerpt 8570-8794)

A more detailed explanation of connections in the model based on student statements is narrated in the following paragraphs. From these statements, we can see the unique experiences of the students but they also hint at the connections between the various sections of the framework:

- Subject 006 (Excerpt 8458-8569) discussed how it was difficult to adjust to the online environment: "The biggest challenge was accepting a whole new way to learn. The new learning method took a while to adapt to." One of the more interesting things about Subject 006 was that they first came to college in 1994, making their duration in the undergraduate world over 10 years longer than the next student with most time in college. Understandably, this student might have a little more of a difficult time adjusting to an online course than his counterparts. This represents a connection between Student Input and Student Participation.

- Subject 027 (Excerpt 6613-6964) hints towards how the process of *Student Participation Decisions* are influenced by *Actual Student Participation* when he said, [The course] "was challenging in the beginning until I understood how the class worked. [I'm] On top of the schedule now that I understand." This statement suggests that the student needed some orientation in the course before he could get "on top of the schedule", which suggests either orienting to the instructor's control of pacing or sequencing or building in some kind of decision processes around their own (student) control of the pacing or sequencing of course components. After they made the decision to participate in a certain way, they suggested they kept to that pattern.

- Subject 007 provided an example of the connections between participation and output with outcomes. This comment acknowledges that there was disconnect if the instructor's intended outcomes were to have students learn more conceptually. This student explained that because the assessments required students to learn the facts, students would learn just the facts: "Quizzes and tests focused on inane bits of information straight from the book.

Students were rewarded for memorizing tidbits of trivia from the text rather than understanding the concepts of the class."

- Subject 032 (Excerpt 6590-6793) suggests some of the connections between certain areas of the model by stating, "I really enjoyed the essay assignments. Normally, I don't like writing homework--me being a science major. But I felt like I got a better grasp on the impact of [of this subject area] by writing essays." The Internal Characteristic Input (being a science major), normally would make her dislike assignments, however, she realized (or made an efficiency decision) she got a better grasp of the impact of the subject matter through the *Participation* in the *Component-Activity* of the essay writing, which is related to both her Internal Characteristic Input of being a science major and possibly her own personal goals related to being a science major.
- Subject 030 (Excerpt 3501-3937) "I emailed my TA and instructor about the problems that I was having with my laptop and using the website and they did not have a solution for me. Granted, it was most likely something wrong with my computer and not anything to do with them- it was still frustrating completing the end of this course all on my friend's computer." This shows the path or *Technology Input* > *Course Operation* > *Actual Student Participation* > *Actual Student Output* and *Actual Student Outcomes*. This is not something that could easily be modeled statistically. But it shows how much could be unnoticed when things go right with technology.

From these examples, we can see that there is a strong potential for connections between various portions of the model. However, almost all of the specific types of situations described above are one off. Future research will need to look more closely as some of the connections in the model to establish patterns that educators and researcher can use as signals of good or bad online course environments.

Instructor Interviews

The instructor portion of the framework predicted that instructors would make decisions about the operation of the course and would participate in ways that reflected both personal participation and the operation of the course. After the coding of the student surveys, it became clear that there should be a complete separation of the instructor actor from both the course/media actor and student actors. This meant that the output, outcomes, and impact of the instructor should be independent of other actors in the course.

The coding of the instructor interviews was conducted with a different set of codes than the student interviews. The need to take into consideration the independence of the instructor from other actors in the course meant the need to update the coding scheme. After an initial coding of the instructor interviews, it became clear that the way the instructors described their experience was fairly different than the student descriptions. Without prompt, the instructor considered each of the different actors in the framework more than individual students. Additionally, the instructor alternated his discussion between the past and current state of affairs and what he predicted for the future. The students on the other hand were describing mainly their past or current experience in the course. Part of the reason for this regular switch between past/current and future was that the course was still under development for all of the interviews, especially the first interview.

One other important note was that all of the interviews were conducted before the implementation of the course sections used in the case. While the instructor described experiences with the course, these were during the assembly of the course and during the

first implementation of the course (a full year before the sections used in this case study). Thus, his comments do not match up temporally with the implementation of the course in this case study.

The instructor interview analysis was presented according to each of the actors in the framework. First the results for the main sections of the Instructor Actor are presented, which is then followed by instructor decisions. General data for other actors in the framework follow the instructor. After that, the main sections of Course/Media, which is followed by the data for course operation. Each of these sections starts with framework definitions and a sample excerpt from the instructor. This is followed by an analysis of the coding data for that section.

Because there was only one instructor interviewed (albeit three times), the coding usage was expected to be somewhat low. However, any usage of a code would signal the potential existence of that portion of the framework as a real occurrence. Further, the instructor was interviewed on three separate occasions. The first and second were both prior to the instructor ever implementing an entirely online course: the first interview was approximately seven months before implementation and the second was one month before implementation. Thus, the first two were purely course assembly and anticipation of the first implementation. The third interview was conducted three months after the completion of the first instance of the course. However, as mentioned earlier, that course was one full year prior to the sections studied in this case. Nevertheless, the three separate instances of interviews should provide some insight into the thought processes of the instructor during three different moments in course implementation.

One last difference between the three interviews is important, the length of the interviews varied. The first interview lasted a total of 67 minutes and the transcription had approximately 10,000 words. Interview 2 was conducted over 68 minutes and had approximately 7,300 words in the coded transcription (parts of Interview 2 were not used because of the lack of relevance to this particular study). And Interview 3 ran for 55 minutes and had 7,000 words. Thus, interview 1 could have many additional code applications simply because of the additional length of the interview.

The Instructor Actor represents how the instructor viewed himself as through the lens of these types of characteristics and processes: Instructor Input Characteristics; Instructor Decisions; Instructor Participation Decisions; Instructor Participation; Instructor Output or Outcomes/Impacts. Because there was only one instructor that was interviewed, it was expected that the code usage would be low. However, because this portion of the framework represents the instructor and because the instructor would most likely reference their own actions during the interview, these particular codes were expected to be somewhat greater in usage.

Table 5.2.28
Definitions and examples of *Instructor Actor*

Framework Area and Definition	Example of Instructor Interview Excerpt
Instructor Input Characteristics: Any reference to input variables related to the instructor or TA input characteristics. These characteristics refer to any permanent or semi-permanent characteristic that the instructor brings to the course upon entry or developed during the course.	Instructor Interview 1 (Excerpt 31014-31131) INTERVIEWER: Have you ever taught an online course before, specifically? INSTRUCTOR: Uh, not in this, not this much.
Instructor Decisions: Any reference to a instructor making decisions about the course	Instructor Interview 3 (Excerpt 29141-29575) Interviewer: So, I'm just kind of curious, as time went on, did you just kind of back off? Instructor: Yes. And once the TA became more skillful, they didn't need that back-up. It became clear that after about two weeks, I would just be in the way and would prevent the students from focusing on the person that was running the session, which I don't want to do at all. So, running the course was trivial once everything is in place
Instructor Participation Decision: (Participation in Course or Component OR How to Participate in Course or Component) Any reference to the instructor making a decision to participate in the course, a component-activity, or the reference in how he/she will participate in either	Instructor Interview 3 (11297-11691) And I think coming to the discussion sections, I need to promote the review sessions and tell them. So I'll try in due time try to improve that and maybe include a Doodle on when we should have discussion and when we have review sessions and make appointments for students to come meet with me in a webinar. But I have the webinars run by the TAs so, they have interacted with me to some degree
Instructor Participation: (Including Communication, Action, or Experience) Any reference to Instructor Participation, including Communication, Action, or Experience	Instructor Interview 1 (22926-23489) INSTRUCTOR: Um, what I'm doing is, I'm doing some pilots. I've written the scripts for all the pilots now, and [instructional designer] has read and edited them, and incorporated, we're going to do some of the productions, then I'm going to go with the professional staff here because the videos for the campus, and they're going to go through the ones that I've done and criticize them and make suggestions. And then I'll correct those, and then use those lessons learned to make sure that the subsequent ones have those techniques and improvements incorporated.
Instructor Output or Outcomes/Impacts: Any reference to Instructor Output or Outcomes/Impacts	Instructor Interview 2 (9539-10312) …I'm curious how much time you're spending on the affiliated tasks with getting this course together. INSTRUCTOR: Conservatively, 60 hours a week. INTERVIEWER: 60 hours a week? INSTRUCTOR: Yes. INTERVIEWER: Wow. And that's development of the videos as well as the kind of ancillary tasks that are required, including approvals and ADA compliance? INSTRUCTOR: Correct

Something that would be difficult to convey through quantitative data was the goals that this instructor had. This was not a random instructor pulled out a hallway to teach this course. The instructor was genuinely interested in helping students learn the material. But also, the instructor was well funded with broad support from institutions across the country. This allowed him to put in the 60 hours per week (as described in the output/outcome variable area of Table 5.2.28 above) and pushed the instructor to have goals that were broader than the implementation of this course at this particular university. He wanted to make this material available to institutions across the country as described here (Interview 3, Excerpt 29,577-30,219):

> And that's the hope that this investment of two years full-time will start to allow the course to be taught five times per year, will allow it to be a massive open online course that people can do and grade themselves and the outreach will be much greater than the… and well worth the time that I spent on it. And the updates of the course and the materials will be… well, the videos are just little clips. I can update the video clips, it's just like a movie. When they video record a movie, it's not all in one piece. It's made of little scenes and retakes and all that stuff. You can substitute new material for old material, change figures..

The code usage for each area of the instructor actor portion of the framework was somewhat high given the low sample size of one instructor with three instances of interviews. While the code count was very similar across interviews, Interview 1 had quite a few more comments in the area of Instructor Decisions. Part of the reason for the difference could have been the extended length of interview 1. However, Interview 1 has nearly double the usage for this code as both Interview 2 and Interview 3. Further reason for this additional count could be the expectation of things to come and the need to make decisions leading up to the implementation of the course.

Table 5.2.29
Code usage for Instructor Actor portion of the framework

	Total	Interview 1	Interview 2	Interview 3
Instructor Input Characteristics	**19**	8	5	6
Instructor Decisions	**54**	27	13	14
Instructor Participation Decision (Participation in Course or Component OR How to Participate in Course or Component)	**17**	6	5	6
Instructor Participation (Including Communication, Action, or Experience)	**30**	13	8	9
Instructor Output or Outcomes/Impacts	**15**	4	6	5

This next section looks at issues related to instructor decisions. As mentioned in the introduction to the instructor interview analysis, the instructors took into account a broader perspective of the implementation of the course and how it fit in the larger environment. The instructor had a more multi-leveled decision processes than the students. While the students were concerned mainly with their own costs and benefits, the instructor considered a variety of targets for cost-benefit. For example, while the instructor considered his own costs and benefits as of primary importance, he was also concerned with the costs and benefits of the student and the university. Further, the instructor gave thought to time outside of the current implementation of the course. The instructor thought about how the section had been but also how it could be in the future. Below is an example of when the instructor reflected on their situation and alludes to multiple parties and times related to the decision portion of the framework (interview 1, excerpt 44225-45433):

> Lectures, I've been told that the average attendance at lectures at [this university] is about… 30 to 40% of the students enrolled actually attend lectures. I get about 70 or 80%, which is, I think, I take pride in. But I hear that's unusual, particularly for a general ed class. To give you one example, we

> have some classes that have 1000 students enrolled, but we only an auditorium that holds 600. So, it's anticipated that 400 students will not attend the lecture each time. So I see that this is a great benefit over that. There are things that students do better, you know, first of all, it's not possible to have lectures that are 10-minute segments, 10 times a week. Just because of convening people is too time-consuming. It's not efficient; it's not viable to do it that way. With video segments, you can do that. You can assign 10 segments, or 4 or 5 segments and they can actually attend those. And then they can review it because they can be quite dense. So I see that being an advantage over a lecture, where people are not as engaged as they might be if they had a shorter, because of the short attention span, and because of the inconvenience of going to a specific site at a specific time.

In this excerpt we can see the instructor addressed a range of efficiency evaluation issued: temporally, the instructor described the current situation and how the online solution will impact future iterations of the course; for targets, the instructor described benefits to the students, the instructor, and the university; and the instructor described how the videos benefit the university through the easing of resources, the instructor by making short lectures more viable through online mode, and the student by making lectures more accessible and creating a process that is better for learning. As we look at this interview and subsequent interviews, the instructor also takes into account the time-effort that creating these lectures costs the instructor. Because the instructor was funded through external agencies, the instructor was able to create the videos, even at a high time-effort cost to him.

This section looks at multiple issues that the instructor considered in his description of the decision process. There were a set of codes that looked at the instructor assessment of the positive and negative aspects of online and in-person courses (Online Positive; Online Negative; In-Person Positive; In-Person Negative). Another set of codes looked at who was the target of an efficiency evaluation (Instructor Target; Student Target; Institution Target; and Other Target). There were two codes for the perspective of time in the efficiency evaluation (Time – Past/Present; and Time – Future). And finally, there were three codes used to mark the criteria of an efficiency evaluation (*Costs* –

Time-Effort or Money-Resources; *Gain – Learning, Goals, Satisfaction*; and *Operational Functions – Access and Process Performance*). Table 5.2.30 below provides the definitions and some example excerpts from the instructor interview that reflect these codes.

Table 5.2.30
Definitions and examples of Instructor Decisions

Framework Area and Definition	Example of Instructor Interview Excerpt
Online Positive: Any positive reference to the online version of the course	Instructor Interview 1 (43685-44413) So I see that this is a great benefit over that. There are things that students do better, you know, first of all, it's not possible to have lectures that are 10-minute segments, 10 times a week. Just because of convening people is too time-consuming. It's not efficient; it's not viable to do it that way. With video segments, you can do that. You can assign 10 segments, or 4 or 5 segments and they can actually attend those. And then they can review it because they can be quite dense. So I see that being an advantage over a lecture, where people are not as engaged as they might be if they had a shorter, because of the short attention span, and because of the inconvenience of going to a specific site at a specific time.
Online Negative: Any negative reference to the online version of the course	Instructor Interview 3 (33856-35088) Instructor: I think there has to be a way. I got a lot of support from the instructional designers. And I think that this is such a new way of doing it and having a support group for instructors. And I think this is pretty necessary. I don't think that they're gonna get the support I've gotten. But the issue is that it has to be easy for the people to adopt. One of the main impediments to adopting something like online learning or even pedagogical methods or interactive pedagogical methods that prove to be effective is the time. Time and efficient. It's true here and it's true worldwide that the time spent teaching is negatively correlated to the salary that people are paid. So, advancement at [this university] is inversely related to the amount of time you spend teaching. So how do we address that? We have to make this online instruction easier to implement. That's an easy task, isn't it? I mean, recording lectures or doing electronic workbooks, doesn't really use the medium to any advantage. So, I know that there are a number of colleagues in this program that are doing that. But a number are not. They're doing the [other subject] classes are pretty creative. I haven't seen many of the other classes as closely.
In-Person Positive: Any positive reference to the in-person version of the course	Instructor Interview 1 (43205-43420) Lectures, I've been told that the average attendance at lectures at [this university] is about 30 to 40% of the students enrolled actually attend lectures. I get about 70 or 80%, which is, I think, I take pride in.
In-Person Negative: Any negative reference to the in-person version of the course	Instructor Interview 1 (43205-43683) Lectures, I've been told that the average attendance at lectures at [this university] is about 30 to 40% of the students enrolled actually attend lectures. I get about 70 or 80%, which is, I think, I take pride in. But I hear that's unusual, particularly for a general ed class. To give you one example, we have some classes that have 1000 students enrolled, but we only an auditorium that holds 600. So, it's anticipated that 400 students will not attend the lecture each time

Table 5.2.30 Continued
Definitions and examples of Instructor Decisions

Framework Area and Definition	Example of Instructor Interview Excerpt
Instructor - Efficiency Target -- Any reference to the Instructor in regards to efficiency	Instructor Interview 3 (11297-11691) And I think coming to the discussion sections, I need to promote the review sessions and tell them. So I'll try in due time try to improve that and maybe include a Doodle on when we should have discussion and when we have review sessions and make appointments for students to come meet with me in a webinar. But I have the webinars run by the TAs so, they have interacted with me to some degree
Student - Efficiency Target -- Any reference to the Student in regards to efficiency	Instructor Interview 1 (8754-8956) INTERVIEWER: Do you have students that come up with uh, contrary viewpoints and discuss it with you? INSTRUCTOR: Uh, some of them do, uh. Usually, that takes more effort than they're willing to expend.
Institution - Efficiency Target -- Any reference to the Institution in regards to efficiency	Instructor Interview 2 (7520-9482) INTERVIEWER: Yes, absolutely. So can you say a little bit more about the ADA issues in general? I mean, it sounds like it was more than just this particular incident. INSTRUCTOR: Yeah, someone in the Office of the President—and I won't say who—is more concerned about ADA than anything else, and so whether the material is ready or not for the other students isn't as important as it being ADA-compliant from the get-go. And this has to be compliant for people who are blind, deaf, color-blind, or have other learning disabilities, which is… usually when you teach a course, you can get assistance for that. For the deaf people, we already have scripts, but sometimes in the script when I'm doing the editing, just because they're too long, I've discovered that I have 20 minutes of video when I'm trying to get them down to below about… somewhere around ten minutes, because I think that's the length of people's attention span. So I do cutting. There are scripts, sometimes the words are not, I don't say them because I've cut that part out. That wasn't acceptable to this person, and so there was threats to eliminate my course from the program because I didn't have all my videos done three months in advance, and I said, "Well, there are scripts there and also the scripts are machine-readable. They may have words that I don't say in the videos, but all the words I say in the video are there," and that wasn't good enough. So we were going back and forth, so they've taken the videos I've done and the scripts I've had and had someone actually transcribe the videos that are posted. So they had a stenographer transcribe them, and so essentially… and they're making mistakes, so the script is more accurate, but because I leave some things out… so anyway, we're having to spend an enormous amount of time to comply in ways that are way above and beyond what anyone would do for any reasonable amount of course. This has become a breaking point.

Table 5.2.30 Continued
Definitions and examples of Instructor Decisions

Framework Area and Definition	Example of Instructor Interview Excerpt
Other - Efficiency Target -- Any reference to another entity in regards to efficiency	Instructor Interview 1 (7934-7272) So that's why I thought it would very useful to extend the course into an online format that even if schools do not use it for their, as a course, as a whole, there will be bits and pieces they can incorporate into their own curriculum.
Time - Past/Present: Any reference to the current state of the course or past experience	Interview 1 (4132-4235) It's also has a reputation as being a difficult course, but for some students, that's not a deterrent.
Time – Future: Any reference to an expectation or prediction for the future	Instructor Interview 1 (32184-32673) INSTRUCTOR: Um, I don't, I can, I think I'll probably be, if we're going to be more personal that for every module it's going to be me delivering it, it's not just things, so they'll get sick of looking at me. Office hours will turn from me sitting alone, working on something else, to actually maybe people attending at times, other than right before the exam. So if they can do it from the comfort of their own home, then they come to office hours, when before that was too much effort…
Cost (Time-Effort or Money-Resources): Any reference to costs such as Time, Effort, Money, or Resources	Instructor Interview 2 (4471-4799) I've written these people, sometimes they don't respond, sometimes they send you a folder full of permission forms… One we were trying to use, a poster for a movie, and Sony sent us saying, "Before we can tell you what we will do about this, you have to pay someone on our staff $50 an hour to determine what's going to happen."
Gain (Learning, Goals, Satisfaction): Any reference to gains, such as learning, goals, or satisfaction	Instructor Interview 1 (43685-44413) So I see that this is a great benefit over that. There are things that students do better, you know, first of all, it's not possible to have lectures that are 10-minute segments, 10 times a week. Just because of convening people is too time-consuming. It's not efficient; it's not viable to do it that way. With video segments, you can do that. You can assign 10 segments, or 4 or 5 segments and they can actually attend those. And then they can review it because they can be quite dense. So I see that being an advantage over a lecture, where people are not as engaged as they might be if they had a shorter, because of the short attention span, and because of the inconvenience of going to a specific site at a specific time.
Operational Functions (Access and Process Performance): Any reference to the operational function, such as process performance or access	Instructor Interview 1 (53128-53372) INSTRUCTOR: Yeah, my guess is what will happen is that a lot of people will show up face to face for the first couple of weeks and then as time goes on, they'll go more and more online, as they get comfortable and if they see that's effective.

Below, Table 5.2.31 displays the usage count for Instructor Decisions. The instructor gave positive and negative evaluations of educational experiences in the online environment far more than the in-person environment. Also, the instructor started out with 10 positive comments about online instruction but gave fewer praises over the next couple interviews. The negative comments were opposite. With each interview, the instructor gave more negative reviews of online instruction. Part of the reason for this was the nature of the interviews. In the first interview, the instructor talked about what was possible. By the second and third interviews, the instructor had invested more time into the course development and implementation and was able to describe actual problems he had experienced. Also, the instructor most often conducted an efficiency evaluation in reference to students. Thus, much of the thought around the course was how students would respond.

Table 5.2.31

Instructor Decisions

	Total	Interview 1	Interview 2	Interview 3
Online Positive	**15**	10	3	2
Online Negative	**8**	1	2	5
In-Person Positive	**2**	2	0	0
In-Person Negative	**2**	1	0	1
Instructor	**18**	9	5	4
Student	**25**	13	3	9
Institution	**11**	4	5	2
Other	**7**	5	2	0
Time - Past/Present	**26**	16	4	6
Time - Future	**19**	8	5	6
Cost (Time-Effort or Money-Resources)	**21**	8	8	5
Gain (Learning, Goals, Satisfaction)	**25**	11	5	9
Operational Functions (Access and Process Performance)	**47**	22	12	13

Below is a listing of the frequencies with which the actors in the efficiency evaluation were cross-listed with criteria. Students were listed most with operational functions but almost as often with gain. So, the instructor was often thinking about student gains and how that would happen when discussing the conceptualization and implementation of the online course. For all other actors, the instructor discussed operational functions the most, followed by costs. Costs were mentioned the most in relation to the instructor. This makes some sense, since students would logically be the recipients of most gains from the implementation of the course. That the instructor was conceptualizing gains beyond the student was also important. However, it should be noted that while a cursory run-through of the excerpts tagged for each of these cross-listings accurately reflects most of the quantitative findings, there were instances in which different actors were used in the same excerpt with reference to different efficiency criteria. For example, the instructor talked about adding a recording of office hour webinars to the online website. In this instance the instructor was weighing the potential gains for students with the process performance issues and costs for the instructor. Additionally, this investigation included only one instructor that clearly gave thought to the multiple stakeholders involved in the implementation of an online course. Other instructors may not be so broad in their outlook of potential consumers and stakeholders. Therefore, while these numbers give some insight into the decision processes of the instructor, further investigation would be required to gain a more accurate illustration of how instructors conceptualize the assembly and operation of an online course.

Table 5.2.32

Efficiency Evaluation by Actor

	Student	Instructor	Institution	Other
Cost (Time-Effort or Money-Resources)	6	10	4	3
Gain (Learning, Goals, Satisfaction)	18	5	3	2
Operational Functions (Access and Process Performance)	21	15	11	6

This next section looks at the codes for other actors aside from the instructor in the course implementation. Whereas the codes for actors included in the efficiency evaluation were used exclusively for instructor conceptualization of cost-benefit-implementation, these codes were used to describe how the instructor observed the actual attributes and processes of other actors in the reference to this online course. The codes used in this area are presented with a definition and example excerpt in Table 5.2.33 below and included these codes: Course-Media Actor; Institutional Actor; Student Actor; and Other Actor.

Table 5.2.33

Definitions and examples of Other Actors

Framework Area and Definition	Example of Instructor Interview Excerpt
Course-Media Actor: Any reference to the Course-Media Actor (Input, Decisions, Participation, Output, Outcomes)	Instructor Interview 1 (4132-4235) It's also has a reputation as being a difficult course, but for some students, that's not a deterrent.
Institutional Actor Any reference to the theory or actual function of the Institutional actor (Input, Decisions, Participation, Output, Outcomes)	Instructor Interview 3 (22856-35088) Instructor: I think there has to be a way. I got a lot of support from the instructional designers. And I think that this is such a new way of doing it and having a support group for instructors. And I think this is pretty necessary. I don't think that they're gonna get the support I've gotten. But the issue is that it has to be easy for the people to adopt. One of the main impediments to adopting something like online learning or even pedagogical methods or interactive pedagogical methods that prove to be effective is the time. Time and efficient. It's true here and it's true worldwide that the time spent teaching is negatively correlated to the salary that people are paid. So, advancement at [this university] is inversely related to the amount of time you spend teaching. So how do we address that? We have to make this online instruction easier to implement. That's an easy task, isn't it? I mean, recording lectures or doing electronic workbooks, doesn't really use the medium to any advantage. So, I know that there are a number of colleagues in this program that are doing that. But a number are not. They're doing the [other subject] classes are pretty creative. I haven't seen many of the other classes as closely.
Student Actor: Any reference to the theory or actual function of the student actor (Input, Decisions, Participation, Output, Outcomes)	Instructor Interview 3 (11693-12390) And what I found a little surprising is that even though the interactions were limited, the students felt like they had made a personal bond with me. You know cause of the videos I made they felt they knew who I was. And I think that is an advantage of having your head in part of the videos and saying things that are kind of stupid but knowing that it is stupid and making it personable. They seem to feel they knew me well. Their comments were very similar to what I get when I teach in a face-to-face course like. And I think the interaction they had with me in the videos was about the same interaction they have with me in a lecture hall with about 200 students. SO, this is a positive thing.

Table 5.2.33 Continued

Definitions and examples of Other Actors

Framework Area and Definition	Example of Instructor Interview Excerpt
Other Actor: Any reference to the theory or actual function of any other actor (Input, Decisions, Participation, Output, Outcomes)	Interview 1 (24385-25111) Have you been talking to anyone from the management group, like [Project Manager] or [Head Course Website Administrator] or [Head of technology]? Have you worked with any of the media professionals locally, on campus? INSTRUCTOR: Yes. Hold on, [Head Course Website Administrator] has been most helpful. He sort of the, leads the technical aspects on the [this university] campus. So I've seen him several times, even outside the, this project. He's been most accessible. And the people working for him have been most helpful as well. Um, I talked to [the leader of this online course project] a number of times. He's been very supportive and encouraging, [Project Manager] as well. So, I can say that I don't feel neglected.

Whereas the students seemed to have a somewhat self-centered view of the course and only thought about how other actors were affecting them, the instructor seems to have a much broader perspective on the actors involved in the course. This broad view could be an inherent characteristic of the role of an instructor. Or perhaps, the connections an instructor has to different entities at a university that an undergraduate may not have. Or this could just be the experience of this one instructor. Whether it was universal or unique to this particular course, there seemed to be more direct connections between the instructor and other actors in the course. For example, the instructor seemed to have a much more direct relationship with the institution and actually met with members of the institution. This was at different levels of management, other departments, and instructional designers. For this particular course, those in management positions and instructional designers were especially attentive to the assembly and implementation of

the course. Those in other departments were interested in the interdisciplinary aspects of the course.

The framework predicted that potential student impacts would include the continuation of further learning in the area of study, such as continuing to take courses in the associated area. Through the instructor interviews, it became apparent that this type of student outcome is reliant on the institution to host other courses, programs, or research opportunities at the university. The instructor had intimate knowledge of this potential outcome and the necessity of institutional partners to invest in continued learning. For example, when asked in the first interview about subsequent courses at that institution, the instructor responded in the following way (Interview 1, excerpt 29,510-31,010):

> Oh I mean, there's lots of them. That's part of the issue. It's that previously when people talk about [the subject matter of this course] that, internationally as well as nationally, it was really hijacked by the people in [a related field], so students learned about [a very specific aspect of this subject], [the same very specific aspect of this subject], [the same very specific aspect of this subject] and for a change, they learn more about [the same very specific aspect of this subject]. And they really don't care about [this very specific aspect of this subject], and so what they're more interested in is what kind of car they should buy. And so this is a course that teaches them the rudiments of [this very specific aspect of this subject], but then it goes and spends most of the time talking about not only the causes of [the subject matter of this course] but the consequences and then, what kind of solutions there might be, and how it's going to affect their lives. And it really extends much further than the traditional courses. Now if they want to learn about [a very specific aspect of this subject], [the same very specific aspect of this subject], they can do that. We have a whole emphasis in [a related subject area] and the way that they have, there's also one who teaches the ecology of [the subject matter of this course] on campus. So, there's about five other courses but they all handle one very special aspect of it.

The instructor went on to talk about other potential areas of knowledge transfer within the university that went beyond the classroom, "Yeah, there's actually a number of institutes on campus, there's the [a number of institute names]. The [university leader] is trying to get a [the subject matter of this course] institute, this will be the educational focus of that." Based on these instructor statements, there is a clear potential connection between student outcomes and other areas in the institution. However, this impact is a potential, the future

learning experiences provide an opportunity for the students that have learned the material. The extent of these types of connections could be investigated in future studies.

Table 5.2.34 below displays the code usage for the other actors in the course. The actor with the most code usage was media. This was the actor that the instructor interacted with the most, namely, the construction of short lecture videos. Most mentions of media occurred in the first interview, however, that the first interview was longer in time could explain greater mention of media. The instructor actually increased the mention of students by the third interview. This increase is likely due to the discussion of what happened in his first implementation of the online course, whereas the first couple interviews he could only reference students as he had known them in previous in-person courses and his expectations of what they would do once the online course was implemented. "Other" actors were mentioned less by the third interview. This could be the result of less interaction with instructional designers and upper management.

Table 5.2.34
Other Actors

	Total	Interview 1	Interview 2	Interview 3
Course-Media Actor	**55**	22	17	16
Institutional Actor (Input, Decisions, Participation, Output, Outcomes)	**21**	8	7	6
Student Actor (Input, Decisions, Participation, Output, Outcomes)	**24**	7	7	10
Other Actor (Input, Decisions, Participation, Output, Outcomes)	**25**	12	7	6

This next section looks at the main areas of course and media and included three codes: Media Input; Course Operation; and Media decisions, Output, and Outcomes. The first code, Media Input, refers to the Assembly, Technology and Subject/Content of the

course. It was predicted that the instructor would refer quite often to this since two of the interviews were conducted prior to course implementation. The next code, Course Operation, refers to the way a course operates, particularly through media. The last code refers to three separate areas of the framework but was grouped into one code for logistical coding purposes. Because this code included properties and processes that were theorized to be less tangible to the instructor, it was predicted that the count for any of these individual features would be low. This was a post-hoc analysis of the interview without the advantage of this framework for reference. However, it is predicted that the instructor, as a creator or co-creator of media used in instruction, should be able to comment on these areas of media if relevant questions are asked, therefore, future interviews may be able to obtain a higher count of code usage for these areas.

Table 5.2.35
Definitions and examples of Course and Media

Framework Area and Definition	Example of Instructor Interview Excerpt
Media Input (Assembly, Technology, Subject): Any reference to the Course Input of Technology, Assembly, or Subject/Content of the course.	Instructor Interview 2 (911-1697) Can you give me a sense of I guess where your course is right now in terms of getting it ready to go up and start running in the Spring? INSTRUCTOR: The course has several parts to it, as you may know. The first part is the replacing lectures with video segments; there will be about 46 of them at ten minutes each. About 60% of those are done, and I've been working really frantically to try and get the rest of those done at the same quality of what the previous ones are. All the exercises and assignments and essays are all done and field-tested. Discussion sections and homework could be covered there or have been done. So, it's mainly working on the video segments and the quizzes for the video segments are pretty much done as well. So most of the pieces are in place.
Course Operation: Any reference to the operation of the course	Instructor Interview 1 (46331-46920) So the TAs tend to get to know the students quite well because they generally deal with about 60 students on a multiple-times-a-week basis. And so, it's usually when they see a student who's having difficulty, they're encouraged to approach that student and say, "Okay, what is the problem with, where's the problem lie, and how do we address it?" So I could see it as a way of getting feedback on where we're not doing things well or when the student is not engaging well, and as a way of correcting it before it becomes difficult, more difficult than can be handled in that one quarter.
Media Decisions, Output, or Outcomes: Any reference to the decisions, output, or outcomes of the course media	Instructor Interview 3 (17081-18273) Interviewer: Can you record whether they go back and redo or does it just kind of record globally how they did on the quiz? Instructor: Um, I don't know. I don't think. I think you can determine if they did it twice. I don't think you can determine what they did like if they just guessed the second time. Interviewer: I think it would be interesting to see if people went back and changed their scores. Instructor: I would guess that a number of them do that. Interviewer: I do too. But I think that's a measure. That's either a measure of engagement or a measure of doing whatever the heck you can to get a better grade. And I think it could be used as useful metric. But go ahead. I was just curious. Instructor: No, no. I'm curious too. I would say that if they tried answering it twice it shows they were engaged and that's we could have it. It's all arbitrary. I mean you could set it up your pool sizes so it. You know, you could manipulate it. I just have it on a trial basis. When your world gets less cluttered, if that is ever the case. If you go through one of them you can see how they work or doesn't work. So, we're working on that and that should be done by the Winter.

Table 5.2.36 below presents the count for each of these codes. The discussion around each of these issues stayed fairly consistent over the three interviews. Not surprisingly, Interview 3 had the fewest mentions of Media Input. However, it also had the fewest mentions of Course Operation, which is surprising. As predicted, in the absence of direct questions, the third code (Media Decisions, Output, or Outcomes) was used very infrequently.

Table 5.2.36
Code usage for Course and Media

	Total	Interview 1	Interview 2	Interview 3
Media Input (Assembly, Technology, Subject)	**37**	15	13	9
Course Operation	**42**	15	15	12
Media Decisions, Output, or Outcomes	**6**	0	3	3

This last section examines the specifics of course operation and included these six codes: Component-Specific; Communication and/or Interaction; Control; Features of Curriculum and Content; Features of Media; and Characteristics of Online. Because the sample size was small, these codes were examined only at the general level with no specific sub-codes. Usage of each of these codes would indicate the instructor either intentionally or unintentionally considered issues related to each of them. Table 5.2.37 provides a definition of each of these codes and example excerpt in which the code was used.

Table 5.2.37
Definitions and examples of Course Operation through Media

Framework Area and Definition	Example of Instructor Interview Excerpt
Component-Specific: Any reference to a specific component activity	Instructor Interview 2 (6226-7516) INSTRUCTOR: Well, again it was something else that came up… one way we dealt with it initially was to have videos… so I'm teaching a face-to-face version of the course right now and to give the students access to the videos without the issues of intellectual property, I put them on a private YouTube site. They wanted a YouTube site because of ADA issues because YouTube allows you to put in closed-captioning, where Vimeo, which you can… The problem with YouTube and a private site is you can have only 50 people, where on Vimeo you can have an unlimited number of people if you pay a reasonable fee, like $200 a year, but the problem with Vimeo is you can't have closed-captioning. And they don't want it on the university site because they don't have enough storage or bandwidth. And so we put it on a YouTube private site because of the ADA issues, which is another thing that's become troublesome, and we've had multiple discussions about that and I'll go through that later, but we gave everybody in the class a common email account and a common password, and then we discovered that someone had posted objectionable material, and the meaning, it was obscene. So someone in the class had done that, and so we had to pull down the site, so we're working on it. Does this make sense?
Communication and/or Interaction: Any reference to communication or interaction	Interview 3 (11297-11691) Instructor: And I think coming to the discussion sections, I need to promote the review sessions and tell them. So I'll try in due time try to improve that and maybe include a Doodle on when we should have discussion and when we have review sessions and make appointments for students to come meet with me in a webinar. But I have the webinars run by the TAs so, they have interacted with me to some degree
Control: Any reference to Control (e.g. Location, Timing, Pacing, Sequencing, Content, Component-Activity)	Instructor Interview 1 (32184-32673) INSTRUCTOR: Um, I don't, I can, I think I'll probably be, if we're going to be more personal that for every module it's going to be me delivering it, it's not just things, so they'll get sick of looking at me. Office hours will turn from me sitting alone, working on something else, to actually maybe people attending at times, other than right before the exam. So if they can do it from the comfort of their own home, then they come to office hours, when before that was too much effort…

Table 5.2.38 Continued
Definitions and examples of Course Operation through Media

Framework Area and Definition	Example of Instructor Interview Excerpt
Features of Curriculum and Content: Any reference to the Curriculum and Content of the course (Accuracy of Information or Assessments; Alignment; Amount of Work; Complex or Difficult; Navigation or Organization; Other)	Instructor Interview 2 (15367-16797) Instructor: Then with the second one they have to learn something about the [this subject] models. We go through one of the [this subject] model, and this is a really good exercise because not only are we talking about [this subject] models, but it forces people to try to get, glean some information about a topic they'll never understand. So how do you, when you're assigned something that is way beyond your ken, how much can you assimilate about it in a way that you can say something about it that's useful. I imagine none of the students could have ever explain in detail how [this subject] model works. So when we get them going towards some primary literature and secondary literature, and saying, "Okay, given that these things are complex, the only understanding of…" like your operating system on your computer. No one person understands it in its entirety, but they can get a general feel for it, and how you approach materials that may be more detailed than you need to know or can know, and glean enough information to use it in a profitable way. So we give them an example, we show them [this subject] model and say, "Look, look how detailed this is, but you don't need to know that." This is where they talk about and give you some information that may be useful, and so why they did it this way and why it's useful for the public to know about it. That's the second exercise.
Features of Media: Any reference to Media Features, such as Structure, Form, Multiplicity, Non-linearity, Synchronicity, Symmetry, or Anytime/Anywhere	Instructor Interview 3 (13601-15643) Instructor: What we're doing (I don't know if you've had a chance to see that I've replaced many of the videos with more interactive things). Interviewer: What is the new content? Compared to the old? Instructor: What I do is I looked at the previous videos. And the average video was about 12 minutes long. And what we found was that the students look at these videos in bits. And we said, well these students go to a 50-minute lecture, what's the problem with a short video. Well what's happening is that the attention span is very low. So how do we make it… So, what I've done is broken up each of these videos into three or four parts. Actually about four or five parts. So each of the videos are about 3-4 minutes long. And then after they watch each video, they have a little quiz or they have an interaction thing. So for example, when we have a video about isotopes, I have a picture of me skinny and me fat and show that I can't jump very high if I'm fat and I can jump higher if I'm skinny. So the idea is that the heavier isotopes don't really move as fast and can't change phase very quickly and that's how we can use isotopes to look at [data] in the past. So, things like that. And they they have to manipulate data. So we show them one of the graphs and they see it numerically in [data] and we answer the question about what do these figures say about [facts from] 100 million years ago? And all we have to do is go to a figure but they can also manipulate it so they only see [specific data] and they can look at it during a particular year. So they can manipulate data visualization but they have to look at what is there and be able to answer a question about it. So this idea of making it so that they watch videos in 3-4 minute bits, the quizzes are integrated into the medium, it's not like they take a quiz separately, and um also work with the data or watch a video from another source or they do some data manipulation, so I'll have them go to an online model and see if they can get that to work

Table 5.2.38 Continued
Definitions and examples of Course Operation through Media

Framework Area and Definition	Example of Instructor Interview Excerpt
Characteristics of Online: Any reference to the characteristics that contribute to the definition of an online course (Distance, Organization and Distribution of Content, Communication, Content Interaction, and/or Assessment)	Instructor Interview 2 (14036-15365) So what we've learned… we'd like to expand, particularly with the online, to people who are in different parts of the country and different parts of the world, and getting them to have an idea how [this subject] are actually varying among various places. We discovered that all the students have access to a spreadsheet and have used those programs; most of them have just looked spreadsheets that other people have prepared for them. And less than half of them have ever cut and paste new information into a spreadsheet. And even with explicit directions on how to do this, they failed. We're preparing little videos on how to cut and paste new data into a spreadsheet and to this particular spreadsheet. Most of them didn't even know that there can be formulas within a cell of a spreadsheet that are important to understand. So just giving them that skill is probably… I know there's a whole course here at [this school] which is sort of a Mickey Mouse chorus, that's all they learn how to do, which is kind of ironic for a college-level course…But the fact is that they do the first exercise, and if they learn that skill, then the courses will be more worthwhile for them. INTERVIEWER: Great. So you guys are creating videos to I guess backfill that kind of information? INSTRUCTOR: Yeah, for those who need it.

Table 5.2.39 presents the count for each of these codes. The number of instances in which there was discussion about component-specific media as well as discussion about features of curriculum and content seemed to stay consistently high across interviews. Instances of in which there was discussion of Communication/Interaction seemed to increase with each interview. Surprisingly, there were few instances of discussion about the features of media during the interviews. Also, there was very little discussion about control. These are both important areas of course operation and could have a profound affect on the student experience. As discussed in Study 3, both of these areas have a big impact on the decisions that students make in the course.

Table 5.2.39
Course Operation through Media

	Total	Interview 1	Interview 2	Interview 3
Component-Specific	**35**	12	13	10
Communication and/or Interaction	**12**	2	4	6
Control	**5**	2	2	1
Features of Curriculum and Content	**14**	5	5	4
Features of Media	**6**	1	2	3
Characteristics of Online	**8**	0	5	3

Results Summary for Study 2

The purpose of this study was to analyze an individual course as a means of providing validation to the framework proposed in Chapters 2 and 3 of this dissertation. The conceptualization of the framework relied on the experience of this researcher and articles about online education. As explained at the beginning of Chapter 3, this conceptualization was based on models already proposed for online education and higher education and resulted in a framework that combined many of the concepts of these models, which include Astin (1993), Bean and Metzner (1985), Tinto (1993), Rovai (2003), Pascarella (1985), Cole (1984 and 1996), Engeström (1997), Hiltz (1993), Benbunan-Fich and Hiltz (2003), Väljataga and Laanpere (2010), Anderson and Rogan (2011), Lowenthal et al. (2009), and Piccoli et al (2001). Because the framework were conceptualized by personal experience and through prior developed models, validation was needed. This study provided the second round of validation and framework modification through a reference of how an individual online course was implemented, how the students described as their experience in the course through open-ended survey responses, and what the instructor described as his experience in the course during interviews.

The main reason for conducting a case study of an individual course was to understand the processes of a course at a local level without holding variables or processes constant. This allowed the researcher to not only check the existing framework but to also look for new sections, processes, ordering, and variables in the framework. To answer the research questions, this study sought to determine if the different portions of the framework were described by the subject course; determine if there was anything

about the framework that was not described by the course; look for anything in the course that was not described by the framework; and look for evidence of connections between different sections of the framework. By using a qualitative approach that critically analyzed the existing framework while simultaneously looking for ways to expand the framework, the study benefitted from both a deductive and inductive process. Through this method, new processes and variables were discovered. As major new processes and variables were discovered, they were added to the coding scheme. Thus, this study was meant as a both a validation of the original framework and a search for evidence that the framework could be adjusted.

From coding of student surveys and instructor interviews, it became apparent that there was evidence of support for some sections of the framework, moderate support for other sections, and some areas were lacking evidence in the literature and hinted at the need for revision. Some interesting findings in this study came from how students make decisions to participate and the way that the instructor acted on the course compared to the students. The decisions that students made to participate in the course seemed to follow the hypothesis that they were making efficiency evaluations. The instructor had similar processes as the students but thought much more broadly about the course than the students.

Case Match to Major Sections. The coding of student surveys looked at all parts of the framework. Some aspects of the framework had strong support from student statements. Other parts of the framework had very little evidence from open-ended responses that students gave on the surveys. While code numbers would seem like an obvious indication of whether the framework feature actually exists, the interpretation is

not straightforward. For example, some of the more conceptual aspects of the framework, such as Instructor Operation Decisions and Instructor Intended Output have very low numbers. However, some of the component-activities, such as Office Hours and Video Transcripts also had very low numbers. Even though there were very low numbers for the component-activities, it does not mean that these did not actually occur. It could mean that students did not feel they should or needed to discuss them on the survey. The code numbers for the framework can be more difficult to interpret since they are somewhat abstract. There is no definite number that provides "proof" that the section exists or does not exist. However, the numbers help give some indication of where attention needs to be placed. When students did not mention something that would seem like they should, then there could be a problem with the framework.

For the main framework areas, a low number would indicate either the section of the framework does not exist in the form that this framework presents, students were unable to observe that area, the students did not communicate their observation, or the investigator was unable to code the area correctly. All of main sections of the framework had moderate to high coding numbers except for these five areas: Instructor Operation Decisions, Instructor Intended Output, Instructor Goals, Instructor Intended Outcomes, and Student Goals. Four of these involve instructor processes that could likely be hidden from the students. And even the instructor may not be aware of them or be readily presenting them without prompt. Thus, these four sections of the framework would need further interpretation.

- **Major Framework Areas:** Each of the section areas seemed to have strong support. However, as the result of the study, it became apparent that the ordering of *Operation and Participation* and *Operation and Participation Decisions*

needed to have their order reversed. As described later in the *Modifications to the Framework* section, the finding of an experiential loop, which places prior experiences as an *Input* variable, allows for all/most information needed for actors to make decisions to come from the *Input* area. This means that it would be more logical for decisions to be placed before operation/participation.

- **Sections in the framework:** A moderate to very high number students discussed all of the major areas, with the exception of instructor intended output, instructor intended outcomes, instructor goals, and student goals. When coding the instructor interviews, the coder looked less at instructor intentions and more at the actual output, outcomes, and goal attainment of the instructor that was in line with the updated version of the framework (see "Modifications to the framework" section below). The reason that students did not discuss goals because of the questions the students were asked or goals are potentially an internal characteristic and should be moved to a different area of the framework (see "Modifications to the framework" section below).

- **Actors in the framework:** The actors in the framework (students, instructor, and institution) were discussed as predicted. As mentioned, the student did not discuss certain aspects of the instructor portion of the framework. The students discussed the institution very infrequently while the instructor discussed the institution somewhat frequently. This could be because of the role that the institution played in this course and may have had very little observable involvement in the course from the student point of view; had a limited involvement altogether; or the involvement of the instructor was only observable to the instructor. As discussed in the results, the students described some issues they had seen in their course that involved the institutional context. However, these comments were not strong indicators of institutional composition or processes. Most of the comments that students made had to do with their direct interaction with the institution, such as this comment from Subject 218 (excerpt 1884-2188), "If I wanted to take a specific course, but did not have the time to take the class or if the class did not fit in my schedule, an online course would be the best opportunity [the university] can offer." For many of the statements that were coded as institutional issues, students might not have even known they were commenting on the institution. This was particularly relevant when students were discussing technical malfunctions with the course website, as this was supported by the institution. Only a few students commented directly on the composition or actions of the institution, probably the most obvious came from Subject 003 (excerpt 2256-2396) who stated, "I've noticed it's getting harder to get a reasonable schedule going after the recurring budget cuts and an online class solves this problem." While the evidence for this section of the framework was not strong or thorough in the student responses, it was predicted that students would not richly describe much of the institutional portion of the framework.

- **Online versus In-Person:** Online and in-person students discussed different areas of the framework with similar frequency. This seems to suggest that the

framework proposed in this dissertation would work for both in-person and online courses.

Section variables. In addition to the major areas and major sections in the framework, this study coded student comments for specific variables that fell under the subsections of the framework. This coding included both predicted and unpredicted variables. For example, it was predicted there would be internal and external variables, however, the exact variables that students would discuss in open-ended survey responses was not known. In addition to opening the door to new unpredicted variables, the study provides evidence of validity for both the predicted variables and even stronger evidence for the more general sections that they fall under. For example, that there were so many internal and external input variables discussed provides strong evidence that the *Student Internal and External Input* section of the framework reflects the reality of these students. Below are some of the important findings.

- **Student Internal and External Input Variables:** Students discussed a number of input variables. However, there were a few input variables that the students mentioned substantially more than any others. Internal Input variables that were frequently discussed by students included *Background and Abilities*; *Compatibility for Learning Environment* and *Compatibility for Instructional Practice*; *Interest in Subject or Learning Intervention*; *Motivation*, *Focus*, and *Time Management Skills*; *Preference for Learning Environment*; and *Prior Experience*. External Input variables that were frequently discussed by students included *Distance from University*; *Money or Resources*; *Personal Environment*; *Requirements for Graduation*; and *Time Conflicts*. How much these variables were discussed as a product of the survey questions is unknown. Also, it is unclear how well these variables would transfer to studies of other online courses. The variables discovered from these open-ended student responses were limited compared to all of the input variables that were discovered in Study 1 of this dissertation. This difference between what the students volunteered as input variables affecting them and the variables chosen for other studies is worth noting and studying further.

- **Control:** Students often discussed the area of Control. One big finding was the need to add two additional codes for Control Type: Location and Timing. Students frequently referenced these two types of control. Timing resulted as a

distinct type of temporality from pacing and sequencing. Meanwhile, students often described their ability to control their location, something that differentiates in-person learning from distance learning.

- **Curriculum and Content:** Curriculum and Content was an area that was developed during the coding process. When the coding started out, the curriculum and content was conceived as mainly an input variable. However, as the coding process unfolded, there was a clear need to both add this to the operation are of course implementation and to expand on the variables within the curriculum and content area. An important distinction between variables in this area is between *Amount of Work* and *Complex or Difficult*. One pertains to physical and/or mental work that is expected while the other describes a quality of the subject matter.

- **Features of Media:** The area of media was surprisingly not mentioned too often by the students, with the exception of *Anytime or Anywhere*. The discovery of two other types of control, Timing and Location however, called into question the need for the *Anytime or Anywhere* variable as there was a large amount of overlap. It is unclear why students did not discuss issues related to the other areas of media. It is hypothesized that either there needs to be more direct questions about media or the were not thinking about these areas during their study because technology has become so commonplace and they are not responsible for the design so they do not have to think about the details. This would be like individuals commenting about bridges or the smoothness of the pavement after a road trip, if there are no problems, then the average person will not notice or make note of infrastructure that has become expected.

- **Participation Decisions:** The area of participation decisions had an overwhelming number of comments from students, particularly in the area of *Participation Decision in Course*. The reason for this was largely because of two direct questions about the reasoning for enrolling or not enrolling in another online course at this university in the future. The code *Participation Decision in Component-Activity* was not used nearly as often and would probably be more relevant for interviews with students where the questions can really probe why students participated or did not participate in particular component-activities. Because many of the comments were post-hoc and the decisions were referring to future courses, it became clear that the framework needed adjustment to account for this

- **Efficiency Evaluation Criteria Types:** This study revealed three main types of criteria for making an efficiency evaluation: gains, costs, and operational function. This study also revealed specific criteria under the three main types that students described as reasoning for their decisions: costs (Time/Effort and Money/Resources); gains (Affect Satisfaction, Content Learning, Contribution to Goals / Interests); operational functions (Access and Process Performance)

- **Access Types:** This study also showed that there were specific types of access that students referred to when making their decisions: Fit with Schedule; Place Access; Interaction / Communication; Course Format; Other External Possibilities; and Course Offering

- **Student Evaluation of the Course**: The evaluations that students gave for the course and components in the course were probably influenced by the questions that were asked on the survey. There were a similar number of positive comments about online courses as there were negative comments. This could be related to the questions asking why the student would or would not enroll in an online course at this university in the future. Each of the respective questions prompts a response that fits the coding as such. Meanwhile negative comments about online component-activities were higher than all other comments about component-activities combined. There were probably two reasons for this: most of the component-activities were online and students are probably more likely to add a comment when there was a negative experience than a positive one.

Instructor portion of framework. While the students discussed certain aspects of the instructor portion of the framework, the majority of the findings for the instructor portion of the framework came from the instructor interviews. This study showed support for the framework that evolved from Study 1 and also provided new insight into how the instructor portion of the framework operated. In addition to the findings discussed below, the following section also discusses general findings about all of the actors in the framework, such as *Order of Framework Areas*; *Experiential Loop*; and *Actor Prognosticator*. The following section also describes some framework functions specific to the instructor: *Instructor Preparation*; *Instructor Decisions*; and *Efficiency Evaluation Altruism*. Each of these were discovered during the coding of the instructor interviews and will need further research with the subject of different instructors.

- **Instructor Preparation:** Two of the interviews were conducted prior to the implementation of the course. From these interviews, the instructor indicated an extensive amount of time and effort that went into the course prior to implementation. For example, in the second interview, the instructor stated that he spent at least 60 hours per week just developing videos and working on the logistics of course set-up. Further, the instructor had worked for at least a year

prior to course implementation. From just the preparation of the course, the instructor portion of the framework should be viewed quite differently than the student portion of the framework. This effort prior to course implementation indicates a more prolonged instructor portion of the framework that reaches months and possibly years into the past. However, while this instructor for this framework was proactive in the creation and implementation of the course, other courses have instructors that do no work on course creation and minimal work on implementation. In fact, some online courses could operate without an instructor at all. Therefore, in the framework for this course, the instructor was heavily involved and is illustrated as such; in the framework however, the instructor should not be represented as a definite actor.

- **Instructor Decisions:** The instructor discussed making decisions less frequently the closer the interviews were to course implementation. The first interview had the most comments about decisions; the second and third interviews each had about half as many comments related to decisions. This probably had to do with the number of possibilities available earlier in the process. As the course approached implementation, many of the decisions about materials, activities, curriculum and media had been decided and were will on their way to development or in the case of the third interview, were already being developed. However, there were still decisions to be made even just prior to and during the course. The Instructor Decisions section represents how instructors decide how to participate in and operate the course. The process of deciding how to participate in a course is similar to the participation decision processes of a student. Like the student, the instructor will encounter three main decision mechanisms: Information Gathering and Theory Development; Efficiency Evaluation; and Participation Decision. In addition to the participation decisions that a student also makes, instructors also have to make course operation decisions. Below is an outline of all these processes (including those shared with students):

    - Information Gathering and Theory Development
        - Gather information about past, present, and future
        - Develop a personal theory about the course or aspects of the course
    - Efficiency Evaluation
        - Internalized and rational cost-benefit analysis
        - Using criteria based on past and current experiences and predictions of future actor processes and potential results
    - Participation and Operational Decisions
        - Based on an evaluation of efficiency
        - Participation Decisions – If, When, How, Where, and at What Level the instructor will participate
        - Instructional Operation Decisions – If, When, How, Where, and at What Level the instructor will assemble and operate a course, including sources and types of control.

More research will need to be conducted in this area. This area can be difficult to observe, as it requires some insight into what the instructor is thinking. However, it can be difficult to get an accurate account of instructor cognitive processes involved in making decisions. One way a moment-to-moment account of decision-making could be researched is through talk-aloud methods. However, this method can be time intensive for both the instructor and the researcher, as it would require the researcher to be present during the moments decisions are being made. Further, it could be difficult to get an authentic course decision-making scenario to play out in complete form in real time. While it gives an account of the instructor thought processes as they happen, they do rely on the instructor to provide accurate information on their thought processes. A less time intensive way of gathering information on instructor decision-making can be implemented through surveys or interviews with instructors. Surveys and interviews could allow for a more data with minimal intrusion. However, like the think-aloud, surveys and interviews rely on the instructor to accurately describe their internal thought processes and in the case of surveys of interviews. Unlike the think aloud, surveys and interviews do not have the benefit of immediacy, as they would be time separated from the decision-making process.

- **Efficiency Evaluation Altruism:** The instructor often considered the efficiency of multiple actors when discussing and making decisions about the course. For example, the instructor discussed the amount of resources the institution was investing in online and in-person courses. The instructor also discussed the costs and gains for students taking the course. This thinking was very different than the students that primarily only discussed their own prospects of efficiency. This could be related to the different roles that the instructor and the student have. It is part of the instructor's job to teach the students and part of that responsibility is to attempt to help the student get as much knowledge about the subject in the brief amount of time allotted for the course during the term. Another part of the role is to work with the institution on the logistics of implementing a course. On the

other hand, the students do not have any official responsibilities that relate to thinking about the instructor's characteristics or actions. Instead, the students pay money in order to take the course for their own gain.

- **Instructor as Conductor:** This study found that while students think primarily about their own interests in the course, the instructor thought broadly about different the impact of the course on different actors and stakeholders. While part of this thinking could be unique to this instructor for this particular course, it is worth noting that the instructor was concerned for the gains, costs, and operational functions of the institution, students, instructional designers, himself, society, and other universities. This way of thinking about the different actors and stakeholders is similar to how a conductor thinks about the roles of all the musicians in an orchestra. If and under what circumstances this conductor role is played by other instructors will need further research. The instructor in the case studied here acted as a conductor of an orchestra might, keeping his eye on multiple aspects of the course all at once. His concern moved beyond his own actions and results and instead also kept in mind the decisions, actions and outcomes of other actors, especially the students. However obvious this may seem since it is the job of the instructor is to run the course, it will be important in future studies to determine when instructors act in the way this instructor did, as a conductor, and when the instructor is more selfish or unconcerned. Indeed, the actions of the TAs even in this course were checkered. Some students commented that the TA they had was excellent while other students commented that their TA was late and unprepared for discussion section. Thus, while the framework provides a path to understanding how instructors work and their differing goals, motivations, and interactions that they have with media and others in the class means that there could be many ways of being an instructor.

Modifications to the Framework. While all of the findings discussed in the prior few sections have implications for similar online courses with an instructor and institution, there were some findings that were more broad and would have implications on the broad framework for how all or most online courses operate. Below are findings that have broad implications that either have implications on all online courses or have a strong potential to influence all online courses. In other words, these findings seem to be applicable to any and all online courses. For example, the *Course Operation through Media* section describes not a specific state of the course but rather give parameters for

how a course might operate. Thus, the principles are generalizable and the specific variables can be found in each course studied.

- **Media as an Actor:** When the framework was first conceptualized, there was uncertainty as to whether media was an actor or an artifact. The argument for artifact originally won and media has been treated as such in this dissertation. Evidence to the contrary began with Study 1 when media was found to be independent of the instructor. Further, while instructor had lost the status of permanence in the framework, media was designated as a permanent entity in the framework. While this should have been clear from the literature review in Chapter 2, namely that online courses are unique because of their use of media, it was not realized until the end of Study 1. This study brought evidence that media should be treated not only as an independent artifact but potentially an independent *actor*. The evidence for this came from a simple comment by Subject 222 (Excerpt 5955-6123) he made this statement about a question-and-answer software, "the questions are not always answered but I really liked the anonymous option". This statement offers a subtle suggestion that media can have an independent purpose, output, and outcomes. Beyond that, it is easy to imagine following the same pattern, in regards to sections of the framework, as other actors. In other words, Media could also be represented with the following properties and processes: Input, Participation Decisions, Participation/Operation, Output, and Outcomes. While decisions may seem irrelevant or unimportant, it must be stated that in addition to static decisions (such as unchanging video), media can be programmed to make specific decisions in a given circumstance. And in the future, media can be developed using technology that would allow it to make independent freethinking decisions. Therefore, future research should examine the potential of media as an actor.

- **Order of Framework Areas:** As discussed earlier, the findings of this study revealed that two areas of *Operation and Participation Decisions* and *Operation and Participation* would make more sense logically if they were reversed from their original order. This change in ordering made more sense after the idea of *Experiential Loop* (as explained below) was found from the descriptions of the students and instructor.

- **Course Operation through Media:** While many of the findings described in the previous few areas describe specific variables that make up sections that are potentially specific to this course, some of the variables could be considered generalizable across most/all online courses. These variables, which are related to *Course Operation through Media*, include *Control, Features of the Media*, and *Curriculum and Content*. The variables related to the operation of the course have the greatest potential for being generalizable. Part of the reason for this is that the variables found were to scale per course. In other words, while each of these categories of variables stay the same; the state of the variables will change

according to the features of the course. Therefore, these categories and features within them are appropriate to add to the framework.

- **Experiential Loop:** The descriptions that students gave about how they made decisions suggested an experiential loop where the information from previous experiences and interactions with the course were reused as an input variable of prior experiences. This input information that came from experience in the course was then used in new situations as background information for decisions. Thus, the framework continuously loops with each experience.

- **Actor Prognosticator:** Another interesting phenomenon that was found during the review of students was that of their own development of theory about the course. As students gathered more information about the course from both experience and contemporaneous interaction, they would develop a theory or theories about how the course operated. Often their thinking was similar to the layout of the framework. However, many times the students skipped over important variables or processes in their descriptions. They may have skipped over these variables or processes out of convenience for description of their thoughts or their logic did not match that of the framework in this dissertation. It is hypothesized here that students and instructors develop their own mental logic models for the course. How these models differ from each other and the framework developed here needs to be researched further. Further, the extent to which instructors believe that students will understand and follow the instructor's logic for the course would be beneficial for instructor training. Lastly, as the courses allow for more student control over different aspects of the course, it is predicted that there would be an increase in the differences between the logic models of a student between other students and the instructor.

- **Student Goals:** When examining the one low section that is a characteristic of the student (Student Goals), it becomes apparent that this section of the framework is somewhat problematic. First, a goal can be interpreted as both an internal and external characteristic. The internal characteristic is a source of motivation and drive; it is that desired end result. This definition would put the goal as a Student Internal Characteristic Input variable. The other definition is an actual positive result. This dual definition presents a problem in the flow of the framework. And because it has already been acknowledged that the outcomes can be both intended and unintended, the final link should match this. As a result, Goals has been modified in the framework to be a specific variable and has been moved to the Input area as an Internal Input Characteristic. The term "Impact" was used as a replacement for the ultimate result, what the outcome course experiences will lead to. This section was therefore renamed to "Impacts and Goal Attainment" and refers to whether students reach their internal goals, the impacts the student has on their future world, and the impacts that the course has on the student.

- **Instructor Naturalism:** As indicated in the previous study, the actor role that an instructor has in the framework should separate the instructor as an individual.

Thus, the instructor should have his/her own output and outcomes. Thus, the low scoring "Intended Output" and "Intended Outcomes" has been changed to be "Instructor Output" and "Instructor Outcomes" and are indicators of the results of the actual instructor, not the instructor's intentions for student learning. Instructor Goals, like student goals explained in the previous paragraph, would be moved to an internal characteristic while "Impacts and Goal Attainment" replaces Instructor Goals as the ultimate result for the instructor. And as with the student Impact and Goal Attainment section, impact refers to both the impacts that an instructor has on their future world as a result of the course and the impact that the course has had on them. Finally, for the Instructor Operation Decisions, a different methodology is needed to examine the actual thought processes of the instructor rather than students' thoughts about them.

Chapter 5.3: Results for Study 3 - Student Case Studies

This study that examines ten online and five in-person student cases was implemented in order to provide validation for the framework proposed in Chapters 2 and 3 of this dissertation. This framework was developed through a careful perusal of online and higher education literature and through personal experience in the evaluation of online education programs. While these sources of information gave a broad understanding of some of the variables and processes of online education, a the structure for the framework was developed by synthesizing prior online and higher education frameworks constructed by Astin (1993), Bean and Metzner (1985), Tinto (1993), Rovai (2003), Pascarella (1985), Cole (1984 and 1996), Engeström (1997), Hiltz (1993), Benbunan-Fich and Hiltz (2003), Väljataga and Laanpere (2010), Anderson and Rogan (2011), Lowenthal et al. (2009), and Piccoli et al (2001). Studies 1 and 2 provided both validation and enhancements to the framework. Here, Study 3 provides a detailed examination of the student experience and relationship the student has with other actors the framework.

This third study of the dissertation helps to better understand the proposed framework, especially the student portion, by taking a closer look at the course from the student perspective. In addition to providing further examination of the framework as a whole, this study took a closer look at the student portion, with special emphasis on student decision-making in the online course. There were 15 students examined as case studies. Five of the students were in the Winter in-person iteration of the course, while the other ten were in the online version (five were enrolled in the Winter and the other five in the Spring). Multiple data sources were used to build student profiles, develop the

cases, and examine coding based on the framework. The foundational data from students are used to answer each of the research questions below and are thus presented one time at the beginning of this results section. Each of these research questions are then directly addressed using this background information as well as the coding data from student interviews that particularly addresses each respective research question.

Student case study question 3.1: Does the student portion of framework adequately represent the student experiences in the course?

Student case study question 3.2: What influences students to make certain participation decisions?

Student case study question 3.3: How do students incorporate class activities into their weekly routines?

Student case study question 3.1: Does the student portion of framework adequately represent the student experiences in the course?

In order to understand the student portion of the framework, 15 student cases were developed using data from multiple sources. The results of the case studies come in a number of forms: student demographics, favorite and least favorite aspects of the course for each student, weekly sequencing of each student, students' regular participation in component-activities, primary sources of content information for students in course, overall framework coding of student interviews, coding specifically for student decisions, and student week/lesson sequencing cycles.

Table 5.3.1

Study logic

Case study result type	Source of data	How it was used in analysis
General information about students	University system data, surveys, interviews	Provides foundation for understanding individual cases and helps answer question 3.2
Favorite and least favorite aspect of course	Interviews	Provides foundation for understanding individual cases and helps answer question 3.2
Regular participation in component-activities	Interviews	Provides foundation for understanding individual cases and helps answer questions 3.1, 3.2, and 3.3
Primary sources of content information for students in course	Interviews	Provides foundation for understanding individual cases and helps answer questions 3.1, 3.2, and 3.3
Overall framework coding of student interviews	Interviews	Addresses research question 3.1
Decision-making coding of student interviews	Interviews	Addresses research question 3.2
Student week/lesson sequencing cycles	Interviews	Addresses research question 3.3

General Information about Student Cases

This section provides general information about individual student cases and is meant to provide foundation information about each student. This data describes both the background information, as they entered the course (e.g. prior GPA and gender), and information about their performance in the course (e.g. course grade and satisfaction with the course). The data is first presented by section and includes general information with detailed notes and a listing of what the students reported in the interview as being their favorite and least favorite aspects of the course. After the initial, more detailed, presentation information by course section, a more general representation of this information is presented for cross-section analysis.

Below in Table 5.3.2 is a presentation of general information about the student interviewees in the Winter in-person course. This data was gathered from two main

sources: institutional data and interviews. The information is a snapshot representation of student data as they entered the course, as they proceeded through the course, and outcomes of the course.

Table 5.3.2

General information about interviewees from winter *in-person* course

Data*	Student 1	Student 2	Student 3	Student 4	Student 5
Course Mode	In-Person	In-Person	In-Person	In-Person	In-Person
Course Grade	A-	A+	B[3]	A-[4]	A-
Satisfaction with Course[1]	7.5	8	8.5	7[5]	8
Hours per Week Spent on the Course	7-8	6-7	8-12	6-7	8-9[6]
Amount of Work in the Course	Just Right[2]	Too Much	Just Right	Too Much	Too Much
Prior GPA	2.94	3.30	3.66	3.45	2.10
Gender	Male	Female	Male	Female	Male
Low Income	No	No	No	Yes	No
Transfer Student	No	Yes	No	No	No
Standing	Junior	Junior	Sophomore	Sophomore	Senior
Year Entered Institution	2011	2012	2012	2011	2009

***** Data in this table was drawn from two main sources: Institutional Database and Interviews. Data items that were left unmarked were sourced from the Institutional Database; data with represented with **Bold** text was sourced from interviews.

[1] Students stated their level of satisfaction with the course in the interview. This *Satisfaction with Course* score was a rating that students gave in the interview that expressed their level of satisfaction with the course on a scale of one to ten, ten being the highest level of satisfaction with the course.

[2] Student 1 said, "I don't think it was too much, it was a little bit more than I expected, but that's because we had weekly assignments, but I don't think it was too much. I feel like as an elective I would have expected it to be 4 units as opposed to 3 but I don't think it was too much, it was a little bit more than I expected, but I don't think it was too much."

[3] In the interview, Student 3 disputed his grade. He believed the TA had graded his midterm incorrectly, resulting a lower final course grade than he should have gotten. He did not want to challenge the grade because he felt that he learned a lot and it was that knowledge that he was after.

[4] In the interview, Student 4 expressed surprise that she had gotten such a high grade. She stated that she had performed poorly on the multiple-choice portion of the midterm and final. Even though she turned in all of her essays on time, she said "I didn't know what I was doing half the time." She attributed her high course grade to the grading practices of the TA on her essays.

[5] Student 4 said that while they had given a satisfaction rating of a seven if instead of a three unit course there "would have been four units it probably would have got a nine [in the satisfaction rating]."

[6] Student 5 stated that while they generally worked eight or nine hours on the class per week (including lecture and discussion), they increased their study time during the week before the midterm and final.

Even with the basic information in Table 5.3.2 above, the unique identities and course experiences of the students begin to be uncovered. Most of the students rated their

satisfaction with the course as high, with a rating of 8 or 8.5, one student had more reservations, rating the course as a "7" out of "10". The students also have very different prior GPAs; Student 5 had a low 2.1 prior GPA, while Student 3 had a 3.66 GPA. Further, the range of university class standing ranged from sophomores to a senior. Only one of the students was considered Low Income and only one was a transfer student. Three of the students received an "A-" in the class while one received a "B" and another received an impressive "A+". The "A+" was given to Student 2, who during the interview, stated that she was also offered a research position with the professor teaching the course. Meanwhile, Student 3 believed that he was given a low grade because of the Teaching Assistant's error and Student 4 believed she received a higher grade than she deserved. Thus, even this sacred outcome data point could have been influenced by the subjectivity of the Teaching Assistant or Instructor.

One of the more interesting areas of this table is the comparison of reported hours spent on the course per week with the belief of how much work there was. Two students stated that the amount of work in the course was "Just Right" but also put in a moderate to high amount of time into the course per week in comparison to the other students: Student 1 stated that the amount of work was "Just Right" and spent 7-8 hours on the course per week and Student 3 also stated the amount of work was "Just Right" and spent 10-12 hours on the course per week. Meanwhile, the other students stated that there was "Too much" work in the course but reported the number of hours spent on the course per week as 6-7, 6-7, and 8-9. Thus, some students may have different standards for an acceptable level of effort. However, because both the "hours spent on the course per

week" and the belief about the "amount of work in the course" were self-reported data, either the number could be over or under-reported.

Similar diversity can be found for Students 6-10. Below in Table 5.3.3 is a presentation of general information about the student interviewees in the Winter online course. This data was gathered from two main sources: institutional data and interviews. The information is a snapshot representation of student data as they entered the course, as they proceeded through the course, and outcomes of the course.

Table 5.3.3

General information about interviewees from winter *online* course

Data*	Student 6	Student 7	Student 8	Student 9[2]	Student 10[3]
Course Grade	B	B	A-	B	B
Satisfaction with Course[1]	7	~8.5[4]	9	5	8.5
Hours per Week Spent on the Course	3-4[5]	12	5-6	~5[6]	10-12
Amount of Work in the Course	Just Right	Just Right	Just Right	Too Much	Just Right
Prior GPA	3.00	2.80	3.00	3.23	3.00
Gender	Male	Male	Male	Female	Male
Low Income	No	No	Missing	Yes	Yes
Transfer Student	No	Yes	No	No	No
Standing	Sophomore	Junior	Junior	Senior	Sophomore
Year Entered Institution	2011	2012	2011	2008	2007

* Data in this table was drawn from two main sources: Institutional Database and Interviews. Data items that were left unmarked were sourced from the Institutional Database; data with represented with **Bold** text was sourced from interviews.

[1] Students stated their level of satisfaction with the course in the interview. This *Satisfaction with Course* score was a rating that students gave in the interview that expressed their level of satisfaction with the course on a scale of one to ten, ten being the highest level of satisfaction with the course.

[2] Student 9 was enrolled in the online version of the course but was somehow able to go to the in-person discussion section.

[3] Part of the recording for student 10 was lost but the interviewer kept notes for all areas of interview and some of the information for this table was assembled from these notes.

[4] Student 7 did not give a specific number on a one to ten scale but stated that he was "very satisfied. I like didn't expect that much of it, so I was pleasantly surprised"

[5] Student 6 said that on average weeks, they put in only three to four hours per week, "Which was basically one hour on Wednesday for discussion and like two to three to crank it [the assignment] out on Friday." And this time increased during midterms and finals, "Once the midterm and the final rolled around, this number, I remember, went up very high. I, I think I pulled an all-nighter before the final and I studied two days before, so I studied a lot for the final."

[6] Student 9 was not asked the question of how many hours per week were spent on the course. However, Student 9 did say that in addition to discussion section, she waited until the last day of the week and crammed to complete the assignment.

Four out of five of the students that were interviewed for the Winter online course received a "B" in the course, the other was an "A-". On a scale of 1-10 (10 being the highest score), three of the five students rated their satisfaction with the course as high with a rating between an 8 and 9; one student gave the moderate rating of a 7; and one student gave a low score of 5. These five students had fairly similar GPAs: three students had a 3.0 when entering the course; one student had a 2.8 GPA; and one student had a 3.2 GPA. The institutional class standing of the students ranged from sophomore to senior. Two of the students were considered Low Income; two were not; and one had an unknown Low Income status. Only one student was a transfer student.

The only student that said there was too much work in the course seemed to have worked less than the average interviewed student. While Student 9 never stated how much time was dedicated to the course each week, she did state that she would wait until the last minute and then cram the work in to a short time frame. Based on other students that also crammed like this, Student 9 would probably have put in about 3-5 hours per week on the course. Even at the high end of this time spectrum, Student 9 was putting in less time in this class than most of the other interviewed students and was still rating the course as having "too much" work. Even ignoring Student 9, this discrepancy is apparent through the other students that were interviewed in this section. While each of the other four students rated the course as having "just right" amount of work, they reported very different amounts of time that they spent on the course each week. Student 6 only spent 3-4 hours on the course per week; Student 8 put in 4-5 hours per week; Student 10 spent in 10-12 hours; and Student 7 dedicated 12 hours to the course each week. These are huge discrepancies for students that equally said that the amount of course work was "just

right". Again, like the students for the Winter in-person course, the amount of time spent on the course and the rating of how much work was in the course were both subjective self-reports and thus could both be under or over-estimated.

The uniqueness of student demographics continue for Students 11-15. Below in Table 5.3.4 is a presentation of general information about the student interviewees in the Spring online course. This data was gathered from two main sources: institutional data and interviews. The information is a snapshot representation of student data as they entered the course, as they proceeded through the course, and outcomes of the course.

Table 5.3.4

General information about interviewees from *spring online* course

Data*	Student 11	Student 12	Student 13	Student 14	Student 15
Course Grade	B+	B+	A-	A	D+
Satisfaction with Course[1]	8	7	8	4[2]	8
Hours per Week Spent on the Course	3-4	6-7	4-10	7-8	5-7
Amount of Work in the Course	Just Right	Just Right	Just Right	Just Right	Too Much
Prior GPA	2.95	1.51	3.67	3.31	2.00
Gender	Male	Female	Female	Male	Female
Low Income	No	No	Yes	Missing	Yes
Transfer Student	No	No	No	Yes	No
Standing	Sophomore	Senior	Senior	Senior	Sophomore
Year Entered Institution	2012	2011	2008	2010	2011

* Data in this table was drawn from two main sources: Institutional Database and Interviews. Data items that were left unmarked were sourced from the Institutional Database; data with represented with **Bold** text was sourced from interviews.

[1] Students stated their level of satisfaction with the course in the interview. This *Satisfaction with Course* score was a rating that students gave in the interview that expressed their level of satisfaction with the course on a scale of one to ten, ten being the highest level of satisfaction with the course.

[2] Student 14 stated that while he gave such a low satisfaction score, it was the best online course he had ever had. He added, "it might just be that online courses aren't really for me."

For the interviewees in the Spring online course, one student received an "A", one an "A-", two were given a "B+", and the last received a "D+". On a scale of 1-10 (10 being the highest score), three of the five students rated their satisfaction with an "8"; one student gave a moderate rating of a "7"; and one student gave a very low score of a "4". However,

the student that gave a score of a "4" said that it was the best online course he has ever taken. The satisfaction scores of these students does not mirror the grade that they received in the course as one student that received a very high grade of an "A" rated the course as a "4" and the student that received the worst grade out of all the interviewees with a "D+" rated the score high with an "8". The amount of work that students felt was in the course was a more related to the grade they received; only the student that received the low grade of a "D+" said that there was "too much" work in the course while the rest of the students said it was "just right". Interestingly, the data point that should be a better indicator of the feelings students have about amount of work was their report of how many hours they work each week but these data points did not seem to correspond. Student 15, who said there was too much work in the course, said that she spent 5-7 hours on the class per week. This number of hours was lower than other students, including Student 14, who reported spending 7-8 hours on class per week. While Student 15 was not too much different than other student in the reported amount of time spent on the course each week, she was the only student to say there was too much work in the course. There were two students that were known to be low income, one transfer student, and a split of three seniors and two sophomores in the course.

Table 5.3.5 below shows the demographics for all of the student interviewees together. This more comprehensive table helps illustrate some of the diversity of the students.

Table 5.3.5

Summary of student information from university database, surveys, and interviews

	Student Number														
Data*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Term & Mode[1]	W-IP	W-IP	W-IP	W-IP	W-IP	W-O	W-O	W-O	W-O	W-O	S-O	S-O	S-O	S-O	S-O
Course Grade	A-	A+	B[3]	A-[4]	A-	B	B	A-	B	B	B+	B+	A-	A	D+
Gender	M	F	M	F	M	M	M	M	F	M	M	F	F	M	F
Low Income	No	No	No	Yes	No	No	No	N/A	Yes	Yes	No	No	Yes	N/A	Yes
Standing	JR	JR	SO	SO	SR	SO	JR	JR	SR	SO	SO	SR	SR	SR	SO
Prior GPA	2.94	3.30	3.66	3.45	2.10	3.00	2.80	3.00	3.23	3.00	2.95	1.51	3.67	3.31	2.00
Transfer Student	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No
Satisfaction[1]	7.5	8	8.5	7[5]	8	7	~8[4]	9	5	8.5	8	7	8	4[2]	8
Satisfaction	5	7	N/A	4	5	6	5	7	2	6	7	6	6	1	4
Converted Survey Satisfaction	7.14	10.00	N/A	5.71	7.14	8.57	7.14	10.00	2.86	8.57	10.00	8.57	8.57	1.43	5.71
Satisfaction Change from Survey to Interview	1.36	-2.00	N/A	1.29	0.86	-1.57	~0.86	-1.00	2.14	-0.07	-2.00	-1.57	-0.57	2.57	2.29
Amount of Course Work	Just Right[2]	Too Much	Just Right	Too Much	Too Much	Just Right	Just Right	Just Right	Too Much	Just Right	Just Right	Just Right	Just Right	Just Right	Too Much
Course Hours – per week*	7-8	6-7	8-12	6-7	8-9[6]	3-4[5]	12	5-6	~5[6]	10-12	3-4	6-7	4-10	7-8	5-7
*Course Hours -per week**	3	8	N/A	5	8	2	10	5	8	10	5	5	5	5	7
Hours worked on course per week – change from survey to interview	4.5	-1.5	N/A	1.5	0.5	1.5	2	0.5	-3	1	-1.5	1.5	2.50	2.50	-1.00
Hours per week Employed	0	0	N/A	11-15	0	0	11-15	0	0	11-15	0-5	16-20	0	0-5	>30
Attitude toward subject improved	5	5	N/A	5	5	5	5	7	2	6	5	6	7	1	4
Recommend Course	5	7	N/A	2	6	7	5	7	1	6	7	6	6	1	4

* Data was drawn from three main sources: Institutional Database, Interviews, and Surveys. Data items that were left unmarked were sourced from the Institutional Database; data with represented with **Bold** text was sourced from interviews; data represented with *italicized* text was sourced from survey data.

[1]Term: W-IP = Winter In-Person; W-O = Winter Online; S-O = Spring Online

*Course Hours – per week: The amount of hour students reportedly spent on the course per week.

[1] Students stated their level of satisfaction with the course in the interview. This *Satisfaction with Course* score was a rating that students gave in the interview that expressed their level of satisfaction with the course on a scale of one to ten, ten being the highest level of satisfaction with the course.

[2] Student 1 said, "I don't think it was too much, it was a little bit more than I expected, but that's because we had weekly assignments, but I don't think it was too much. I feel like as an elective I would have expected it to be 4 units as opposed to 3 but I don't think it was too much, it was a little bit more than I expected, but I don't think it was too much."

[3] In the interview, Student 3 disputed his grade. He believed the TA had graded his midterm incorrectly, resulting a lower final course grade than he should have gotten. He did not want to challenge the grade because he felt that he learned a lot and it was that knowledge that he was after.
[4] In the interview, Student 4 expressed surprise that she had gotten such a high grade. She stated that she had performed poorly on the multiple-choice portion of the midterm and final. Even though she turned in all of her essays on time, she said "I didn't know what I was doing half the time." She attributed her high course grade to the grading practices of the TA on her essays.
[5] Student 4 said that while they had given a satisfaction rating of a seven if instead of a three unit course there "would have been four units it probably would have got a nine [in the satisfaction rating]."
[6] Student 5 stated that while they generally worked eight or nine hours on the class per week (including lecture and discussion), they increased their study time during the week before the midterm and final.
[1] Students stated their level of satisfaction with the course in the interview. This *Satisfaction with Course* score was a rating that students gave in the interview that expressed their level of satisfaction with the course on a scale of one to ten, ten being the highest level of satisfaction with the course.
[2] Student 9 was enrolled in the online version of the course but was somehow able to go to the in-person discussion section.
[3] Part of the recording for student 10 was lost but the interviewer kept notes for all areas of interview and some of the information for this table was assembled from these notes.
[4] Student 7 did not give a specific number on a one to ten scale but stated that he was "very satisfied. I like didn't expect that much of it, so I was pleasantly surprised"
[5] Student 6 said that on average weeks, they put in only three to four hours per week, "Which was basically one hour on Wednesday for discussion and like two to three to crank it [the assignment] out on Friday." And this time increased during midterms and finals, "Once the midterm and the final rolled around, this number, I remember, went up very high. I, I think I pulled an all nighter before the final and I studied two days before, so I studied a lot for the final."
[6] Student 9 was not asked the question of how many hours per week were spent on the course. However, Student 9 did say that in addition to discussion section, she waited until the last day of the week and crammed to complete the assignment.
[1] Students stated their level of satisfaction with the course in the interview. This *Satisfaction with Course* score was a rating that students gave in the interview that expressed their level of satisfaction with the course on a scale of one to ten, ten being the highest level of satisfaction with the course.
[2] Student 14 stated that while he gave such a low satisfaction score, it was the best online course he had ever had. He added, "it might just be that online courses aren't really for me."

From this table we can see that the majority of interviewed students received a grade that ranged between an "A-" and a "B" with five students receiving an "A-" and another five receiving a "B". Interestingly, most of the students at the bottom level of this range ("B") were enrolled in the winter online course. This could be an indication of an anomaly that occurred either with the instruction or the students enrolled in the winter in-person course. A couple of outliers include an "A+" (Student 2), an "A" (Student 14), and a "D+" (Student 15). Nine of the fifteen students are male and there were only three transfer students that were interviewed. There were five students known to be low-income, eight that were not low-income, and two with unknown income levels.

Nine of the students had a prior GPA level of 3.0 or higher and three students had below a 2.5: Student 5 (2.10), Student 12 (1.51), and Student 15 (2.0). Most of the students stated a high level of satisfaction with an "8" or higher on a scale of 1-10 (ten being the highest). The rating of satisfaction changed slightly for each student from the survey to the interview, even when considering that the survey was on a 1-7 scale and the interview was on a 1-10 scale. When converted from a 1-7 to a 1-10 scale, students ranged from increasing their rating by over two points (Student 14 increased his rating by 2.57) to decreasing their rating by two points (both Student 2 and Student 11 decreased their rating by 2). However, when looking across students, there was only a slight increase in the rating of the course with a total increase of 2.57 points or an average increase of 0.18 points per student. Thus, for these students there seems to be a high variability between individuals but the change was minimal when looking across all of these interviewed students.

Ten students stated that the amount of work they put into the course was "just right" while five said that it was "too much". Interestingly, three of the five of the students that said "too much" were enrolled in the in-person course, while only one student from each of the winter online course and the spring online course said that there was "too much" work. Students also reported the number of hours they worked on both the survey and in the interview. In the survey, the interviewed students reported on average, spending just over six hours on the course per week. In the interview, that number jumps to just over seven hours. When looking at the average hours for each student reported in the interview and comparing that to the hours reported on the survey, there was a total increase of 11 hours across all students or an average increase of .79

hours across the fourteen students that reported both survey and interview hours. While 11 hours may seem like a lot, that is less than one reported hour per student. And the interviews may be a better measure of hours per week since the interviewer was able to help the student think through all of the possible hours the students spent on the course.

For the students that were interviewed, the number of hours that a student reported to have spent on the course each week does not seem to correspond with the level of work they felt was in the course. For example, the student that reported the most hours spent on the course each week (Student 7 and Student 10) also said that the amount of work in the course was "just right". At the same time, some of the students that reported a fairly average (amongst the interviewees) number of hours each week also said that there was too much work in the course.

Most of the students reported that they were not employed or were employed five or less hours per week. Three students reported being employed between 11 and 15 hours per week. While one reported working 16-20 hours per week and another was employed over 30 hours per week. Student 15, who worked over 30 hours per week, also had recently had a child. This may be the reason she thought that spending between five and seven hours on the course each week was too much.

Other outcome data came from the survey and included how students reported their improvement in attitude toward the subject and how likely they would recommend the course to others. Both questions were on a 1-7 scale of how much the student agreed with the statement. Most of the interviewed students reported an above average rating on an improvement of their attitude toward the subject matter as a result of the course and only two students gave a negative rating (Student 9 and Student 14) and one was neutral

(Student 15). Most students also affirmed that they would recommend the course to others; only three gave a negative rating (Student 4, Student 9, and Student 14) and one was neutral (Student 15).

Favorite and Least Favorite Aspects of Course

This next section describes the student cases' self-reported favorite and least favorite aspects of the course. The data is presented and examined across all sections. Below, Table 5.3.6 lists the favorite and least favorite aspects of the course for each student in the winter in-person course. The role that this table plays is providing an insight into how each student viewed their interaction with the various aspects of the course. And seeing what were the favorite and least favorite aspects of the course helps to further describe the profiles for each of these student cases and their experience in the course. However, this compilation of the different students also allows for some comparison amongst the student cases and upon examination, some patterns between the different students and features of the course emerge.

Table 5.3.6
Favorite and Least Favorite Aspects of Course

	Student Number														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Content	F*	F			F					F				L*	
Lectures	F*	F*			F	-*	-	-	-	-	-	-	-	-	-
Textbook and/or Readings		F	F							F	L*				
Replayable Lecture Videos		F				F	F	F		F			F		F
Essays / Assignments			F		F									F	
Discussion Section	L*			F	F	F	L*				F	F	L*	L*	
Personalized TA Help				F				F*	F*		F*		F		
Convenience- Student Control							L*		L*		F				F
Instructor Enthusiasm		F*			F							F			
Course Website														F	
Whole Course															F
First Assignment		L*		L*											
Quizzes			L		L*	L*					L				
TA			L												
Midterm and Final (Multiple Choice)				L											
Logistics of Midterm and Final								L*							
Slow speed of instructor updates of material								L							
Piazza										L					
Difficulty of Course (Too Hard)											L				
Not knowing how to study for tests												L			
Lack of spontaneity and informality of interaction with instructors and other students													L		
Lack of In-Person Office Hours														L	
Amount of assignments (one due every week)															L

Key: F = Favorite; L = Least Favorite; - = Not Applicable to in-person students

*Student 1 liked the content because it was introductory and he did not have to work hard but got what he wanted out of it.

*Student 1 liked the lectures because the instructor discussed more real world impacts of the subject matter.

*Student 1 disliked the discussion sections because he though the TA was bad and he did not learn during them.

*Student 2 liked the lectures because of the instructor's enthusiasm

*Students 2 and 4 disliked the first assignment because of technical difficulties

*Student 6 was very happy he did not have to go to lecture and said he would not have done well if that had been the case.

*Student 8 enjoyed the regular emails from the TA and the regular grade updates from the TA

*Student 8 did not like the timing of the midterm and final. There was no official time, so it conflicted with other classes. He also did not like that he had to meet in a specific location for them and thought they should be online.

*Student 9 enjoyed the specialized TA tutorial videos that were posted on the course website

*Students 5 and 6 disliked the quizzes because of inaccurate grading.

*Student 7 did not like the discussion section because it was small and required participation, however, he admitted that it probably helped him learn the material

*Student 7 disliked the inconvenience of having to set up a time an location of midterm and final with the instructor

*Student 9 disliked the amount of student control over timing and location of material.

*Student 11 preferred reading over watching the videos (reading was his primary method of learning the material) but he thought the material was difficult and the readings were tedious, so he disliked the textbook mainly because of the difficulty or complexity of the readings, not the format of the textbook.

*Student 11 liked that he felt close to the TA

*Student 14 disliked that the content was too shallow
*Students 13 and 14 disliked the technology disruptions during the online discussion sections but may have liked the discussion section in general .

The table above summarizes what students described as their favorite and least favorite aspects of the course in which they were enrolled. Many of the students described more than one favorite and/or least favorite aspect of the course. At the high end, Student 5 had five favorite aspects of the course and Student 14 had three least favorite aspects of the course. Eight students had just a single least favorite aspect of the course and only two students had just one favorite aspect of the course.

At a glance from the distance, one might notice that most of the favorite aspects of the course are lumped at the top of the table and many of these features are favorable to more than one student. Nine of the eleven favorable features of the course were the favorite aspect of two or more students. However, in a show of differing opinions, while four features were described by at least one student as their favorite aspect of the course (content, textbook or readings, discussion section, and convenience/student control), others described these same features as their least favorite aspect of the course. Only twice did only one student name a feature of the course as their favorite aspect of the course (Student 14, the course website; Student 15, the whole course). And while students were often of shared opinion about their favorite aspects of the course, the students' least favorite aspect of the course was often one-off. In only four instances were features shared as the least favorite aspect of the course by two or more students (discussion sections, convenience/student control, the first assignment, and the quizzes).

The replayable lecture videos feature was the most frequently mentioned favorite aspect of the course and simultaneously was not mentioned by any students as their least

favorite aspect of the course. Discussion sections and quizzes tied with four students stating these were their least favorite aspect of the course. While discussion sections had five students giving the opposite view that it was their favorite aspect of the course, not one of the interviewed students mentioned quizzes as their favorite aspect of the course.

One notable item from this table is the amount of "Favorite" items that are clustered together, while the least favorite aspects of the course are singular instances or there is a qualification, such as, for Students 13 and 14 who stated that they did not like the technology glitches experienced during the discussion section, not necessarily the discussion itself. This suggests that certain aspects of the course were more generally appealing while certain negative aspects of the course interacted with specific people or only these specific people had a problem with them.

Some evidence that the negative aspects of the course only interacted with certain students can be found in the comments of the students that disliked the aspect of the course. An interesting pattern is that many of the least favorite aspects of the course that were conditions that seemed to cause irregular or unexpected logistical difficulties. For example, Students 13 and 14 did not like the discussion section because of technology issues; Students 5 and 6 did not like the quizzes because of inaccurate grading; and the only two students that disliked the first assignment was because the website they were originally supposed to navigate to did not work for them.

Student 13 seemed to be speaking for many other students when she said that her least favorite aspect of the course was the lack of spontaneity and informality of person-to-person interactions. Indeed, many of the online students expressed similar longing but did not say this was their least favorite aspect of the course. Further, the feeling of

isolation or lack of close proximal interaction seems to summarize many of the criticisms of online education. Despite this, Student 13 was very satisfied with the course.

Another important note is that some of the component-activities were not mandatory (students had control over whether to participate in some component-activities without participation affecting their grade) and students stopped participating in them early on. Thus, a student may have felt that participation in these component activities would have been their least favorite part of the course had it been required for getting a full grade. One interesting example of this was Student 11, who described their least favorite aspect of the course as the readings since they were so tedious. Yet, Student 11 had stopped watching the replayable videos early on in the course. This raises an important question of whether Student 11 would have thought the videos were his least favorite aspect of the course had they been mandatory. Perhaps he would have disliked the readings less had the videos also been required. Other students that gave up on the readings or videos may have also changed their opinion of the least favorite aspect of the course given a change in student control over some of the component-activities.

Regular Participation in Component-Activities

Below is Table 5.3.7 that illustrates the component-activities that students regularly participated in. Since Table 5.3.7 shows whether the interviewed students participated in a selection of the component-activities, one can begin to get a sense of how students had different experiences in the course. At first glance, one will notice that there were only a couple students that regularly participated in the exact same component-activities. While the in-person students had access to the in-person lecture, one student did not attend the lectures after the first week. This seems to go against the

normal trend as it was reported that most of students in the in-person sections stopped attending the lectures after the first week or two (approximately 80% of the in-person students stopped attending lecture). The online students did not have access to these lectures. Some of the activities were scheduled at a regular time or had a due date (discussion sections, assignment/essays, graded quizzes, in-class lectures, and TA office hours). And some component-activities were required (attendance or submission) in order to receive full credit in the class (discussion section, assignment/essay, and graded quiz).

Table 5.3.7
Regular participation in selected component-activities for winter in-person students

	Regular Participation of Each Student														
Component-Activities*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Discussion Section	Y	Y	Y	Y	Y	Y	Y	Y	Y[14]	Y	Y	Y	Y	Y	Y
Assignment/Essay	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Graded Quiz	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
In-Class Lecture	Y	Y	N	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TA Office Hours	N	N	N	Y[7]	N	N	N	Y[12]	Y[15]	Y	Y[19]	N	Y	N	Y[25]
Textbook	N	Y	Y	Y[8]	Y	N	?	Y[13]	Y[16]	Y	Y	Y	Y	Y[22]	Y[26]
Replayable Lecture Videos	Y	Y	Y	Y	Y	Y	Y	Y	N[17]	Y	N	Y	Y	Y	Y
Video Transcripts	N	N	N	Y	N	N	?	N	N	N	N	Y	N	N	N
Piazza	N	Y[3]	Y[5]	Y	N	Y	Y	Y	Y[18]	N	N	N	N	Y	N
Email to TA	N	N	Y	Y	Y	Y	Y[10]	Y	Y	Y	Y[20]	?	Y	N	Y
Online Exam Practice Quiz	N[1]	Y	Y	Y	?	Y	Y	?	?	?	N	Y	Y	N[23]	N
Meet with other student(s) outside of class	Y[2]	N[4]	Y[6]	Y	N	Y[9]	Y[11]	N	N	N	N	Y[21]	N	N[24]	Y[27]

Key: Bolded component-activities = Mandatory for full grade; Italicized component-activities = Scheduled
Y = Regularly participated; No = Did not participate; Y = Occasionally participated; ? = Unknown; N/A = Not Applicable to online students

*Online Textbook: There was an online textbook but none of the interviewed students reported using it.

*Discussion Section: All of the students regularly attended the discussion section. In-person students attended in-person discussion sections and online students attended online discussion sections (with the exception of Student 9 who attended the in-person discussion section despite being enrolled in the online course)

[1]Student 1 used the hard copy exam study guide (different than the online ungraded repeatable quiz)

[2]Student 1 met with other students outside of class but they were all friends that he had made prior to the course.

[3]Student 2 switched to the Piazza app. She said it was much more user friendly in the app version.

[4]Other than meeting with students for a discussion section assignment, Student 2 never met with other students outside of class

[5]Student 3 did not use Piazza looking for answers to his own question, instead, he used it to answer other students' questions

[6]Student 3 would meet with another student down the hall that he had known prior to the course. But this was primarily for logistical information, like when the exam was. The student down the hall would sometimes ask Student 3 for help because Student 3 said that that student had not read the chapter.

[7]Student 4 did not attend any formal in-person office hours, however, she did have some online sessions with her TA. One was a one-on-one Adobe Connect meeting, another was a text-based chat session, and Student 4 would also watch recorded online office hours (recorded from Adobe Connect) that were conducted by another section's TA.

[8]Student 4 only used the textbook to look up answers to the quiz, to help with the essay, and to study for the exam.

[9]Student 6 only met with his roommate outside of class.

[10]Student 7 frequently emailed the TA but responses from the TA were delayed or not received.

[11]Student 7 only met with his roommate outside of class. He only met with her to study for the midterm and final.

[12]Student 8 went to multiple office hours, both online and in-person.

[13]Student 8 would have the book open as he was watching the online lecture videos because he said a lot of the material in the online lectures directly referenced material in the book.

[14]Student 9 was enrolled in the online course but was somehow able to attend the in-person discussion section

[15]Student 9 watched previously recorded office hours that the TA posted on the main course website.

[16]Student 9 stopped looking up information after the midterm because she thought she was not learning.

[17]Student 9 stopped watching the videos after the midterm cause she thought they were not helping her learn the material

[18]Student 9 read through Piazza but never wrote anything

[19]Student 11 said that he went to all of the TA's online office hours.

[20]Student 11 frequently emailed the TA

[21]Student 12 had a friend in the course that she knew prior to the course. She also met with a student from her discussion section

[22]Student 14 would only use the textbook to search for answers. He did not read it in the conventional way.
[23]Student 14 would study for the midterm by looking at the questions in the back of the book
[24]Student 14 once ran into someone from his online discussion section but it did not consist of any content discussion.
[25]Student 15 attended TA office hours one time.
[26]Student 15 used the book just as supplementary to the lecture videos. She did not read it in the conventional way.
[27]Student 15 saw other students during an office hours session and saw another student she knew from another course. She sometimes talked with that student during the discussion section for that course.

All of the interviewed students completed the activities that were mandatory for a full grade in the course. However, these were the only activities that were consistent across all interviewed students. All but one of the interviewed in-person students attended the lecture (this is quite different than proportion of the full in-person course, in which only about a quarter of the class attended the lecture). Most of the students read or skimmed through the textbook, while two students did not read the textbook at all. All but two students watched the online replayable videos. One of those stopped watching the videos after the midterm because she resigned to the idea that she was not going to do well in the course (she ended up getting a "B") and the other student did not watch the videos because he read the book so intently that the videos seemed to not add any additional information. The video transcripts were only read by a couple of the students. One of the students often read the transcripts instead of watching the video because it was much faster to get through them. Many of the other students did not seem to know about the transcripts. Most of the students used the online practice quiz to study for the midterm and final. Some of the students that did not use the online practice quiz did not know about it.

Finally, one of the more surprising findings was the similarity with which the online students matched the in-person students in terms of meeting other students outside of class. Three in-person students stated that they met with other students in the course outside of class, while four online students met with peers outside of class. Further, only

two of these students met outside of class with a previously unknown student while all of the other students met with class members they had already known prior to enrolling in the course, which was either a friend or roommate. Student 4 met with a group of students that decided to form a study group while Student 15 that met up with a classmate had recognized that student in another course (Excerpt 12926-13248):

> INTERVIEWER: Did you ever meet with students outside of class?
>
> STUDENT 15F: Yeah, when I went to the office hours for my TA a couple of other students were there. And it also turned out that one of the guys in that class was also in another discussion section for another class, so we would talk about it sometimes there.

Among the students that were interviewed (both online and in-person), there was only one single point initiation of meeting a fellow student from this course (Student 4). In other words, only Student 4 met with students outside of the course after only meeting them from this class. Further, each of the students that had a friend in the course reported the ease to which they could ask that friend for logistic information, that they did not feel the need to look for other friends or acquaintances in the course, and the logistics of meeting with that friend was not difficult, often because the friend was a roommate or lived down the hall in the dorms. An example of this can be seen from the comments of Student 12 (6604-7205):

> INTERVIEWER: Okay. Can you describe an instance where you felt very frustrated learning the material, and what could have helped you learn that material?
>
> STUDENT 12F: I felt frustrated when we had a part on economics and stuff, and that stuff has always been difficult for me, so I actually had an other friend in the class, and we actually went over it together and that helped me understand it more.
>
> INTERVIEWER: If the friend hadn't been in the class, what might have helped you learn the material?
>
> STUDENT 12F: Probably going into office hours or meeting up with someone that knew the material.

And this type of interaction can be crucial for gaining hidden logistical information that might not be readily accessible to the average student. As Student 12 (Excerpt 14079-14648) describes below, she might not have known about a website that the instructor built (separate from the main course website) had her friend not told her about it:

> INTERVIEWER: Do you think it was pretty straightforward on how to get to those things, or did you just happen to come across them by chance?
>
> STUDENT 12F: It would have been more helpful if they were put up on the Adobe portal that we used to connect to the class because my friend was the one who told me that they were on his actual other website. So if they were on the original website that would have been more helpful.
>
> INTERVIEWER: Your friend told you about them, but is there any other way that you would have known about them?
>
> STUDENT 12F: I don't think so.

Thus, while meeting with classmates outside of course may be beneficial for the learning process, having a friend in the course simplifies the process of meeting with those other students and discussing both content and logistics of the course.

While this table begins to illustrate the differences between student participation, in order to get a fuller understanding of student participation, one needs to an explore of temporal issues of learning, such as time spent on the course, the timing of activities, the sequencing of activities, and pacing of activities. The last section of this study looks at the differences in how students paced, timed, and sequenced component-activities for the average week and over the term for the course.

Student Primary Sources of Content Information

This last section of general/demographic data brings to light the component-activities that each student described as their primary sources of information. Table 5.3.8 summarizes the ways that each student looked for content information in the class based on their interviews. This information was summarized based on the descriptions students

gave about how they routinely learned in the class and their stated preferences and time-on-task.

Table 5.3.8

Component-Activities that primary sources of information for interviewed students

	Primary Source of Information for Each Student														
Component-Activities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Replayable Lecture Videos	P	X	X		X	P	P	P	P	X		X	P	P	P
Textbook		P	P		X				X	P	P	P	X	X	X
In-Class Lecture	X	X		X	P										
Video Transcripts				X								P			
Lecture Notes								X					X		
Discussion Section				P											

* "P" represents the primary source of information that a student used for content learning
* "X" represents additional sources of information that a student used for content learning

Looking at the table from a distance shows that all but one of the students (Student 4) used either the textbook or the replayable lecture videos as a regular source of content information and for all but one of these students, either the textbook or replayable lecture videos was their *primary* source of information. Student 4, the only student that deviated from these two sources of information stated that her primary source of information was the discussion section. However, she also used the transcripts from the replayable lecture videos and attended the in-class lecture. She ended up receiving the strong grade of an A- in the course.

Similarly, all but one student used either the replayable videos or the in-person lecture as a source of information. Student 11 was the exception and stated that he only used the textbook as his source of information. This means that Student 11 was spending no face time with the instructor for the course each week. Student 11 was still attending discussion section, which a Teaching Assistant ran, and read the book that the instructor

wrote, but he did not see the instructor's face or hear his voice during the week. Student 11 received a respectable B+ in the course.

Interestingly, all but one of the students in the in-person section used the online lecture videos and none of the in-person students stated that the in-person lecture was their primary source of information. Indeed, many of the students that attended the in-person lecture stated that while it was interesting and motivating, they were not very informative. This could be the reason that approximately 80% of the students in the in-person course stopped attending lecture. Two students (Student 6 and Student 7) indicated the replayable lecture video as their only regular source of information and, as mentioned, just one student (Student 11) stated that the textbook was their sole source of information.

Conclusion of Student Demographic Information

Something that this prior data begins to suggest is the interaction that a student has with a course is individual and unique. Each of these students had very different experiences interacting with the component-activities in the course. For example, the first section of demographics displayed how much time students put into the course each week, which can be viewed as an indicator of student output. Meanwhile, the student report of their feelings about how much they worked (just right, too much, or not enough) can be seen as a connection between output and outcomes; it is both a comment on output (how much they worked) and an outcome of their feelings about that output.

The context surrounding a student is hinted at with Student 15 who worked more than 30 hours a week, had a baby, and was low-income. This type of context could cause a student to want to spend less time on a class and feel that any amount of time spent on a

course is too much. And although Student 15 received a low grade of a D+, she still stated a high level of satisfaction with the course during the interview. Other students, like Student 14 who received a very high grade in the course was left unsatisfied. And Student 7, who spent 12 hours on the course each week (approximately double that of Student 15), thought that the amount of work in the course was just right.

Some students were able to invest as little as three to four hours per week on the course, while others were working three to four times as many hours. The discussion section for the course added an additional hour of time per week and while it was primary source of information for only one student, other students liked that they were able to get additional logistical information about the course and interact with other students. Students that attended the in-person lecture were automatically adding three hours of time that were spent on the course each week. And they may not have been receiving much additional content information but rather were attending the lecture for inspiration or motivation.

When looking at the favorite and least favorite aspects of the course, there was a general pattern in which many of the favorite items were commonly enjoyed and many of the least favorite items were one-off. Further, many of the students disliked certain component-activities because of technology glitches or unanticipated additional logistical work. Despite these patterns, the favorability for component-activities also seemed to have an element of preference as not all students liked or disliked the same aspects of the course.

How students participated in the course provides the foundation for understanding the decisions students made. That there was a difference in student participation indicates

that students were allowed some freedom in how they participated. When looking at the regular participation in a component-activity, each of the student cases regularly participated in all of the component-activities that were required for full credit in the course (discussion section, the assignment/activity, and quizzes). Indeed each student had a choice as to whether or not they would participate in these activities, albeit, they would not have received a full grade if they had not. The other component-activities were checkered with student participation. The replayable videos and textbook both saw regular participation from all but two students. However, only a couple of students read the video transcripts and only a handful of students met with other students outside of class (and many of these students met with friends or people they already knew prior to enrolling in the course). Finally, most students claimed they received much of their content information from either the replayable lecture videos or the textbook with little deviation. Even the in-person section students claimed that the lecture was supplementary and did not add too much information. This is helpful as it begins to suggest reasons as to why students participated in the ways that they did.

Understanding why students participated in these ways is key to understanding the student portion of the framework. By discovering both how students uniquely participated in the course and why the students participated as they did helps to identify what steps can be taken to both improve a course and help individual students make decisions to improve the learning experience. More analysis in how and why students participated as they did continues through this study.

Coding for Framework Sections Using Student Interviews

The student interviews were coded using a coding scheme based on the latest framework. This framework was informed by the original conceptualization of the framework (as described in Chapters 2 and 3), the first study (review of the literature), and the second study (course case study). As opposed to the results of the previous study, the results for the coding of this study are presented according to each actor in the framework: Institution, Instructor, Course/Media, Other Students, and the Individual Student. Instead of looking at counts per student, this analysis looks at the results in terms of the total code count and three different groupings

- Online versus in-person
- Low income versus not low income
- Female versus male

The analysis here demonstrates that each group described all of the sections of the framework as they discussed their experiences in the course. And proportionally, they were all similar.

Coding for the actor, *Institution*, based on the student interviews included just one code: *Institutional Issues*. The reason for the one code was that it was predicted the students would not discuss too many issues related to the institution. The low count was predicted because of how far the institution was removed from the student in terms of interaction within the course. Further, the questions asked in the interview were not specifically related to the institution. Therefore, any comments that students made about the institution would come from their own insight into how the institution influenced the creation or operation of the course. Because the count was predicted to be relatively low, it would be easier to make distinctions about what area of the framework the comments about the institution were referring to (Input, Decisions, Operation, Output, Outcomes

and Impacts). Table 5.3.9 below gives a definition and example from the student excerpts of the code *Institutional Issues* and is followed by an analysis of related excerpts from the student interviews.

Table 5.3.9
Definitions and examples of *institutional issues*

Framework Area and Definition	Example of Student Excerpt
Institutional Issues: Any reference to institutional inputs, processes, or results. Institutional input being any time, effort, money, or resource that the institution invests in the facilitation of a course. Institutional processes being any process that the institution engages (decisions and operation/participation) in relation to the course. Results being any output or outcome for an institution that relates to the course.	STUDENT 6M (Excerpt 5690-6158) I liked it, I don't see it as a course that somebody would take if they are interested in actually getting into that field. most of us that were in that course were just in there to get some GE credits and get out. In that sense it was a good course because we did actually learn you know a few things mostly, we knew a lot of things, mostly it was a good course it was just get the GE credits for it, im pretty almost everyone was taking that course for.

Many of the interviewed students felt that the course was worth fewer units than the work required (it was a three unit course but should have been four units). Student 4 described how an additional unit of credit would have bumped her level of satisfaction for the course from a seven to a nine. Thus, the institutional recognition of her effort seemed to have a direct influence on a personal satisfaction outcome.

Student 3 described the drop-off in attendance for the in-person course. Because students were not required to attend lecture and could alternatively watch the online videos, many students stopped attending the in-person lecture. By the end of the term, there were was only between 30 and 50 students still attending lecture in lecture hall that could fit 450 students. This suggests that 1) the space on campus was being underutilized; 2) courses that are designed in a similar fashion may not require as much brick an mortar infrastructure from the university, potentially saving quite a bit of money that would be spent on new building construction and maintenance.

Student 14 wondered why everything would have to be online when the instructor has been provided an office at this university Student 13 and Student 14 chose this course, which was only offered online this term, because it was the only course that met their need in this area that the university was offering. Student 5 took the in-person version of this course for the very same reason. Student 2, Student 6, and Student 7 described the "typical" student that takes this course was one that was trying to meet lower division GE or writing requirements. Thus, these types of students might bring down the quality of the course for those that want to go into the subject more in-depth.

Student 10 and Student 11 described the process of finding out about the course and subsequently enrolling in the course through the university registration website. Student 9 discussed how all of the classes that were an alternative option to this one were booked by the time she was ready tor register. Student 5 described how he felt that the students in his course were like "Guinea Pigs" for the Learning Management System they were using as it was very buggy, and how the website crashed and all the conversations that were on there for three weeks were lost. He said that this caused problems with students being late for turning in assignments and the instructor was forced to wave the late penalty. Student 8 and Student 9 mentioned that they were in contact someone from the university for help when the technology failed. Meanwhile, Student 5 found it difficult to even navigate the course website which was supported by the university and suggested alternative ways that a student should be able to navigate to the site. He also thought that the Learning Management System that they were using was not great but not any worse than the other one the university was using for all other courses he was taking.

Student 8 described how he had to reschedule his exam with the professor because they were scheduled in-person for a specific time and he had another class at that specific time. This suggests that there could be institutional problems in scheduling in-person exams for classes that are supposed to be anytime-anywhere.

Student 7 mentioned that a lot of students do not have good Internet service or a lot of bandwidth. He suggested an alternative for these students would be to find somewhere quiet on-campus. However, even this could pose a problem as he felt there were not many quiet places on campus that one could interact with others online in a discussion section format.

This conversation with Student 5 (Excerpt 16411-18074), presented below, is one of the few statements where one of the interviewed students discusses multiple processes of the Institution (Input, Decisions, Operation, Outcomes, etc).

> INTERVIEWER: You said it was hard to find canvas?
>
> STUDENT 5M: yeah, he had a link on the syllabus, which was good, you could get to it there. But like it was weird I would Google [university online courses] and it would take to the [university online courses site] site and from there I could register for [university online courses] classes but there wasn't ever a direct link to sign into the [university online courses]. I always had to bookmark the site on the syllabus. You know I would think that you would Google [university online courses] and it would take you the [university online courses] course, which is good - it did that. and then I would think there would be a login button in addition to all the other 'sign up for courses" other than hiding the login button on a different page. And piazza and canvas didn't actually have a site you had to sign in on [university online courses] to reach them.
>
> INTERVIEWER: So you think it's not very accessible the canvas site.
>
> STUDENT 5M: Like I'll show it you, (goes to site)... as you can see it is a really nicely designed site but as you click around you can see that there's no place to login. You can sign up for courses you can view online courses. I think that what made it hard to access was that this was the only way to login unless you had it bookmarked. This is the only place to sign in and because it is a secure site it makes it harder to find, just Googling it doesn't bring it up. But once again that doesn't mean it needs to be fixed. If they just take the [university online courses] website and they just put a link to that login site and that would make it much more accessible.

Table 5.3.10 below gives the count of frequency with which students discussed institutional issues during the interviews. This table shows that, as predicted, the

frequency with which students discussed institutional issues was low. The reason for this low count was probably either the relevance of the questions asked or the distance between students and the institution in the course creation and operation. However, as explained through the examples above, the student experience was impacted by the ways the institution operated in relation to the course.

Table 5.3.10
Code usage for *Institutional Issues* section

		Instructional Mode		Income		Gender	
	Total	Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Institution Issues (Input, Operation, Decisions, Output, Outcomes, Goals)	**26**	15	11	6	14	6	7

[1] The income of two students was unknown

Coding for the actor, *Instructor*, based on the student interviews included four codes: Instructor / TA (General Code); Instructor Input; Actual Instructor Participation; and Instructor Decisions, Output, and Outcomes. The first code is a general code for the instructor that included the statements of all the subsequent codes. Below are the definitions and sample statements from the interviewed students for each of these codes. The last code (Instructor Decisions, Output, and Outcomes) refers to three separate areas of the framework but was grouped into one code for logistical reasons. Because this code included properties and processes that were theorized to be less visible to students, it was predicted that the count for any of these individual features would be low and the statements that students made would be slight.

Table 5.3.11
Definitions and examples of *Instructor* sections

Framework Area and Definition	Example of Student Excerpt
Instructor / TA (General Code): Any reference to the instructor in general	Student 7 (Excerpt 3437-3509) I had a problem with my TA. Because of stuff not getting graded on time.
Instructor Input: Any reference to input variables related to the instructor or TA input characteristics. These characteristics refer to any permanent or semi-permanent characteristic that the instructor brings to the course upon entry or developed during the course.	Student 13 (Excerpt 24885-25279) For an online course, yeah. Professor [Professor's Name] was, he was really into the subject, and he really wanted us to learn, and I think I'm speaking for everyone that when I say that yeah he really did.
Instructor Participation: Anything that refers to the actual participation of the instructor or TA in the course	Student 15 (Excerpt 12272-12637) Um, it would have been nice if the professor had been there for the discussion sections a little bit more but I know he had office hours, and I never utilized that, so, I'm not sure how helpful that was for other students.
Instructor Decisions, Output, and Outcomes: Any reference to latent characteristics/actions of the instructor that may be difficult to observe externally but could be theorized about. This includes the following: any reference to an instructor making decisions about the course; how much work or output the instructor has expended; and instructor outcomes from the course	Student 3 (Excerpt 24606-25346) I expected my TA to be a little bit more enthusiastic, he's a grad student, almost all the TAs here are grad students, and some show a lot of devotion, interaction, and knowledge and others show the opposite and I wouldn't say my TA shows no enthusiasm, that's definitely not true, he's passionate about things such as [this subject] he's a [similar subject] major, but sometimes he would just come in and be very sleepy, like he just woke up for a nap or he hadn't slept for 40 hours and he wouldn't stand up, wouldn't really want to be there, ended class early and the discussion wouldn't be very productive and other times it was alright, it would go the full length, he would answer questions but overall, that area needed improvement.

Table 5.3.12 below presents the count for each of these codes. The counts for the different groups (Instructional Mode, Income, and Gender) were fairly proportional. However, as anticipated, the codes with the higher frequency of usage are the codes that represent processes and characteristics of the instructor that are more visible to the student. Indeed, the code that signified the most visible property (Instructor Participation) had the most usage. And the least used code was the code that represented somewhat hidden characteristics of the instructor. Even in the example above, the student barely makes the connection to decisions, output, or outcomes of the TA, which was made when

he said, “[the TA] wouldn’t really want to be there” and with the indication of output (ending class early and not being productive) and outcomes (the overall statement suggests that the discussion section was not successful) but also was an indication of the instructor’s input (motivation and goals) and reflected poorly on the TA. Another statement from Student 7 (Excerpt 3437-3509) coded with Decisions, Output and Outcomes had somewhat blurred lines between Instructor Participation, Instructor Output, and Instructor Outcomes: “I had a problem with my TA. Because of stuff not getting graded on time.” This statement was closely related to participation and output because of the actions (or inactions) that the TA took. It was closely related to outcomes because we can assume there was an intent that the assignments would be graded on time, but they were not, leading to an undesired outcome (at least according to the students).

That the students commented mostly on characteristics that the student could observe (instructor participation and instructor input) was not surprising. Further, it was not surprising that the students did not often comment on instructor decisions, instructor output, or instructor outcomes and when they did, it was difficult to make the distinction about what aspect of the framework the comment related to. These characteristics are difficult for a student to observe and might not be something students are prone to think about. Further, the questions asked in the interview were not specifically intended to elicit responses related to these latent instructor characteristics. However, from the instructor interviews analyzed in Study 2, it is clear that this instructor had more depth than what the students were describing. Further research in this area will be needed to determine how well other instructors match up with the theory of the instructor presented in this dissertation.

Table 5.3.12
Code usage for *Instructor* sections

	Total	Instructional Mode		Income		Gender	
		Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Instructor / TA	**168**	99	69	60	87	72	96
Instructor Input	**19**	13	6	7	11	9	10
Instructor Participation	**155**	95	60	55	80	63	92
Instructor Decisions, Output, Outcomes	**17**	15	2	11	4	6	11

[1] The income of two students was unknown

The next set of codes was based on the actor, Media, had a coding scheme similar to the instructor coding scheme that included four main codes: Media Input; Course Operation; Component; and Media Decisions, Output, and Outcomes. Below in Table 5.3.13 are the definitions and sample statements from the interviewed students for each of these codes. The central point of the framework through which students interact with media, the instructor/TA, and other students is the course operation. Under the Course Operation code, there were multiple subcodes, including all of the codes for components, control, features of media, and features of curriculum and content. These subcodes are described and analyzed in the sections that follow. With all of these subcodes, the Course Operation code would naturally have a high usage count. The last code in this section (Media Decisions, Output, and Outcomes) refers to three separate areas of the media portion of the framework but was grouped into one code for logistical reasons related to a predicted low code count. Because this code included properties and processes that were theorized to be less visible to students, it was predicted that the count for any of these individual features would be low and the statements that students made would be light. This section is important as it presents the general codes for an actor that directly

interacted with all other actors in the framework. Further, the media represents the main differences as to what makes an online course, online.

Table 5.3.13
Definitions and examples of *Media and Course* main sections

Framework Area and Definition	Example of Student Excerpt
Media Input (Technology, Assembly, Subject/Content): Any reference to course or media input in general.	Student 8 (Excerpt 7014-7424) And sometimes the videos weren't updated so sometimes he changed the information and it took a while for the professor to maybe edit what he wanted to say and also add in some of the quiz questions so I mean it kind of messed with my schedule cause I wanted to review the information on maybe Monday and Tuesday but he wouldn't post anything until Wed so I kinda had to work around that. That was not very fun.
Course Operation: Any reference to characteristics or operation of the course. This includes any general characteristics or operations related to the course, such as when the course is offered or the format of the course overall.	Student 6 (18655-19292) STUDENT 6M: Yeah definitely, that was, it was very clear, the course was nice, because it was very clear what we needed to do, when. There were modules set up, and each module corresponded to current week, and in that module was basically, the lecture video for that week, the quiz for that week, the assignment for that week, and any additional or supplemental links I guess for that week. So it was really nice to be able to just go through there and be like here's the module for this week, here is exactly what I need to do.
Component: Any reference to the characteristics or operation of a specific course component-activity, such as an assignment, a reading, a quiz, or a discussion section	Student 4 (22890-23350) STUDENT 4F: Oh I liked, so they had a video and then they had the transcription of the video, which is written words- I feel like the transcript how more information than the video itself. The videos were kind of short and sweet and to the point but the transcriptions had more information. I forgot to say that- I would read those. More so than watching the videos.
Media Decisions, Output, and Outcomes: Any reference to latent characteristics/actions of the course media that may be difficult to observe externally but could be theorized about. This includes the following: any reference to media making decisions; how much work or output the media has expended; and media outcomes from the course	Student 14 (22903-23307) STUDENT 14M: Umm no, I mean I didn't really seek out help I was just thinking, "Wow this software sucks, the audio is really horrible", I thought it was just inherit in the program I mean there wasn't really anything I could do to fix it, so I didn't seek help.

Table 5.3.14 below presents the count for each of these codes. With the exception of Media Decisions, Output, and Outcomes, all of these codes had strong usage, indicating an important role in the student course experience. While the counts for the different groups (Instructional Mode, Income, and Gender) were not perfectly

proportional, the differences were not large enough to signal a substantial influence on frequency of usage. This signals that regardless of group identity, the media and course operation have important roles in the experience of students. And as predicted, students did not readily offer comments on the more hidden aspects of media and the course, particularly the decisions, output, or outcomes of the course. This is most likely because of the lack of student involvement in the creation or implementation of media for the course. Thus, the student concern of media is more how they interact with it and not the inherent nature of the media.

Table 5.3.14
Code usage for *Media and Course* main sections

		Instructional Mode		Income		Gender	
	Total	Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Media Input (Technology, Assembly, Subject/Content)	**152**	105	47	47	78	60	92
Course Operation	**490**	318	172	150	274	201	289
Component	**363**	223	140	109	208	146	217
Media Decisions, Output, Outcomes	**25**	22	3	8	10	6	19

[1] The income of two students was unknown

Media input was coded with the three subcodes and included: Technology Input; Course Assembly Input; and Subject / Content Input. These codes mirror the course input codes for Study 2, which were condensed from the multiple variables found in Study 1. For ease of use and the expectation that anything addition would result in diminishing returns, the number of codes for this study was limited to three with no subcodes. The definitions and examples student excerpts are presented in the table below.

Table 5.3.15
Definitions and examples of *media input*

Framework Area and Definition	Example of Student Excerpt
Technology Input: Any reference to the technology infrastructure. This could refer to localized or external infrastructure that supports the course.	Student 6 (Excerpt 30729-31473) on adobe connect we had a lot of issues. Almost every single discussion section, every single week there was some issue. Every once in a while the internet would be a little bit slow and the people would cut out or freeze and we wouldn't hear anything. There was a couple mic problems with some of the students but I guess that's not really adobe's fault. Let me see what else. It was really good, most of the time but when it was bad it was really bad. INTERVIEWER: you mean like adobe connect or the whole course? STUDENT 6M: Adobe connect. It was just every once in a while it would just give up and just freeze everything. You couldn't see you couldn't hear anything, you could see people moving kind of… but everything would just freeze
Course Assembly Input: Any reference to the creation of the course. This could refer to any processes or resources allotted to course development.	Student 3 (Excerpt 31658-32283) INTERVIEWER: Overall did you feel that you had a high quality learning experience? STUDENT 3M: Yes I definitely think so. I think a lot of that is attributed to how the course is laid out. It's very efficient way to go through the course, he definitely planned it out well ahead of time. The book is organized very well with the whole course. The course lives off the book, which is good because the course would not be high quality just off of his lectures. But yeah I would recommend the course to anyone and have them go into it knowing that the lectures aren't going to be stimulating necessarily, but the book will be.
Subject / Content Input: Any reference to the subject or content of the course.	Student 10 (1459-1848) STUDENT 10M: Loved it. Because the material was really interesting. The videos were awesome., Even though there were no interactive. The videos made way more sense if you had already read the books. It all made sense. Read big chunks of chapters. If there was something that was really important, then would just read it

Technology Input has been placed in the Input area of the Online Course Framework, however, this location could be moved to the Course Operation through Media section since many of the comments about Technology Input are related to issues related to the technology failing (as the example above shows). However, this point is rather minor since technology failure could be seen as either input or operation. The

importance is in the clarification of what this means. Below, Student 15 (Excerpt 9585-10402) explained how the technology input sank the experience in discussion section for some students, including her:

> INTERVIEWER: Was there any ways that they could have been more useful; these interactions?
>
> STUDENT 15F: Sometimes… the only thing that I could really think of is that AdobeConnect has issues sometimes, so sometimes there was a few discussion sections where students couldn't really get in and so there would only be a couple of us, or there'd be group connection issues and so then the whole discussion section would be kind of wasted, and that wasn't really helpful.
>
> INTERVIEWER: So you're saying that most of the discussion sections--on these occasions-- most of the discussion section was devoted to trying to fix the technology issues, or you just kind of--
>
> STUDENT 15F: Yeah. But there'd only be a couple of us in there and so, it wasn't a whole lot of discussion going on when there's only a couple students.

Student 14 (Excerpt 9412-10020) seemed to follow-up the comments of Student 15 by stating that had the technology worked to the level expected (and for him a better TA as well), the discussion sections would have been good and important for the learning process:

> STUDENT 14M: My least favorite aspect was the discussion section because I feel like I was wasting my time being there and it was just kind of frustrating all the technical problems, so that was my least favorite component.
>
> INTERVIEWER: So if the glitches were worked out and you had a better TA, do you think the online would have been okay?
>
> STUDENT 14M: yeah, I do. I think that if there were improvements it could definitely be worth the students while I feel like discussion sections add something to their course and that wouldn't change for an online course, I feel like it would still be valuable.

These comments show how problems with the technology completely derailed the online discussion section and were directly responsible for failed implementation. Regardless, coding for technology input is sufficient as being represented in one location in the framework, coding it for both input and operation would be redundant and could cause confusion over how to analyze the results. For this study, Technology failures were coded in with Technology Input as a characteristic of Media Input.

The usage count for each of these codes is presented in Table 5.3.16 below. Each of the codes had moderate usage. This indicates that students were cognizant at some level of the resources that went into the development of the course. However, despite the moderate usage, most of the student comments did not probe the actual processes or resources involved in media input. While students may have been more articulate if they had been asked more direct questions about media input, most of the comments that students offered only lightly touched on media input as they were more focused on their experience. There did not seem to be any exceptional differences between the different groups (Instructional Mode, Income, and Gender), indicating some similarity in the amount that these groups talked about media input.

Table 5.3.16

Code usage for media input subcodes

		Instructional Mode		Income		Gender	
	Total	Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Technology Input	**64**	46	18	16	33	26	38
Course Assembly Input	**65**	48	17	22	30	24	41
Subject / Content Input	**41**	23	18	17	22	19	22

[1] The income of two students was unknown

Control was a sub-area of Course Operation. As explained earlier in the dissertation, control refers to the ability to the ability to make an alteration to a specific aspect of the course. There are two main aspects of control: *Source* and *Type*. *Source* of control refers to the actor or actors that have control. *Type* of control refers to the area of the course that is the focus of the control. This study focused on the coding of Control in general and the various types of control. The codes for control are presented in the table

below and included seven codes: Control (General); Location; Timing; Pacing; Sequencing; Content; and Component-Activity.

Table 5.3.17

Definitions and Examples of *Control*

Framework area and Definition	Example of Student Excerpt
Control: Any reference to a source or type of control. A source of control being the entity that is in control (e.g. institution, instructor, media, student, or a group of students). A type of control being the way an entity or process is controlled (e.g. location, timing, pacing, sequencing, content, or component-activity)	Student 9 (Excerpt 1127-1611) INTERVIEWER: Could you describe what your typical week looked like for this course? STUDENT 9F: Well there's always things due on Friday at 10pm. It's either an essay or an exercise and there would always be online quizzes. Since I'm not being forced to go to class, I wait til the last minute to do everything. I didn't really do much in the beginning of the week. I just crammed it in in the end. I didn't like how everything was due on one day. I would rather have it spaced out.
Location: Any reference to the control issue of location but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students)	Student 6 (359-698) STUDENT 6M: it was mostly like I was taking a lot of units last quarter, so I thought it would be a good idea to not have to spend you know as much time on campus, and it was mostly that that got me to enroll.
Timing: Any reference to the control issue of timing but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students).	Student 7 (20178-20634) STUDENT 7M: Just probably the convenience. Setting your own schedule and that it didn't add a huge specific time commitment, like the only specific time commitment was whenever I needed to submit my essays and when I needed to attend online discussions. It didn't require me to watch lectures at any time; it didn't take away lectures. I had access to anything at any time.
Pacing: Any reference to the control issue of pacing but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students).	Student 14 (Excerpt 1859-2428) So there were like deadlines usually like on Friday nights. We had to take like a weekly quiz and write a weekly either exercise or essay. Those were usually due midnight on Friday. So I tried to do things during the week, like they had online videos to watch so I tried to fit those in during the week but I typically saved the text and the writing things for Friday afternoon because I was trying to focus on some of my other classes during the week. So it was usually just watching the videos during the week and working on assignments and quizzes Friday afternoon.
Sequencing: Any reference to the control issue of sequencing but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students)	Student 10 (Excerpt 1660-1726) The videos made way more sense if you had already read the books.

Table 5.3.17 Continued

Definitions and Examples of *Control*

Framework area and Definition	Example of Student Excerpt
Content: Any reference to the control issue of content but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students)	Student 8 (31237-31726) STUDENT 8M: I would say that, I- I would say maybe online would be better because like I was more on top of stuff, like I kinda made myself do all the work and normally I wouldn't want to do that because its not fun to me, and its not nagging me so like, having online made me push myself to maybe learn this like, actually learn this more in-depth, compared to other course.
Component-Activity: Any reference to the control issue of component-activity but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students)	Student 13 (3349-3775) INTERVIEWER: Okay. is there anything else you would do during the week that I'm missing? STUDENT 13F: , ohh the lecture notes, I don't know if its notable, there were lecture notes like power point slides that professor [Professor's Name] used for his in person lectures in the past quarters so we had that as resources it wasn't entirely necessary to, to look them over, but I would do that from time-to-time over the week.

The coding usage count is presented in Table 5.3.18 below. One of the surprising findings was the low count for Location, especially in relation to the higher counts of the other types of control. This indicates that it either played less of a roll in the student experience once they entered the course, they were not cognizant of control over their Location, or the questions from the interview were not setting up students to talk as much about Control over location as the other types of control. In Study 2, Location was the third most mentioned type of control, under Timing and Pacing. Indeed two of the questions on the survey asked students why they would or would not enroll in an online course in the future. This type of question will elicited more answers that were geared towards the convenience of Timing and Location. Meanwhile, the questions in this interview were more directed in how the students interacted with the media, students, and the instructor, which was more closely related to issues of Timing, Pacing, Sequencing,

Component-Activities, and Content. While most of these expectations were realized, there were fewer comments about control of content than was expected. However, while students were able to make choices about which component-activities from which they would acquire the content information (e.g. Readings, Videos, Transcripts, Lecture Notes, and In-Person Lectures), the content they were expected to learn remained the same. In other words, all of the media presented in this course were aimed at convergent outcomes. Thus, students may have had control over the component-activity but the content they were expected to learn was the same, regardless of the learning experience.

Table 5.3.18

Code usage for control and subcodes

		Instructional Mode		Income		Gender	
	Total	Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Control (General)	148	98	50	48	81	66	82
Location	9	6	3	3	4	3	6
Timing	69	50	19	25	32	29	40
Pacing	77	55	22	25	44	33	44
Sequencing	36	22	14	10	22	19	17
Content	15	14	1	7	4	7	8
Component-Activity	61	38	23	17	37	28	33

[1] The income of two students was unknown

Something noticed during the coding of control was the possibility that while the types of control that were coded here – Location, Timing, Pacing, Sequencing, Content, Component-Activity – seem to be the main types of control, there are potentially many other types of control that need to be investigated further. For example, one of the types of control coded here was component-activity. This code was intended for the choice to participate in the component-activity as exemplified through this exchange with Student 11 (Excerpt 16996-17621):

> INTERVIEWER: Okay. So you didn't really watch the videos but if there had been an in-person lecture and that had been optional do you think you would have gone to the in-person lecture or stuck with the book.
>
> STUDENT 11M: I feel like I would say "yeah". But when it comes to it I probably wouldn't go because it's optional.
>
> INTERVIEWER: Okay. Do you think like an in-person lecture would have been better than videos or do you think the videos were better and you just didn't watch them because they were optional.
>
> STUDENT 11M: I think I just didn't watch them because it was optional and I like reading the book more.

However, aside from temporal, location, and content types, there could be numerous types of control related to participating in the component-activity. In this study, it was found that there could be a type of control related to Media Form. For example, Student 15 had a baby at home and liked that she was able to opt-out of the video component of the video conferencing so that she could surreptitiously nurse her child:

> INTERVIEWER: Would you have liked more or different types of interactions with students?
>
> STUDENT 15F: I think this way was pretty good. It worked pretty well for me, especially since I usually had to, you know, take care of my son during the discussion sections so I'd be nursing and stuff. So, I'd rather, you know, not have to interact with people too much while I'm doing that.

This example from Student 15 shows that Control over Component-Activities does not necessarily mean the entire activity but could just be the form. In other words, the student might want to participate, just not in a specific format. Another example of this comes from Student 15 (Excerpt 10023-10824):

> INTERVIEWER: You mentioned that you didn't like the online office hours from the professor, what particularly did you not like about it?
>
> STUDENT 14M: It's not so much that I didn't like that he held them online, its more like I didn't offer the option for them to be in-person. He's a professor [at this university], he has an office on campus, it just didn't make sense that he wouldn't also offer things in-person. And I didn't like it because of the online communication tool. The problems that I had with the discussion section it was the same for the office hours, it was the same system, so it was just like for me, I felt like it made communication more difficult because of all the sound problems and it cutting in and out, I just didn't like that he didn't offer the other in person option.

This comment shows that there is somewhat of a blurred line between a component-activity and the form that it is presented. In other words, if the online office hours were also conducted in an in-person format, they might be considered a different component-activity. While the issue of control over component-activity versus the form of the component-activity has a logical argument and was exemplified by the comments of students in this study, more research will be needed in this area to provide clear distinctions between these types of control and find other examples.

Another type of control that could be potentially be separated from control of component-activity is *control of interaction*. The following excerpt (Student 6, Excerpt 23382-24038) shows how a student could control interaction with others through media features.

> INTERVIEWER: And so there weren't any like announcements that, that came through on email, I mean as far as like Piazza postings? It was, you just had to go on?
>
> STUDENT 6M: I very quickly changed my settings on Piazza to stop them from emailing every four hours, cause they were extremely annoying. I only set email preferences to send me announcements from the TA's and the professor. Which they mostly did their announcements not on Piazza but on the course page, is what they did most of their announcements on. So it was a lot easier to, to go and look on there. But yeah, there was email notifications for anything that the instructor or the TA said.

The distinction here is that the student is given the choice of whether to interact with others, not the media form of the interaction (as described in the example from the online discussion section above). In an in-person course, a student could make decisions about who to interact with given the options in the classroom. Or an instructor could have some level of control over interactions by making rules of silence or setting up the groups for group-assignments. While the issue of control over component-activity versus the control over interaction has a logical argument and was exemplified by the comments of students in this study, more research will be needed in this area to provide clear distinctions

between these types of control and find other examples. And future research is needed to discover other potential control types not identified here.

Another aspect of control that was discovered during the coding of this study was how control originates. For this, two main concepts were found: meta-control and negotiated control. Meta-control refers to control of control or having the ability to make decisions of the sources and types of control in a course. The idea of meta-control was discovered when looking at some of the hypothetical statements that students would make about how they would potentially change things about the course. For example, Student 8 (Excerpt 11438-12045) explained how he would have liked more flexible discussion times but also acknowledged that the logistics would be difficult:

> INTERVIEWER: Great. And was there anything that would have allowed you to manage your time better?
>
> STUDENT 8M: Mmm maybe I mean this would be unreasonable, but maybe have like the students choose what time they wanted to go to what is it the discussion, I know that's impossible because you had to take roll, but like maybe if there was like some time I had something else happening maybe an event during my discussion like I could go to an earlier discussion or a later discussion. but, other than that I, I felt that the course was pretty fine in terms of time management, letting me manage my own time.

This statement gives the student a theoretical situation in which control could be decided. In this case, the student saw the convenience of having discussion times at the times that worked best for each student but also accepted that this might not be logistically possible. After the discovery of the potential for meta-control to reside in the hands of the student, it was theorized that this meta-control could also be a process that an institution would engage in and potentially it could arise in media. Therefore, it is theorized here that meta-control could occur with any actor involved in an online course. However, meta-control and the source of meta-control needs further research.

Negotiated control is related to meta-control but is a specific type of meta-control that assumes shared or negotiated process.

Student 14 (Excerpt 10827-11209) explained how pacing can be controlled through the deadlines set for assignments and quizzes:

> INTERVIEWER: I see okay. Do you feel like you were able to learn at your own pace in this course?
>
> STUDENT 14M: Yeah I think so. I think because of the flexibility- you know there were deadlines every week with the writing assignment and the quizzes, but aside from that you had all week to work on it whenever you wanted. So yeah I would say that you could learn at your own pace.

In this case, the negotiation for control for timing and pacing was rather limited. When setting up the course and the week, meta-control rested in the hands of the instructor. The instructor set the due date for the assignments and quizzes for a specific time during the week. However, after that, the instructor left the timing and pacing during the week up to the student. Part of the reason that the pacing and timing for student control over the pacing and timing of the assignment during the week was related to the nature of online courses. This affordance of student control over pacing and timing during the week is the result of materials being online and available to students at a distance. However, that the materials are online creates another layer of potential influence. The discussion with Student 15 (Excerpt 5868-7171) a subtle hint at how pacing can be influenced by the organization of the course:

> INTERVIEWER: Did you feel that you were able to learn at your own pace in this course?
>
> STUDENT 15F: Yeah.
>
> INTERVIEWER: And what do you think helped you learn at your pace?
>
> STUDENT 15F: The fact that all the videos and everything were available online 24/7.
>
> INTERVIEWER: Was there anything organizationally that helped you sort of keep track of time? Maybe that you did or the course did?

STUDENT 15F: I just tried to pace it kind of like a normal class.

INTERVIEWER: Okay. And by "normal class" does that mean you kept a calendar or you just kind of had a sense of what to do?

STUDENT 15F: Yeah.

INTERVIEWER: Did the course website help you keep track of the things that were due at all?

STUDENT 15F: Yeah it was one page that said--had a list of all the assignments that were due, which ones had already passed, which ones were upcoming, and they were really easy to use.

INTERVIEWER: Did you go to that frequently or was it just kind of a one-time thing and then you were able to not have to go back?

STUDENT 15F: Well I mean I knew that there was one assignment that was due every week, so I would usually go there at the beginning of the week and look at the assignment and what I needed to do for it, and then I would just open the pages that I needed to and keep them open for the week.

From this statement there seems to be at least three main things related to the organization of the course website that influenced pacing for Student 15: the videos were online all the time; there was one page that had a list of all due dates; and the assignment was posted on the website at the beginning of the week. In this interaction between the student and the website, each of the elements needed for self-completion are available: the student can watch the videos whenever is convenient; the due dates are readily available; and the assignment is available for download. However, there are also both overt and subtle cues of meta-control. The assignment is not available until the beginning of the week. This means the student is unable to get a head start on the work. The page of deadlines makes it easy for the student to follow the desires of the instructor to keep a certain pace. That the videos are always available places meta-control over the timing and pacing of the videos squarely on the students. However, that the videos are paired with the topics of the assignments and quizzes for the week could send a subtle signal to students to watch the videos during the same week as the assignments and quizzes with the matching topics.

While the examples here are an example of meta-control or negotiation of control between the student and instructor, meta-control and the negotiation of control does not have to happen between the student and instructor. Rather, this can occur between any two actors. For example, the instructor may have to negotiate with the institution over where content will reside, when the course will occur, and even the content in the course. More investigation is needed in this area to determine how these processes occur.

Feature of Curriculum and Content was coded within the broader course operation section and included the following sub-codes: Accuracy of information and assessment; Instructional Coherence; Alignment; Amount of Work; Complex or Difficult; Navigation or Organization; and Other Curriculum and Content. Other than the general "Features of Curriculum and Content" code that was aimed for high usage, it was predicted that each of these codes would have low to moderate usage since they would be used for the unique curricular observations of each student.

All of these codes were used in Study 2 with the exception of Instructional Coherence (Focusing-Narrowing to Scattering-Broadening). This code was added when it became clear that part of the student frustrations some of the students expressed from a lack of instruction on what they should focus on. As described in the definition below, Focusing-Narrowing is when the media or instructor focuses the attention of the attention of the students on particular aspects of the course. This could be by telling students what will be on an exam or what is worth credit. Or the instructor may just narrow the material presented to the students. Broadening is when the material is broadened. Scattering is when there is no focus of the instruction and students are therefore left to their own devices to decipher what is important to learn. This code may have some overlap with the

following codes: "Complex or Difficult", "Alignment", "Control" (Specifically "Content" and "Component"). This could also have implications on student decisions, in areas such as "Information Gathering", "Theory Development", "Efficiency Evaluation", and "How to participate in the course", AND the student outcomes and impacts.

Instructional coherence can present itself in many forms. One way to keep a coherent structure to the course is through limiting the material presented to students or even describing to the students what is important for learning. Another way to narrow the course is through the assessments that students get on a regular basis. Student 15 (Excerpt 14901-15363) explained how the assignments helped to narrow the content for the student:

> INTERVIEWER: Was there anything else in the course that helped you? That was very helpful?
>
> STUDENT 15F: Um, the assignments themselves: the essays and the exercises, and the quizzes.
>
> INTERVIEWER: What was it about the essays, exercises, and quizzes that helped you learn the material?
>
> STUDENT 15F: Well, they would have very specific guidelines for how to complete the assignment, and so it was really helpful in learning how to do specific types of research.

This statement helps to show that instructional coherence can be approached from multiple angles. And the objectives in the course can help point to how to narrow.

While Instructional Coherence (Focusing-Narrowing and Scattering-Broadening) is related to convergent and divergent learning objective, there is a difference. While the learning objective is the aim of the instruction, Instructional Coherence is what actually occurs in the instructional practice. Thus, an instructor might have convergent learning objectives but the instruction is scattered and broad, leaving students to potentially flounder. Future studies may want to focus on a comparison between the instructional objectives of the course in comparison to Instructional Coherence. Further, studies may

also want to look at how instructional coherence affects the outcomes of students with different input characteristics such as motivation or prior learning. On the one hand, inexperienced students with low motivation might do poorly in broad and scattered instructional experience. On the other hand, experienced students with high motivation may do very well in broad and scattered instruction.

Features of Curriculum and Content can have an influence on how students participate in the course. For example, the weighing of scores for the course can impress on students a particular way of spending their time in the course. Student 8 (Excerpt 9577-10244) explained that because the assignments were weighted more than the exams, he spent more time on the assignments:

> INTERVIEWER: Okay, great. And how did you allocate your time in this course?
>
> STUDENT 8M: I think I allocated it towards doing maybe the assignments because the assignments were a huge part of my grade actually like overall the assignments constituted more than the midterm and the final combined, which that's kinda weird, so I allocated most of my time to writing the essays and the exercises and a little bit less time like reading the material it was more like a, two four split in terms of hours, like two hours for like the quiz and the material and maybe four hours to like researching what I need to write about and how I would edit it and word it to submit.

Here we can see that the grading scheme for the course had an influence on how Student 8 participated. This indicates that an instructor communicated to the students the importance of various activities by the grading structure.

Another similar way to communicate the parameters of course content is through the content that is actually in the regular assessments. Student 14 (Excerpt 21468-22223) explains that the regular quizzes and practice problems were helpful in focusing his attention:

> INTERVIEWER: So which activities were most effective in helping you learn the class material? you mentioned the essays.

> STUDENT 14M: Yeah umm I don't know that the essays helped me learn the material it was more just for me I felt like it was good practice writing things, to improve my writing. But I don't know if it really, I mean I learned some stuff, but not tons. I think the most effective thing for learning were probably the quizzes because they forced me to actually search for the answers in the textbooks so that's probably were I got the most learning. And then I also did those multiple choice questions in the back of the chapters in the book in preparation for the midterm and final. So that probably were I gained the most knowledge from this class.

This practice allows the student to focus her/his attention on the content that has been designated as important by the instructor or media. Indeed, Student 14 not only used the quizzes to reference important areas to focus; he only read the book while using the quiz as a reference (Excerpt 2840-3395):

> INTERVIEWER: Did you ever read the textbook?
>
> STUDENT 14M: I did, yeah. It was very helpful for the quizzes because the professor wrote the textbook so pretty much all of the quiz questions were directly from his textbook. So, yes, I did read it.
>
> INTERVIEWER: What days would you usually read the textbook?
>
> STUDENT 14M: On Fridays when I took the quiz. Yeah, I mean it was an interesting textbook and of course, I would love to read it more but I technically only used it to get quiz questions, not that I didn't like it, it's just it was time thing.

This example of instructional coherence is subtle and could be difficult to realize as being an indicator of instructional coherence because it has not been conveyed through the information source. Nevertheless, instructional coherence can be manifested in multiple ways, such as the information source, a syllabus or guide to the course, or activities and assessments. Future research could help determine what these ways are and how they are used to convey the parameters of a course.

Student 15 (Excerpt 15365-16175) described how the instructor created an introductory video that communicated the layout of the course, how to navigate, and important things to look out for but then in the same excerpt, explained how she did not know there were certain other features of the course on a separate website:

> INTERVIEWER: Did you ever use the library videos about how to write a paper or how to conduct research?

> STUDENT 15F: There was an initial video that showed us how to use the online website, and there was another one that, for the first essay I believe, showed us how to use a couple of different websites that we needed to go to, to complete the assignment, and I watched both.
>
> INTERVIEWER: Were those helpful?
>
> STUDENT 15F: Yeah. I probably wouldn't have been able to navigate the sites otherwise.
>
> INTERVIEWER: I don't know if you ever got to navigate to the professor's main website, or his own personal website, but I think there was a test--ungraded quizzes tool so that you could keep taking a quiz over and over again, did you ever get a chance to use that?
>
> STUDENT 15F: No, I didn't know about that.

The introductory video was a unique feature of the curriculum that helped improve the operational function of the course for the students. This video helped the student put less time and effort into navigating the course. As explained later, smooth logistical operational function, such as this, allows the student to learn with less time and effort costs. In the second part of the excerpt, the student explained that she was not aware of certain features of the course. This means that the navigation/organization of the course was maybe not ideal for her. However, in this case, while there was no cost in terms of time/effort (she did not know and did not necessarily seek it out), there was a loss of gains, such as greater ability to learn the material. Along with the other features, curriculum and content in the course can influence the results for a student in both obvious and less obvious ways.

Table 5.3.19
Definitions and Examples of Features of Curriculum and Content

Framework Area and Definition	Example of Student Excerpt
Accuracy of Information or Assessments: Any reference to the level of accuracy of information presented in the course or the accuracy of assessments.	Student 10 (Excerpt 21525-21955) STUDENT 10M: I had one really small incident on one of the quizzes, it was quiz 5. And what happened was one of the questions had two answers, but the system would only allow you to input one, but I actually reported the problem and I think they solved it afterwards but they gave me the extra point that they didn't give me at the beginning.
Instructional Coherence: Focusing-Narrowing to Scattering-Broadening: Any description of the student on that falls in the spectrum of focusing-narrowing to scattering-broadening. Focusing-Narrowing is when the media or instructor focuses the attention of the students on particular aspects of the course. This could be by telling students what will be on an exam or what is worth credit. Or the instructor may just narrow the material presented to the students. Broadening is when the material is broadened. Scattering is when there is no focus of the instruction and students are therefore left to their own devices to decipher what is important.	Student 10 (Excerpt 6840-7543) INTERVIEWER: Can you describe an instance where you felt very frustrated learning that material and what could have helped you learn that material? STUDENT 10M: Just the first or second week, they were talking about some crazy stuff, and yeah. They were talking about stuff that was not really related to it that much, and it was mostly like that whole isotopes and chemistry side of it. I think it made it just a little bit confusing, but I found out that we really didn't have to know the material--like the facts for that, it was more for like the general information. That just kind of made it easier for me to just skim through that part and just kind of like understand the basic idea.
Alignment: Any reference to the alignment of two or more of the following: subject/content, material, component activities, assessment, or course outcomes.	Student 6 (Excerpt 10863-11769) STUDENT 6M: There wasn't that much reading, I had the book my roommate didn't, he did just as well I did without the book. So the book was pretty much optional. Because the lecture notes actually were.. the book was written by the professor, so the lecture videos were, most of it was just straight reading from the book, we were able to, I looked at the book, he was just reciting what he had written in the book. So I guess it could have gone the other way. I could have not watched the lecture videos and just read the book and got the same information, but it was actually kind of nice to have that choice, to watch the videos instead of having to read the book. Cause it was a nicer diagram in the lecture video, and he would actually explain it, and it was just easier to hear someone read it, here the person who wrote the book would read it to you.
Amount of Work: Any reference to the amount of work that students are required to put into the course, especially when in comparison to normal work per course.	Student 12 (3776-4084) INTERVIEWER: Okay. How would you describe your experience in this course overall? STUDENT 12F: I would say it was super positive. I thought it was good for the amount of the course load and work and stuff. I thought it was informational and I also learned a lot and it wasn't very stressful. Which was good.

Table 5.3.19 Continued
Definitions and Examples of Features of Curriculum and Content

Framework area and Definition	Example of Student Excerpt
Complex or Difficult: Any reference to the material being complex or difficult.	Student 6 (Excerpt 9763-10384) STUDENT 6M: The essay assignments. There was 5 essay assignments, and 5 reading assignments, so for a total of 10 written assignments during the course. And those took a while. There was one of them that was extremely difficult, it had us read a research paper, knowing that we didn't really have the knowledge to read it, it even said it in there, "we know you cant actually read this research paper, but just try to any way". And we had to write a full report on that, and it was extremely difficult to actually write on something that we didn't understand.
Navigation or Organization: Any reference to actual or ideal form of how the course is organized online or how users are navigating the material.	Student 6 (Excerpt 18655-19292) STUDENT 6M: Yeah definitely, that was, it was very clear, the course was nice, because it was very clear what we needed to do, when. There were modules set up, and each module corresponded to current week, and in that module was basically, the lecture video for that week, the quiz for that week, the assignment for that week, and any additional or supplemental links I guess for that week. So it was really nice to be able to just go through there and be like here's the module for this week, here is exactly what I need to do.
Other Curriculum and Content Features: Any reference to curriculum or content features that is not represented by sub-codes.	Student 14 (7381-7843) STUDENT 14M: I did like that there was a bit of writing. I mean I feel like I can always improve my writing so I feel like getting more practice on it was helpful. I don't think most students would say that, they would probably complain about more writing, but I like that there was big writing component to the class.

The coded usage for Features of Curriculum and Content are fairly proportional. While that there is only one hit for Instructional Coherence for the In-Person students might raise a red flag, the introduction of this code only came about only after the main coding for In-Person students, thus, a second coding of In-Person students would likely yield more use. Therefore, it is inconclusive at the moment whether the in-person students reported more or less instances of Instructional Coherence. Further, the code was only added starting with Student 9, so there were three additional students from the online course that could be coded with Instructional Coherence, which may add to the total code count.

What was a surprising finding from this section was that there was not a single instance in which a female described Accuracy of Information or Assessments. All of these codes came from six students and were almost all about the inaccuracy of the quizzes. This could indicate males were more likely to observe inaccurate information or were more likely to complain about it.

Table 5.3.20
Code usage of Features of Curriculum and Content

		Instructional Mode		Income		Gender	
	Total	Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Features of Curriculum and Content	**174**	124	50	62	89	73	101
Accuracy of Information or Assessments	**13**	8	5	2	7	0	13
Instructional Coherence: Focusing-Narrowing to Scattering-Broadening	**27**	26	1	16	8	16	11
Alignment	**28**	13	15	6	19	6	22
Amount of Work	**41**	31	10	14	24	18	23
Complex or Difficult	**44**	30	14	20	22	24	20
Navigation or Organization	**31**	20	11	9	18	15	16
Other Features of Curriculum and Content	**59**	48	11	25	20	29	30

[1] The income of two students was unknown

Features of Curriculum and Content can both overtly and subtly influence student behavior. As described in the section above that discussed control, the way a course website has been laid out (Navigation and Organization) can provide subtle cues for student pacing and timing. However, there are also overt influences. Additionally, deadlines can be set by the instructor, which can control pacing to some degree. Student 14 (Excerpt 10827-11209) explained that he was able to learn at his own pace except for

the weekly deadlines of the quizzes and assignments. How curriculum and content interacts with other areas of the course could be an important area of future research.

The next section looks at features of media, which is important because of the relevance it has to online education. Features of media included seven codes: media structure; media form; synchronicity; symmetry; multiplicity; non-linearity; and anytime or anywhere. Media structure was not used for the coding of student comments on surveys in Study 2 but added here after it was found that students mentioned descriptions that matched this characteristic. This area is important as it provides insight into one of the important aspects of online education, the use of computer-enhanced media. While it is true that not all media is computer-based, it is a requirement for a course to be defined as online (see Chapter 2 of this dissertation). Thus, media plays an important role in online education and the characteristics of media are important to understand.

The coding for this section required an attention to student descriptions that were somewhat obscure. Many of these concepts as defined characteristics of media are unfamiliar to people, so the students did not have the language to talk about these characteristics of media; however, the experience should be universal. Further, the interviewer did not ask specifically about any of these concepts. Thus, as with many areas of this framework, the coding relied on the unguided explanations that students gave about their experiences. Below in Table 5.3.21 is a display of the definitions and examples of excerpt application for the Features of Media codes.

Table 5.3.21
Definitions and Examples of Features of Media

Framework area and Definition	Example of Student Excerpt
Media Structure: Any reference to the media structure of a course (e.g. *parallel, convergent, divergent*, and *mixed*).	Student 11 (Excerpt 4617-4952) STUDENT 11M: Yeah it was really good because my professor had his own online website other than the course website. He had his own website that pretty much outlined his book for us. So that was really helpful.
Media Form: Any reference to the properties of media, such as how text is displayed, static image, moving image, sound	Student 3 (Excerpt 8439-9578) INTERVIEWER: What was it about the book that you thought was great? STUDENT 3M: It's very easy to read, it has a lot of visuals, that's not good for some people. A lot of people learn just through text, but I would say that for a majority of population, visuals are good. There are a lot of graphs and I don't think that's beneficial too well but with a contested topic like [this subject], it proves useful to have lots of graphs. But again it's organized very well. All of it, from the chapter organization to within the chapters and how it covers all bases, it includes economics of [this subject], the legislation involved in [this subject], what's being done, everything from how we measure [this subject], biological effects- it runs the gamut there, and its all very digestible and within the text it has little boxes that say "click on topic 9.8" or that kind of thing, so you can go online, on the online course, not necessarily, the [this university] online but the [this subject] course, and go on there and look up that video. I never did but you can look at that video or whatever paragraph and it talks about that expanded.
Synchronicity: Any reference to synchronicity, which means the timing of actor-to-actor information transfer through media in terms of both immediacy and automation	Student 13 (17565-18174) INTERVIEWER: Okay. And how did your experience with interactions compare to your initial expectations of interactions in this course? STUDENT 13F: Okay well when you interact with a person in front of you, you kind of, it's a person-to-person interaction. But with an online course like that, it is a person-to-person, but it is a person-to-person through the screen. That makes it much more formal. So I guess its a good thing from the course point of view, because we only talk about what's expected of us to talk about like the course materials I don't know where I'm going, but again just the formality.
Symmetry: Any reference to symmetry or the degree to which there is two-way interaction or dialogue	Student 9 (Excerpt 4679-5400) It sounds like you had somewhat of a frustrating experience. Can you describe a specific instance when you felt very frustrated learning the material and in that instance what could have helped you learn the material better? STUDENT 9F: There was a chapter in this book was about models, predicting [specific process] with models. And there were pictures and everything but the descriptions didn't make very much sense and there was so many, I didn't really know what was what and I think what would have helped was if there were actually lectures in class, in case you have questions, you can raise your hand and ask, instead of just watching the videos over and over again. I think that would have helped a lot more.

Table 5.3.21 Continued
Definitions and Examples of Features of Media

Framework area and Definition	Example of Student Excerpt
Multiplicity: Any reference to multiplicity. Multiplicity mainly refers to the range in which different contexts, media, formats, activities, and assessments convey equivalent content.	Student 5 (Excerpt 33203-34168) STUDENT 5M: Generally I would go to class and then on the weekends or every other weekend or so I would watch the videos and read the textbook. The lecture was my primary source of learning and I would use the textbook and the online lectures to review and refresh my memory on them. It wasn't a diligent by-the-day thing, there wasn't really a specific order. Primarily lectures though, unless I missed a lecture though, then I would go online and watch it. And also having taken the course now, I would say the textbook was optional but very helpful. And the in-person lecture or the online lecture would work. You don't have to do both but I did both cause I found it beneficial for myself.
Non-linearity: Any reference to linearity or nonlinearity in a course. This means, the extent to which a medium has dimensional navigation potentials, such as moving forward and backward in a book or conducting a search on a web browser.	Student 5 (Excerpt 10209-10534) STUDENT 5M: Yeah, toward the midterm, like that week before I would download the videos and play them back and just watch all of them. If there was any topic that I didn't understand I would slow it down and listen to that part. Of course that wasn't my only method of studying, I would do exercises and review my own notes.
Anytime or Anywhere: Any reference to the anytime or anywhere nature of online course or component-activities.	Student 8 (Excerpt 6605-7013) STUDENT 8M: well the fact that I had to maybe go to class to take my midterm I had to work with the professor to schedule a time that wouldn't conflict with my class because everyone else was taking it during the normal class time but I had a class that was going on during that time, so I had to work around that. Same for the final.

The code usage for the Features of Media closely matched expectations. The codes were fairly proportional for each group with the exception of Media Form and Multiplicity. Students in the online group discussed issues of Media Form much more frequently than the students in the in-person version of the course. Additionally, the students in the in-person group discussed issues of multiplicity more often than the online students. However, all but one student (Student 14) discussed multiplicity and one in-person student discussed the issue six times while another discussed it four times. The students that discussed multiplicity more than once were often discussing the same

phenomenon, just on different occasions. Thus, the frequency of discussion did not necessarily mean the students were experiencing more or less forms of multiplicity, it simply means that they discussed the issue more times.

Table 5.3.22

Code usage for Features of Media

	Total	Instructional Mode		Income		Gender	
		Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Features of Media	**104**	73	31	38	56	45	59
Media Structure	**20**	15	5	7	10	7	13
Media Form	**55**	48	7	16	31	20	35
Multiplicity	**28**	13	15	7	20	10	18
Non-linearity	**18**	10	8	5	13	6	12
Synchronicity	**24**	17	7	14	10	14	10
Symmetry	**24**	18	6	15	9	14	10
Anytime or Anywhere	**11**	4	7	6	3	6	5

[1] The income of two students was unknown

The next section refers to other students in the course. This could refer to one other student, group(s) of students, or the whole class. As with the other actors (instructor and media), the interviewed students mainly talked about the observable characteristics of other students. However, the actual coding did not separate the different processes or properties of other students. Instead, any mention of other students was grouped into one main code that included any reference to the input, decisions, participation, output, or outcomes of other students. In the table below is the definition and an example of this code.

Table 5.3.23

Definition and example of Other Students

Framework Area and Definition	Example of Student Excerpt
Other Students: Any reference to all, multiple, or individual students (real or hypothetical) in a class, such as class size or how other students in the class might influence an individual student. (Whole Class, Groups, Individuals) - (Input, Operation, Decisions, Output, Outcomes, Goals)	Student 1 (Excerpt 11244-11423) STUDENT 1M: Like I said I had a friend in this course, so we had a lot of interaction. We'd do quizzes together, or at the same time. We would do our writing assignments together.

The discussion around other students was strong. Even the students that did not meet with other students outside of class enjoyed the interactions that they had with other students, both online and in-person. The count may be high because many of the interview questions were aimed towards student interactions. There also did not seem to be any large differences between any of the groups. Again, this could be attributed to the number of interview questions geared towards student interactions.

Table 5.3.24

Code usage for Other Students

		Instructional Mode		Income		Gender	
	Total	Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Students (Whole Class, Groups, Individuals) - (Input, Operation, Decisions, Output, Outcomes, Goals)	**136**	85	51	38	85	61	75

[1] The income of two students was unknown

This section presents the main codes for the Student actor, which represents one of the major portions of the framework. In Table 5.3.25 below are the definitions and

example excerpts for each of these main codes for this actor. In addition to the Student being a major actor and central to the framework, the data comes from the student interviews. Thus, each of these codes should have a high usage, since students will need to reference themselves in order to describe the course experience.

Table 5.3.25

Definitions and examples of *Student* actor main sections

Framework Area and Definition	Example of Student Excerpt
Student Input: Any reference to student input characteristics as an enduring characteristic or characteristic that the student enters the course with	Student 1 (Excerpt 5098-5274) I kind of enjoyed the topic, which may have been why I enjoyed the course. If I wouldn't have been interested in the topic I don't know how much I would have enjoyed the course.
Student Decisions: Any reference to a student making decisions about the course	Student 7 (Excerpt 129-379) INTERVIEWER: How did you decide to enroll in that section of the course? STUDENT 7M: Actually I just needed a filler class and [this subject area] was something I was interested in and it was convenient and it fit my schedule because it was online.
Student Participation: Any reference to how a student actually participated	Student 5 (Excerpt 2778-3001) Fridays generally we would have a quiz that was also online and then usually an essay or an assignment due, alternating each week. So usually I would work on the essays starting on Tuesday or so and finish them on Thursday.
Student Output: Any reference to actual student output. Student output being any student expenditure, such as time, effort, money, or resources that concludes in product form and can be observed through methods such as direct measurement or self-reporting.	Student 6 (15534-16174) INTERVIEWER: Great. How much time overall do you think you spent on this course per week? STUDENT 6M: does that count the one hour discussion section? INTERVIEWER: Sure STUDENT 6M: Then probably 4… 3-4 hours a week. Which was basically one hour on Wednesday for discussion and like two to three to crank it out on Friday. INTERVIEWER: And then, did that increase just before midterms and finals then? STUDENT 6M: yeah, yeah. Once the midterm and the final rolled around, this number, I remember, went up very high. I, I think I pulled an all-nighter before the final and I studied two days before, so I studied a lot for the final.

Table 5.3.25 Continued

Definitions and examples of *Student* actor main sections

Framework Area and Definition	Example of Student Excerpt
Student Outcomes and Impacts: Any reference to the actual student outcomes. Student outcomes being any gains the student has had in the course, either positive or negative, and can be observed through methods such as direct measurement or self-reporting. OR Any reference to the impact of the course on the student or the student on other areas of their life	Student 1 (Excerpt 22252-22645) INTERVIEWER: Did you feel the course prepared you for the long term, like future courses or your career? STUDENT 1M: Yes, it gave me a basic understanding of the scope of the topic of [this subject], but I don't think the course itself did not prepare me for any type of career or related work if I were to go into that field. But it was a good introductory for future courses in that topic.

The experience that a student has in the course can vary quite a bit from student to student. The things a student brings to the course can influence their experience and ultimately their results in the course. For example, Student 15 (Excerpt 19943-20585) shows that the interests, goals, and projection of future experiences had an influence on how the student viewed the impact of the course:

> INTERVIEWER: Okay, great. Do you feel the course prepared you for the long term? So, like, future courses or your career?
>
> STUDENT 15F: Um, it made me more aware of some of the larger issues we have, just in general, but as far as future classes and my career go, I don't think it would be very useful information.
>
> INTERVIEWER: Okay. Do you say that because of the content matter?
>
> STUDENT 15F: Yeah. There's not a whole lot of [this subject] issues in Psychology.
>
> INTERVIEWER: Right, okay. So you don't feel that the reason is because it was online, you just fee like it was because the subject matter, is that correct?
>
> STUDENT 15F: yeah.

From this one excerpt we can begin to see how one area of the student framework can have an influence on another. And because they were talking about their own experience, the interviews were full of self-reflecting comments.

As predicted, each of the main areas for student had strong code use. The code with the highest usage was participation. This is probably because students spent much of the interview describing their actions, interactions, and experiences in the course. The code with the lowest usage was output. Since output is a reference to the expenditure or cost to the student, this could indicate that students were not as inclined to discuss the effort they put into the course or any developed product that resulted from the course. But again, this could be the result of the questions that were asked of the students in the interview. And there were no strong differences in frequency of usage between groups for any of the portions of the student actor.

Table 5.3.26

Code usage for *Student* actor main sections

		Instructional Mode		Income		Gender	
	Total	Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Student Input	**178**	113	65	51	103	65	113
Student Decisions	**302**	206	96	106	153	127	175
Student Participation	**404**	249	155	131	222	174	230
Student Output	**72**	53	19	23	40	31	41
Student Outcomes and Impacts	**230**	157	73	75	127	93	137

[1] The income of two students was unknown

This next section, student internal characteristics, makes up one of the two Student Input areas and is made up of the following sub-codes: Motivation, Focus, Time Management; Compatibility for Learning Environment or Instructional Practice; Prior Experience; Background and Abilities; Interest in Subject or Learning Intervention; Preferences for Learning Environment; Requirements for Graduation; and Other Student Internal. As with the other areas of the Student actor, this section may have high usage because of the need for the interviewed student to describe their own characteristics when describing the

course experience. Thus, the coding is expected to be somewhat high. However, the usage may vary according to student observations. One other note, many of these codes overlap somewhat with the efficiency criteria for the student. However, while the Student Internal Input characteristics describe either a fairly fixed characteristic or a characteristic the student came into the course with, the efficiency evaluation criteria is the application of criteria that a student has in relation to their evaluation of the processes of the course and their potential participation. But it was common in the application of the codes for duplication of similar Student Internal Characteristics codes and efficiency evaluation codes.

Table 5.3.27
Definitions and examples of *student internal characteristics*

Framework Area and Definition	Example of Student Excerpt
Student Internal Characteristics Input: Any reference to internal characteristics of the student. These characteristics refer to any permanent or semi-permanent characteristic that the student brings to the course upon entry or has developed during the course. This includes (but not limited to) characteristics such as goals, interests, learning preferences, and prior learning.	Student 5 (Excerpt 34847-35093) INTERVIEWER: Did you feel connected with other students in the class? STUDENT 5M: Not particularly. Once again that's because the course was very low priority for me. My effort and my connections with other students was more in my other courses
Motivation / Focus / Time Management: Any reference to an individual's motivation, focus, or time management.	Student 9 (Excerpt 1127-1611) INTERVIEWER: Could you describe what your typical week looked like for this course. STUDENT 9F: Well there's always things due on Friday at 10pm. It's either an essay or an exercise and there would always be online quizzes. Since I'm not being forced to go to class, I wait til the last minute to do everything. I didn't really do much in the beginning of the week. I just crammed it in in the end. I didn't like how everything was due on one day. I would rather have it spaced out.
Compatibility for Learning Environment or Instructional Practice: Any reference to a student having a compatibility to a learning environment or instructional practice	Student 14 (Excerpt 26896-27623) Overall, how satisfied were you with the course, maybe on a scale from 1-10, 10 being the best, 1 being the worst. STUDENT 14M: Umm maybe 4. INTERVIEWER: Okay. STUDENT 14M: I mean it wasn't the worst course I have ever taken. Probably the worst classes would be the online classes I took at community college. So it wasn't the worst. INTERVIEWER: Okay. So in comparison to the other online courses that you've taken, this is maybe the best online course? STUDENT 14M: Yeah. Yeah this is the best online course that I have taken. INTERVIEWER: But it doesn't seem like that is saying much, because this is a bad experience overall. Okay. STUDENT 14M: Yeah, it might just be that online courses aren't really for me.

Table 5.3.27 Continued
Definitions and examples of *student internal characteristics*

Framework Area and Definition	Example of Student Excerpt
Prior Experience: Any reference to a student having a certain prior experience.	Student 15 (Excerpt 19287-19504) INTERVIEWER: How would you compare the quality of this online course to traditional in-person classes that you've taken before. STUDENT 15F: Um, I think it was a lot better than a lot of the other classes I've taken.
Background and Abilities: Any reference to a student's background or abilities, such as academic major or ability to perform in a specific subject area upon entry in the course.	Student 5 (Excerpt 8094-8441) I never went to office hours, mainly because as an undergrad course I was already familiar with a large amount of the material, And there wasn't really anything that was challenging to me in the class. I'm not slamming the class, I'm just saying it was intended for freshmen and sophomores and I took it as a senior so its kind of to be expected.
Interest in Subject or Learning Intervention: Any reference to a student having interest in the subject or learning intervention upon entry in the course.	Student 5 (Excerpt 6529-7192) INTERVIEWER: Sure. We can do subject and then maybe activities too. STUDENT 5M: Okay. Yeah, I would say [a specific subject area] were really interesting because, although I've heard of the idea of simulations I've never learned about them, so learning about how the computers process and predict what's going to be the outcome of the 200 or 300 years- that was really useful. It's also useful because in biochemistry they use simulations to predict protein interactions and I know it's completely different sides of the scale but a lot of the equations were similar at least so I always like when I learn something in a class and I can apply it somewhere else.
Preference for Learning Environment: Any reference to a preference for a learning environment	Student 11 (Excerpt 10-521) STUDENT 11M: I decided to take it when I was looking through the class catalog and I noticed that there was a V at the end of the class name and at the end of the section name and I wanted to see what that was all about. It said it was online and I read about and I thought it was a good choice for me because I don't like going out the house that much.
Requirements for Graduation: Any reference to what is required for a student to graduate or advance towards graduation	Student 5 (Excerpt 22122-22192) It wasn't a required class so I wasn't too concerned about it really.
Other Student Internal: Any internal input characteristics that are not described by other subcodes	Student 10 (Excerpt 24967-25237) INTERVIEWER: Did you feel like you monitored your own understanding of the material in this course? STUDENT 10M: Yeah I think I was able to do that. I'm not sure if everyone can do it on their own, I think it has to do more with personality and being able to set goals.

The Student Internal Characteristics sub-codes had low to strong usage. The two codes used the most were *Prior Experience* and *Background and Abilities*. When students

were talking about prior experience, they often discussed other courses they had taken, usually indicating whether they had taken online courses or courses in similar subject area. In some instances, they would discuss learning interventions, such as other learning management systems or discussion boards. For Background and Abilities, most discussion was around whether the student had learned similar material before or if they had a relevant major. Other students discussed their study skills and some named their year in school.

On the other end, there were a few characteristics that had very low coding frequency, namely Compatibility for Learning Environment or Instructional Practice, Preference for Learning Environment, and Motivation/ Focus/ Time Management. The former two probably could have been combined into a single code since preference and compatibility are similar and may even be the same thing. The low coding of Motivation/ Focus/ Time Management was somewhat surprising. And many of these codes were used because of a direct question about time management from the interviewer. In most cases, the student described their ability to focus, motivation, or time management in direct relationship to their experience in this course. Much of this discussion centered on the ability to keep a good pace with the course. Other times the students would discuss their ability to stay focused in front of a computer or in an in-person lecture. In very few cases did the student directly state they possessed the characteristic. In a couple of instances, the possession or absence of this characteristic was used to justify why they should or should not be in an online course.

Table 5.3.28

Code usage for *student internal characteristics*

	Total	Instructional Mode		Income		Gender	
		Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Student Internal Characteristics Input	**155**	96	59	47	87	58	97
Motivation / Focus / Time Management	**17**	11	6	4	6	5	12
Compatibility for Learning Environment or Instructional Practice	**8**	7	1	3	2	2	6
Prior Experience	**54**	37	17	14	33	24	30
Background and Abilities	**48**	23	25	18	27	21	27
Interest in Subject or Learning Intervention	**21**	9	12	6	14	5	16
Preference for Learning Environment	**14**	11	3	1	8	3	11
Requirements for Graduation	**19**	11	8	8	9	9	10
Other Student Internal	**29**	20	9	9	16	11	18

This section, student external characteristics, makes up the second of the two Student Input Areas and is comprised of the following sub-codes: Money or Resources; Distance from the University; Personal Environment; Time Conflicts; Other External Characteristics. This section was also expected to have high code usage since it was a reflection of the characteristics of the student that was being interviewed. As with the Student Internal Characteristics, there was some overlap in the coding application with the codes for efficiency evaluation criteria.

Table 5.3.29
Definitions and examples of *student external characteristics*

Framework Area and Definition	Example of Student Excerpt
Student External Characteristics Input: Any reference to external characteristics of the student. This includes (but not limited to) characteristics such as home environment, friends, and home distance from the university.	Student 10 (Excerpt 83-347) INTERVIEWER: How did you decide to enroll in the online section of the course? STUDENT 10M: Through the registrars. I found out through the registrar that there were online and it said it would be at own pace. Full schedule working and could do studying at night.
Money or Resources: Any references to a student's money or resources.	Student 8 (Excerpt 23348-24107) INTERVIEWER: Okay, great. This next section talks a little bit about technology. Can you describe your experience accessing and interacting with materials for the course? STUDENT 8M: Okay so the adobe connect was a really good tool and maybe that was the reason why kind of the overall site was kind of slow in loading things it took a while umm, I think I have pretty fast internet, I have 30 megabits per second, I'm not sure if that's fast or not, but I think that's pretty fast and the overall site was very slow in terms of connecting, and I tried connecting on maybe through campus and that was slow. But other than that, overall technology-wise the way that the material was presented was good and the way like I could contact people was pretty good.
Distance from University: Any reference to the physical distance a student is from the university.	Student 9 (Excerpt 13-482) INTERVIEWER: How did you decide to enroll in the online section of the course? STUDENT 9F: I was commuting from school from [a big city 90 miles away from this university] so getting to school from [a big city 90 miles away from this university] to [this campus] it's hard to get to school two days a week and that's the only class that fit my schedule and I need the units.
Personal Environment: Any reference to a student's personal or home environment (e.g. distractions, lack of distractions, lack of community).	Student 15 (11889-12270) INTERVIEWER: Would you have liked more or different types of interactions with students? STUDENT 15F: I think this way was pretty good. It worked pretty well for me, especially since I usually had to, you know, take care of my son during the discussion sections so I'd be nursing and stuff. So, I'd rather, you know, not have to interact with people too much while I'm doing that.

Table 5.3.29 Continued
Definitions and examples of *student external characteristics*

Framework Area and Definition	Example of Student Excerpt
Time Conflicts: Any reference to times conflicts, such as other courses, work, family, or pets.	Student 8 (10633-11435) INTERVIEWER: Okay. And what strategies did you used to manage your time? STUDENT 8M: My strategies really like I just saw my schedule and like I just knew that there was certain times that I had to do the work because I was also taking four other classes so this was kinda like my fifth class and I just had to fill in the gaps where like I could do my work and not conflict with the other stuff I was doing, there wasn't really like a mechanism or anything, it was just like "ohh my schedule is free, I should do work". INTERVIEWER: I see. So basically just filling in your schedule as much as possible? STUDENT 8M: Yeah. Like my schedule last quarter was kinda was pretty full this class kinda helped me you know like, the online section kinda help me schedule it around which was pretty great.
Other Student External: Any external input characteristics that are not described by other sub-codes	(Other Responsibilities) Student 15 (Excerpt 5182-5502) INTERVIEWER: And you said that pretty much the whole course was good, but were there any aspects of the course that you didn't enjoy? STUDENT 15F: Um (pause) it was a little overwhelming that we had a major assignment due every week, but that was just because I had a bunch of other classes plus my son to take care of.

The code count for all External Student Characteristics combined was fairly low. This contributed to very low code counts for each of the sub-codes. The two most used sub-codes were Time Conflicts and Personal Environment. The time conflicts code was often used to discuss the enrollment in this particular section. However, what was surprising was that the code applied more often to why students were unable to attend a particular component-activity, such as discussion or office hours, or why they might put off work until a later time. Most often, these conflicts had to do with other courses that the student was enrolled in.

The second most used code was personal environment. One student discussed how it was difficult to find a quiet space where they could participate in the online discussion. Others talked about how it was either good or bad to work in their home space and some provided detailed description of what that environment was like. Student 5 described how he would not have wanted to just take the online course because he would have been too distracted by features on his computer or the Internet, such as Facebook or Google.

For Distance from University, three instances of the code were applied to Student 9, who had to travel 90 miles to the university. Student 6 liked that he did not have to leave his apartment while Student 5 said that since he attends the university, he should make the time to go to campus to attend class. The code "Other Student External" was mainly applied to instances when there were other priorities that interfered with commitment to the course. Student 15 had a baby and another student was enrolled in 18 units.

Also found in this study was the influence that having a student friend in the course has on the performance. Most of the student cases that had a friend in the course had that friend prior to the start of the course. Having a friend in the course seemed to improve learning performance and simplified various logistics of the course. Thus, while, it was not coded for, having a friend as an input would be worth investigating in future studies.

Table 5.3.30

Code usage for *student external characteristics*

	Total	Instructional Mode		Income		Gender	
		Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Student External Characteristics Input	**39**	28	11	9	23	14	25
Money or Resources	**5**	4	1	1	2	1	4
Distance from University	**5**	4	1	3	2	3	2
Personal Environment	**15**	14	1	4	10	5	10
Time Conflicts	**18**	12	6	5	8	7	11
Other Student External	**5**	4	1	3	2	5	0

[1] The income of two students was unknown

This section is made up of five of the main Student Decision codes: Student Decisions; Information Gathering; Theory Development; Efficiency Evaluation; and Participation Decisions. Student Decisions is the main code for all subsequent student decision codes, thus, it is expected that this code would have a high usage. The codes Information Gathering and Theory Development were not used to code student surveys in Study 2. However, examining the student comments in Study 2 led to the realization of the processes of information gathering and theory development. Full coding of student comments is new to this study. These codes represent the processes leading up to a decision in which a student would gather information about the scenario (Information Gathering) and then form a theory about what the scenario for a course or component-activity might entail.

Table 5.3.31

Definitions and examples of main sections of Student Decisions

Framework Area and Definition	Example of Student Excerpt
Student Decisions: Any reference to a student making decisions about the course	Student 7 (Excerpt 129-379) INTERVIEWER: How did you decide to enroll in that section of the course? STUDENT 7M: Actually I just needed a filler class and [this subject area] was something I was interested in and it was convenient and it fit my schedule because it was online.
Information Gathering: Any reference to a student gathering information about the logistics or overall theory of the course	Student 6 (Excerpt 7-357) INTERVIEWER: great, and how did you decide to enroll in the online section of this course? STUDENT 6M: when I enrolled in the class, I believe I got an email that said they are also offering this class online and after looking it over I thought it was a much better option than well I thought I'll try it out so I just enrolled in the online class
Theory Development: Any suggestion that a student has developed a theory about how the course operates prior to making a decision or evaluation	Student 13 (Excerpt 18177-18619) INTERVIEWER: I guess, when you selected an online course did you think you would have any interaction, or what did you think interaction might look like? STUDENT 13F: I didn't think there would be any interactions honestly. I thought it was just a self paced thing like when you read lecture notes online and you spend a whole bunch of time looking at screens and I didn't expect any office hours online or interactive videos online at all.
Efficiency Evaluation: Any reference to making an evaluation of efficiency in relation to participation.	Student 2 (Excerpt 7773-8166) STUDENT 2F: I had assumed from the beginning that the videos were almost identical to the in class lectures and after the first midterm, I did well on it but the TA had commented that the online lectures were more in depth and at that point I started watching the online lectures and I would watch those before going to the in class and then I would just write any additional notes that I had.
Student Participation Decisions: Any reference to a student making participation decisions about the course or component-activities within that course	Student 6 (Excerpt 3878-4509) INTERVIEWER: And you said problems came up because you were cramming? STUDENT 6M: yeah every once in a while we would miss, we might miss a deadline here and there, but luckily it wasn't that bad from the two times, the quizzes if you missed them I believe you couldn't retake them, so that was like our top priority, was to get the quizzes out of the way, I turned in a couple of the assignments late but the point deduction was not enough to make me want to do them earlier I guess, like if I wasn't making up assignments on Friday I knew that I could just turn it in the next day and not lose enough points to change my grade.

The coding applications for the main sections of Student Decisions were all very strong. The only code with potential differences between groups was Information Gathering. This code was used less for the in-person interviews than the online student interviews. It is unclear why this difference exists. It could potentially be an error by the coder. This code was new to this study and the in-person students were the first students to be coded. Thus, the code may have just been more liberally applied as the coder became more familiar with the code.

Table 5.3.32

Code usage for main sections of Student Decisions

		Instructional Mode		Income		Gender	
	Total	Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Student Decisions	**302**	206	96	106	153	127	175
Information Gathering	**115**	87	28	47	50	50	65
Theory Development	**168**	116	52	61	83	74	94
Efficiency Evaluation	**185**	132	53	64	92	77	108
Participation Decision	**165**	112	53	61	84	81	84

The next section looks at the efficiency evaluation criteria that students use in their evaluation of the course or component-activities within the course: time-effort; money-resources; content learning; contribution to goals or interests; affect satisfaction; access; process performance. As described in Study 2, there are three main groupings of efficiency evaluation criteria: *Costs* (time-effort and money-resources), *Gains* (content learning, contribution to goals or interests, and affect satisfaction), and *Operational Functions* (access and process performance).

While Costs and Gains are fairly straightforward – either the student benefits or loses in a given situation – performance functions are a little less clear. Performance functions refer to properties and processes that facilitate learning. Access is a reference to the ability to engage or interact with given content or materials. Process performance refers to proper functioning of an activity or technology. So, in a sense, performance functions can indirectly lead to greater or fewer costs or gains. Thus, performance functions act as a mediator and a student will look at performance functions as an indicator for the costs and gains of an activity.

Table 5.3.33
Definitions and examples of Efficiency Evaluation

Framework Area and Definition	Example of Student Excerpt
Efficiency Evaluation: Any reference to making an evaluation of efficiency in relation to participation.	Student 2 (Excerpt 7773-8166) STUDENT 2F: I had assumed from the beginning that the videos were almost identical to the in class lectures and after the first midterm, I did well on it but the TA had commented that the online lectures were more in depth and at that point I started watching the online lectures and I would watch those before going to the in class and then I would just write any additional notes that I had.
Time / Effort: Any reference to the amount of time or effort an individual invests or expends on participation	Student 10 (Excerpt 6840-7543) INTERVIEWER: Great. And can you describe an instance where you felt very frustrated learning that material and what could have helped you learn that material? STUDENT 10M: Just the first or second week, they were talking about some crazy stuff, and yeah. They were talking about stuff that was not really related to it that much, and it was mostly like that whole isotopes and chemistry side of it. I think it made it just a little bit confusing, but I found out that we really didn't have to know the material--like the facts for that, it was more for like the general information. That just kind of made it easier for me to just skim through that part and just kind of like understand the basic idea.
Money / Resources: Any reference to the amount of money or resources an individual invests or expends on participation	Student 9 (13-482) INTERVIEWER: How did you decide to enroll in the online section of the course? STUDENT 9F: I was commuting from school from [a big city 90 miles away from this university] so getting to school from [a big city 90 miles away from this university] to [this campus] it's hard to get to school two days a week and that's the only class that fit my schedule and I need the units.
Affect Satisfaction: Any reference to an individual being emotionally satisfied, happy, or content with participation.	Student 2 (435-797) INTERVIEWER: Did you ever consider switching to the online version of the course? STUDENT 2F: Well he gave us the option, lecture wasn't mandatory and because all of the lectures were online there were times where I would watch the lectures online rather than going to the class. But I didn't consider completely switching because I do enjoy in-class lectures.
Content Learning: Any reference to the degree to which a student would learn the content in a course.	Student 5 (Excerpt 7281-7614) enjoyed the exercises because it was a lot easier to study with the exercises than reviewing the material. Because you know reviewing the material is good but the exercises kind of led you to the important points and covered the topics well. The essays did too but essay writing- I don't think anyone ever has a ton of fun with those

Table 5.3.33 Continued
Definitions and examples of Efficiency Evaluation

Framework Area and Definition	Example of Student Excerpt
Contribution to Goals / Interests: Any reference to the degree to which participation would contribute to the individual's goals or interests.	Student 2 (Excerpt 17675-18317) INTERVIEWER: Do you think you would ever do research with him? STUDENT 2F: He offered me a research position but unfortunately I couldn't fit it into my schedule. Otherwise I probably would of INTERVIEWER: Do you think that was unusual? Did other students get that offer or was it just you? STUDENT 2F: As far as I know it was just me, I stayed after class one day and asked him a couple questions about what his research was and he actually happened to have I guess two [scientists] from the [this university] working with him at the time. I don't think many other people went in and expressed interest in his research so.
Process Performance: Any reference to the degree with which an activity runs as intended without unintended or unexpected hold-ups or setbacks.	Student 14 (Excerpt 19404-19965) INTERVIEWER: And, do you think it would have been better if there had been less, like maybe there wasn't a discussion section for this course? STUDENT 14M: Not necessary better, with that said I think a discussion section could be really valuable for a course, so long as you know there weren't any technical issues. So I wouldn't say it would be better without the discussion. INTERVIEWER: Okay. So it would have been better without the glitches basically is what- STUDENT 14M: Right, yeah. INTERVIEWER: And maybe a more prompt TA? STUDENT 14M: Yeah.
Access: Any reference to the ability to use or interact with materials, component-activities, or content in the course and/or the level at which this access occurs.	INTERVIEWER: I see. And what were your favorite aspects of the course? STUDENT 6M: the online lectures, but the online discussions were probably my favorite thing because it was really nice, discussions are usually made in times during the day and it, it would be inconvenient to get up and go to campus, so it would, to be able to be home and do it at home and then get back to whatever I was doing at home, it was really nice because I was able to flow into my schedule instead of having to go all the way to campus and then come all the way back. So I really liked the discussions. Also it was nice that it was such a small discussion section, we only had I think 7, 7 students and then the TA, so if anyone had a question it would get answered right away.

This excerpt (13250-13677) from Student 15 shows the complexity involved in an efficiency evaluation:

> INTERVIEWER: Did the instructor ever encourage you or other students to meet outside of class?
>
> STUDENT 15F: Well, we had the option to if we wanted, but most of the interactions were done online through Piazza or through email.
>
> INTERVIEWER: And how did you find Piazza? Was it a good tool?
>
> STUDENT 15F: Um, I didn't use it that much. I think it could have been helpful but I didn't need it. So... I didn't use it very often.

While she can see the benefit of using Piazza, in her particular case – and possibly for all involved in this particular course – the lack of need negated the possible benefit. This evaluation of a lack of need (actual gain) seems to have been the deciding factor for her to use it infrequently. In this excerpt (1859-2428) from the interview with Student 14, we can see the confluence of course restrictions and personal obligations influencing how the student arranged the timing and sequencing of his activities:

> Student 14: So there were like deadlines usually like on Friday nights. We had to take like a weekly quiz and write a weekly either exercise or essay. Those were usually due midnight on Friday. So I tried to do things during the week, like they had online videos to watch so I tried to fit those in during the week but I typically saved the text and the writing things for Friday afternoon because I was trying to focus on some of my other classes during the week. So it was usually just watching the videos during the week and working on assignments and quizzes Friday afternoon

This shows how messy the process of making an efficient decision can be, The interviews were full of similar complex statements from students.

Efficiency Evaluation sub-codes had from high to low usage. Time/Effort, Content Learning, and Access had the highest usage. These are closely followed by the Contribution to Goals/Interests and Process Performance codes. The high use of Time/Effort indicates that this cost was often a variable in how students evaluated decision situations. Content Learning seemed to be the largest motivator for gain. Meanwhile Access seemed to play a large role in how students viewed the possibility of

participation. However, these were followed closely by the codes Process Performance and Contribution to Goals/Interests. This indicates that students had other motivations than purely learning the material in the course. Further, students had the foresight to predict whether the learning or instructional experience would run smoothly (Process Performance).

The two codes that were used the least were Affect Satisfaction and Money / Resources. The low application of affect satisfaction indicates students were not highly motivated by comfort or enjoyment. Money / Resources only had two code applications. And both of these applications were questionable as they referred to the 90-mile commute that Student 9 had to make to get to campus. Student 9 did not even state whether the discouraging variable related to the commute was money or a time commitment. It might have also just been a lack of transportation. Therefore, this code was applied without substantial evidence. The reason for the low use of this code might have had something to do with the nature of student decisions once they have already enrolled in the course. Choice variables that concern money could be more often considered prior to course (or university enrollment). Or students might not be willing to discuss money issues as openly with a researcher than other issues of choice. Or finances might not have been an issue that was related to choices in this particular course. Student 5 discussed how nice it was to have a low-price textbook for the course, but the price did not inspire any particular decision. At least one student stated that his roommate did not even buy the book but there was no discussion of price.

Table 5.3.34

Code usage for Efficiency Evaluation

	Total	Instructional Mode		Income		Gender	
		Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Efficiency Evaluation	**185**	132	53	64	92	77	108
Time / Effort	**82**	55	27	28	42	30	52
Money / Resources	**2**	2	0	2	0	2	0
Affect Satisfaction	**19**	11	8	5	11	5	14
Content Learning	**73**	46	27	27	35	33	40
Contribution to Goals / Interests	**51**	32	19	15	26	16	35
Process Performance	**51**	41	10	21	23	27	24
Access	**63**	55	8	23	29	30	33

[1] The income of two students was unknown

This next section looks more in depth at the Access efficiency criteria. The table below gives definitions and examples of the Access sub-codes: Place Access; Interaction/Communication; Course Format; Fit with Schedule; Other External Possibilities; and Course Offering. While it was expected these codes would have a low usage, the level at which they were applied in study 2 indicates that these are strong distinct categories that make up the general Access category. Thus, these codes were not expected to get high usage individually but should be strong enough to indicate they represent a unique aspect of Access that resonates with students.

Table 5.3.35
Definitions and examples of Access

Framework Area and Definition	Example of Student Excerpt
Place Access: Any reference to the degree to which one was able to use or interact with the course, materials, component-activities, or content from a desired location.	Student 8 (Excerpt 26716-27157) INTERVIEWER: Okay, great. how would you compare the quality of this online course to traditional face-to-face classes that you've taken before? STUDENT 8M: I think that the material was presented in a more concise and maybe, I, I'd put it in my own personal opinion it was a better way of doing it, and like I could work from my home, which was also very good, I set my own pace, so overall this, I feel is better than a traditional class.
Interaction / Communication: Any reference to the degree to which one was able to communicate or interact with others in the course.	Student 10 (24061-24965) INTERVIEWER: How would you compare the quality of this online course with traditional face-to-face classes that you've taken? STUDENT 10M: If I was to compare it from 1 to 10, I would give it like an 8--8 or 9. Mostly because the person-to-person is a plus because you get to relate more to people have, have more interactions, but on the other hand the fact it all depends on the size of the class on the live-course, so the more people you have in a class, the less interactions you get to have with the professor, but when compared to an online class and to the impression I have of my online course, I felt that I was able to have a better connection and understanding of the material because it was up to the amount of the students present during the discussion and everything like that, I felt it was more closer and that it was more like a 1 on 1 thing, than to a regular course in the classroom.
Course Format: Any reference to the degree to which one was able to use the format that she/he perceived as most suitable to their wants/needs.	Student 12 (52-555) how did you decide to enroll in the online section in the course? STUDENT 12F: I decided just because I knew someone else who took the course and she suggested it to me and I thought it would work out well with my schedule. INTERVIEWER: Okay, and did they recommend it for the content, the format, or-- STUDENT 12F: The format and the Professor for the most part. INTERVIEWER: Okay. And that person has taken the online course before? STUDENT 12F: That person took the online course yeah, exactly
Fit with Schedule: Any reference to the degree to which the course fit in with other activities in the schedule/calendar of an individual.	Student 10 (Excerpt 83-347) INTERVIEWER: How did you decide to enroll in the online section of the course? STUDENT 10M: Through the registrars. I found out through the registrar that there were online and it said it would be at own pace. Full schedule working and could do studying at night.

Table 5.3.35 Continued
Definitions and examples of Access

Framework Area and Definition	Example of Student Excerpt
Other External Possibilities: Any reference to the degree to which participation would have an impact in being able to participate or take advantage of possibilities outside of the course.	Student 14 (Excerpt 1859-2428) So there were like deadlines usually like on Friday nights. We had to take like a weekly quiz and write a weekly either exercise or essay. Those were usually due midnight on Friday. So I tried to do things during the week, like they had online videos to watch so I tried to fit those in during the week but I typically saved the text and the writing things for Friday afternoon because I was trying to focus on some of my other classes during the week. So it was usually just watching the videos during the week and working on assignments and quizzes Friday afternoon.
Course Offering: Any reference to the offering of a course at the university.	Student 13 (Excerpt 29385-29798) INTERVIEWER: And do you think that there's any reason in the future that you would take an online course? STUDENT 13F: If it were required and I didn't have any choice but, no okay well I'll take it back, this was my last quarter and I had to take a GE course and there weren't any other GE courses that were offered in lecture hall. So yeah, that's why I took it, but I was also interested in the course topic.

The sub-codes for access were used with the expected frequency given they were sub-codes of a efficiency evaluation sub-code. Fit with Schedule was the most frequently used subcode. Most of these comments related to why a student decided to enroll in this course. Others discussed problems they had fitting in time for study given their full schedule. Still, others talked about trying to find time to participate in a particular component-activity, such as discussion section. Student 11 described fit with schedule in the context of the availability of his TA.

What is interesting about the Access code counts overall were the very low frequency amongst the in-person students. Perhaps Access was not an issue in many of their decisions. While the sample is small, the low coding application across all issues of access is striking. This could indicate a real phenomenon, a difference just among these students, or could be a product of coding error. As mentioned before, the in-person students were coded before the online students were coded. Therefore, the coder may have applied access codes more liberally as the coding progressed. Whatever the ultimate

reason, the difference between the online and in-person groups regarding access inspires the need for further investigation.

Table 5.3.36

Code usage for Access

		Instructional Mode		Income		Gender	
	Total	Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Place Access	**16**	15	1	7	7	8	8
Interaction / Communication	**8**	8	0	4	2	5	3
Course Format	**18**	17	1	5	8	9	9
Fit with Schedule	**28**	22	6	11	11	14	14
Other External Possibilities	**12**	10	2	3	6	3	9
Course Offering	**9**	9	0	5	3	6	3

[1] The income of two students was unknown

The last area of Student Decisions is Student Participation Decisions. The codes for student participation decisions are presented below (see Table 5.3.37) and include: Student Participation Decisions (General Code; Decision to Participate in Course; Decision to Participate in Component; How to Participate in Course; and How to Participate in Component). The breakdown of Student Participation Decisions is distinct from the codes used in Study 2. Whereas in Study 2, the codes reflected positive or negative comments about the course or component-activities within the course as well as whether the student was making a comment that moved them closer to participating in online or in-person in the future, the codes used here did not express a positive or negative judgment. Part of the reasoning for this was a difference in the nature of the questions used in the survey versus those in the interview. The survey asked two very clear questions about why the student would participate in an online course or not participate in another online course at this university again in the future. And the questions on the survey also

gave students a chance to say positive or negative feelings about their experience in the course as a whole or within specific component-activities. The interviews were more holistic and asked about the student participation decisions in general and allowed for more detailed explanations of that experience. Further, the analysis of the analysis of the participation decisions is very different. While the survey provided greater numbers of students for a more quantitative look at the positive or negative evaluation of students, the interview analysis looks more in depth at the potential influences on student participation decisions (see Analysis of Student Participation Decisions section of this dissertation).

Table 5.3.37
Definitions and examples of Student Participation Decisions

Framework Area and Definition	Example of Student Excerpt
Student Participation Decisions: Any reference to a student making participation decisions about the course or component-activities within that course	Student 6 (Excerpt 3878-4509) INTERVIEWER: And you said problems came up because you were cramming? STUDENT 6M: yeah every once in a while we would miss, we might miss a deadline here and there, but luckily it wasn't that bad from the two times, the quizzes if you missed them I believe you couldn't retake them, so that was like our top priority, was to get the quizzes out of the way, I turned in a couple of the assignments late but the point deduction was not enough to make me want to do them earlier I guess, like if I wasn't making up assignments on Friday I knew that I could just turn it in the next day and not lose enough points to change my grade.
Decision to Participate in Course: Any reference to a student making participation decisions about the course	Student 15 (Excerpt 7-324) INTERVIEWER: How did you decide to enroll in the online section of this course? STUDENT 15F: Well, I have a 6-month old son, so it's easier for me to take classes online than in person. INTERVIEWER: Okay. So it's more of a convenience issue? STUDENT 15F: Yeah. And it was also a course for my prerequisite classes.
Decision to Participate in Component: Any reference to a student making participation decisions about component-activities within that course	Student 9 (7681-8605) INTERVIEWER: Did you feel distracted watching the videos at all? STUDENT 9F: I sat in a room by myself watching it. Towards the end I kinda stopped watching it cause I don't know I didn't feel like I was really learning much since there was so much stuff to memorize, I didn't feel like there was a point in watching them anymore. INTERVIEWER: So did you feel like you knew what you needed to spend time on in this course? STUDENT 9F: No, because the multiple-choice test, he said there would be a question from every single video. I think thee was approximately fifty videos and then if he gives a question from each video and I'm not really sure what the point of each video that makes it really hard to study for a test. Cause in the beginning for midterm, I watched the videos I didn't do well on the test and then during the final, I gave up and stopped watching the videos and I still did about the same anyways.
How to Participate in Course: Any reference to a student making participation decisions about how to participate in the course	Student 1 (Excerpt 21251-21800) STUDENT 1M: Yeah, I was definitely able to monitor my understanding, If I felt like I knew or had some background on a topic I was able to skip through the videos pretty quickly and take the quiz and be done. Or if I wanted to go a little more in depth on a certain topic I could watch all of the videos. And there were certainly other supplemental materials that I could look at if I wanted a deeper understanding of a certain topic.

Table 5.3.37 Continued
Definitions and examples of Student Participation Decisions

Framework Area and Definition	Example of Student Excerpt
How to Participate in Component: Any reference to a student making participation decisions about how to participate in a component-activity within the course	Student 5 (Excerpt 32191-33200) INTERVIEWER: when did you do the readings in the course, compared to like the videos and lectures and the quizzes and everything? STUDENT 5M: The textbook reading I mostly skimmed so two chapters would only take me like 30 minutes and the textbook mostly just reiterates and fills in what he discusses in class. It was useful as a reference to be able to check back and review topics and then reading for the actual assignments, I factored that in with the time to do the exercises and the essays. Because generally the reading was given along with the exercise, like the exercise would be like "analyze this article?, what this article say about this? What methods did they use to determine this?" But like an essay would be like "look at this document of various [subject area] models. Talk about the various [subject area] models, what do they do? What are they useful for? What are their limitations? But I already factored that time in, it's a part of the 4-5 hours time on essay and exercise writing.

The Participation decision codes had moderate to high application. In most cases, each group received a similar proportion of coding application. However, there were large differences between the online and in-person for both the codes *How to Participate in Course* and *How to Participate in Component*. The reason for this difference is unclear. As described before, this could be a product of the order in which the interviews were coded. The in-person section interviews were coded before online section interviews. This could also be a difference in the nature of online versus in-person courses. Students in the online section may need to make more decisions about how they are going to participate in the course or in component-activities. Regardless, this area will need further investigation in the future. More discussion about how students participation decisions and the influences on these decisions is discussed in a later section of this dissertation.

Table 5.3.38

Code usage for Student Participation Decisions

		Instructional Mode		Income		Gender	
	Total	Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Participation Decision	**165**	112	53	61	84	81	84
Decision to Participate in Course	**35**	20	15	10	22	14	21
Decision to Participate in Component	**66**	45	21	23	35	33	33
How to Participate in Course	**73**	59	14	32	29	37	36
How to Participate in Component	**41**	33	8	18	19	23	18

[1] The income of two students was unknown

The last section, Student Participation, represents the point of interaction that a student has with the course and those in the course. In this section, there are three main codes: Communication/ Interaction; Action; and Experience. Under Communication/Interaction, there are five sub-codes: Endorsed or Promoted Communication; Not Endorsed or Not Promoted; Hallway Interaction; In-Person Communication; and Online Communication. This section was expected to have a very high code application rate since they most closely represent the actual interactions, actions, and experience of their descriptions. Table 5.3.39 below provides a definition and example of a student excerpt of each of these codes.

Table 5.3.39
Definitions and examples of Student Participation

Framework Area and Definition	Example of Student Excerpt
Communication / Interaction: Any reference to actual student communication or interaction within the course	Student 12 (Excerpt 4086-4368) INTERVIEWER: What were your favorite aspects of the course? STUDENT 12F: Probably the discussion sections just because talking to other students in the course about the subjects was helpful. INTERVIEWER: And you did those online through Adobe-Connect? STUDENT 12F: Yeah, exactly.
Endorsed or Promoted Communication: Any reference to communication that has been promoted by the instructor or through course activities	Student 11 (13784-14589) INTERVIEWER: Which class activities were most effective in helping you learn the class material. STUDENT 11M: I would basically say the during the discussion times the TA would ask us answer questions like "What do you guys think about this?" and we would all submit our input and I think that helped a lot because sometimes I wouldn't know what the answer is and i would just listen to other people and I would be like "oh that's right" ya know? INTERVIEWER: So you would present your answers. How would you present those answers? STUDENT 11M: Basically there's presentation mode in adobe connect thing and it would be on and the blackboard and the chat it would just be our webcams and our microphones and we'd just talk.
Not Endorsed or Not Promoted Communication: Any reference to student communication that has not been officially endorsed by the instructor or promoted through course activities or technology	Student 6 (Excerpt 20816-20963) so with students… like I said my roommate was also a student in the course so I had a lot of interaction with him. a lot of interaction with him
Hallway Interaction: Spontaneous communication outside of class time that occurs through the combination of right-place (real or virtual) and right time.	Student 13 (Excerpt 5976-6500) The only downfall would be again the technical issues and the fact that you know you can't really stay in on in class and ask interactive questions, like one-on-one in person with either the professor or with the discussion leader. Yeah I feel like, a lot of the students when they have questions they stay on in the class and ask, but we didn't really have the chance to do that. and everything was through email and it was yeah… sometimes in-person interaction is better than email interactions. So yeah I think that's it.

Table 5.3.39 Continued
Definitions and examples of Student Participation

Framework Area and Definition	Example of Student Excerpt
In-Person Communication: Any reference to in-person communication	Student 4 (excerpt 21921-22490 INTERVIEWER: When you met with other students, like in study groups. What would those meetings usually consist of? STUDENT 4F: Primarily it was for the group project and then after that we started studying for the midterm and we would meet up at the midterm review and we would go over the questions that he posted - like the midterm practice review or whatever it was called, we would go over that. And then we would go over practical, maybe topic sentences of how we would write our essays for the test INTERVIEWER: would you meet up on campus? STUDENT 4F: yeah
Online Communication: Any reference to online communication	Student 6 (Excerpt 34291-35191) INTERVIEWER: Okay. Did you feel connected with your TA, you said you didn't have much experience with your professor, but did you feel connected with your TA? STUDENT 6M: Yeah. during the discussions he was always available after it was, the discussion was from 6-7, and he would stay on until like 7:10, just to see if anybody had questions, he would be the last one to leave the chat room. So like if anybody had questions they could stay and talk to him. I know I missed one discussion section so I stayed after on the next one and I talked to him about what I missed and stuff. He just said I needed to make up. INTERVIEWER: So you stayed after the week the week after you missed the discussion section? STUDENT 6M: Yeah. So I missed one week so the next week I stayed about ten minutes after the discussion section ended, and just talked to him about what I missed and how I could make it up.
Action: Any reference to an action taken by a student	Student 6 (10789-10861) STUDENT 6M: I spent the most time on the lecture videos, probably, yeah.
Experience: Any reference to a student experiencing an aspect of the course,	Student 9 (Excerpt 10950-11306) INTERVIEWER: Okay. How did you experience in the discussions or interactions with students compare to your initial expectations? STUDENT 9F: I actually enjoyed it, like that was my favorite part of the class, like I actually enjoyed it. Like I learned most of the stuff for class because of like the TA explaining it and talking to other people about it.

The application of codes for student participation ranged from very high to low. The frequency with which each of these codes were applied is presented in Table 5.3.40

below. As expected the main code was Student Participation had a very high count while the three sub-codes directly under (Communication / Interaction; Action; and Experience) also had very high counts. The sub-codes under Communication / Interaction had varied usage. The sub-code used most frequently was Endorsed or Promoted Communication with Online Communication in a close second place. Not Endorsed or Not Promoted Communication and Hallway Communication had the least codes. Interestingly, while all of the main student participation codes had fairly similar usage between online and in-person students, the communication sub-codes were very different in application between online and in-person. These codes were applied far more often to the students in the online course than the students in the in-person course. As mentioned previously, this coding difference could be related to the timing in which these interviews were coded. The in-person student interviews were coded before the online student interviews. This could mean that the communication sub-codes were applied more liberally as the coding progressed.

Table 5.3.40

Code usage for Student Participation

	Total	Instructional Mode		Income		Gender	
		Online	In-Person	Low Income[1]	Not Low Income[1]	Female	Male
Number of Students	**N=15**	n=10	n=5	n=5	n=8	n=6	n=9
Student Participation	**404**	249	155	131	222	174	230
Communication / Interaction	**171**	113	58	51	94	65	106
Endorsed or Promoted Communication	**100**	89	11	36	47	33	67
Not Endorsed or Not Promoted Communication	**21**	17	4	3	15	4	17
Hallway Interaction	**13**	12	1	5	5	4	9
In-Person Communication	**37**	32	5	10	21	11	26
Online Communication	**89**	85	4	34	39	32	57
Action	**228**	134	94	77	126	100	128
Experience	**127**	97	30	43	58	49	78

[1] The income of two students was unknown

The frequency with which the codes were used shows that the respective properties and processes of the framework were influential on student experiences. Like the other areas of the framework, while it is clear that student participation and the sub-codes should be represented in the framework, a simple representation framework only indicates presence of the properties and processes. Student participation has a much dynamic role in online education. For example, the perspectives of the student cases painted a complex picture of communication and interaction in online courses. Student 15 described how the media led to a more interactive experience than she might have had otherwise in an in-person version of the course:

> INTERVIEWER: And how did people generally participate?

> STUDENT 15F: Um, there was a little chat box that we could type in, or our TA would have us take turns turning our mics on so we could talk and do group presentations and stuff. But yeah, it was usually just typing or using the microphone.
>
> INTERVIEWER: You would generally answer questions that the TA would ask through the chat box?
>
> STUDENT 15F: Yeah, she'd ask like a general question, because she had her mic on, so she would say the question and we would respond in the chat box, because if we all had our mics on at one time it would be kind of chaotic.
>
> INTERVIEWER: How often would an individual student get a chance to talk on the microphone?
>
> STUDENT 15F: Usually at least once per discussion section.
>
> INTERVIEWER: And was it to present something, or to ask a question, or state an opinion?
>
> Student 15F: Um, it was usually to do a presentation.
>
> INTERVIEWER: Okay. And would the screen get shared, or was it always the TAs screen?
>
> STUDENT 15F: Our screen could be shared if we had something on ours that we wanted to present, we could do it that way. It was pretty much up to us.

Communication can be enhanced to allow for greater participation on the task at hand. Indeed others expressed similar feelings of greater access for communicating. Yet, others described a sense of frustration with the communication. For example, Student 14 in particular did not like the online interaction. One reason that Student 14 gave was a the problems with technology. Additionally, Student 14 just thought in-person interaction was of greater quality. Student 12 described in-person communication as being more efficient:

> INTERVIEWER: Was there something meeting someone in-person that kind of changed the dynamics a little bit, and if so, was it a good thing? Or do you think it could have just happened online?
>
> STUDENT 12F: It can happen online, but I feel like you get communication--just works a lot better when you meet in person and so you can get over what happens, and what you want to get done for the projects and how you want to divvy up tasks. It's just a lot more straightforward than talking over email.

Student 8 (Excerpt explained a similar phenomenological difference between online and in-person communication where it is easier for the instructor to communicate to the class and get everyone on track with the course when the communication is in-person:

> STUDENT 8M: Ohh okay, well it did take for me like the discussion sections, it did take a while to set up certain aspects of it, like maybe getting everyone in this class like, I felt that maybe an in-person course there were easier ways to maybe get everyone on track to get all the information in a faster way , compared to the online discussions, but like yeah, like overall like the online courses like they're structures better.

Understanding what causes communication to be more efficient in an in-person environment and when communication is more efficient in these different environments may be important to figure out and would be valuable future research. For example, are there particular situations where sending a quick email or text message is better than calling a meeting? What are the particular tasks that are important for in-person meetings? Was the in-person meeting seen as more efficient simply because the students did not have experience in a business environment where email is exchanged on a regular basis? Or are the students so unfamiliar with one another that an in-person introductory meeting is important to establish relationships and group norms? Answering these types of questions could be important for an instructor or institution trying to create a course that works efficiently and effectively toward achieving student learning goals.

Student 13 (Excerpt 17565-18174) explained that there was something fundamentally different about an embodied in-person interaction that does not translate through online computer-mediated communication.

> INTERVIEWER: Okay. And how did your experience with interactions compare to your initial expectations of interactions in this course?
>
> STUDENT 13F: Okay well when you interact with a person in front of you, you kind of, it's a person-to-person interaction. But with an online course like that, it is a person-to-person, but it is a person-to-person through the screen. That makes it much more formal. So I guess its a good thing from the course point of view, because we only talk about what's expected of us to talk about like the course materials I don't know where I'm going, but again just the formality.

This statement is important as it points to a significant but somewhat intangible and indescribable phenomenon in online communication. The presence of an individual embodied in front of you has some qualitative difference that is difficult to describe in words. And yet, there is a difference that affects those trying to communicate.

As we can see, just communication and interaction has very profound and peculiar influence on the student experience. Student participation has an obvious but potentially idiosyncratic influence on online education. Further research is needed to understand the connections between the various aspects of the framework with student participation.

Decisions about Participation in the Course

This section of the dissertation looks at the decisions that students made in regard to this course. These decisions were analyzed in three main ways:

- The Decision to Participate in this Course
- The Decision to Participate in a particular Component-Activity
- How to Participate in the Course or a particular Component-Activity

Descriptions of student reasoning about these decisions are examined in the following sections. Each section has provided a table with an example of the reasoning that students used for the decision. In some cases the example of the reasoning was provided in summary form in order to combine multiple excerpts and substantially shorten the length of the example. In other cases, the excerpt was left to speak for itself. And in other cases, an excerpt was combined with a summary. Summaries kept as close as possible to the actual narrative. In the column just to the right of each decision description, a list of the related decision processes described by this framework was provided. In the last column, other areas of the framework are listed that were coded for the same excerpt and also seem to be strongly related to the overall decision process. Both the decision processes and the related areas of the framework were codes that were used in the coding process when the excerpt (or combination of excerpts) were coded, thus, they are a part of the coding results described in the previous section.

Decision to participate in the course. First, how each student decided to enroll in the course was explored. There are three tables that follow with a decision example from each of the student cases. As mentioned earlier, the first column provides a description of the reasoning the student gave for making the decision to enroll in this particular course and, in some cases, the explanation they gave for their participation in

this particular section. In the next column are the framework described decision processes that related to this reasoning. In the last column are any framework predicted variables related to the course or characteristics of the individual that directly related to the decision. The content of the second and third columns are the actual codes used to code these decisions. While other codes may have also been used during the coding of the excerpts of interest, these codes were particularly relevant to the decision process. Codes that were not included in these columns were those that were not related to influences on the decision process.

Examples of the decision to enroll in this course for Students 1-5 are listed in Table 5.3.41 below. Each example was coded with efficiency evaluation criteria. Three of these decisions were coded with Information Gathering and four described a theory they had developed about the course. Each of these students explained how the course would contribute to their goals or interests: Students 2, 4, and 5 needed the course for GE credit; Student 1 and 3 took the course because they were personally interested in the subject. What was most interesting was the way students drew from their knowledge of their own preferences and prior experience in the decision to enroll in the course. Students 3 and 4 drew on prior experience to rule out the possibility of enrolling in the online version of the course. Students 1, 2, and 3 all described a preference for the in-person environment. And Student 5 stated that a student that lives near campus, “might as well go to class”. What is interesting is that only Student 2 described a specific aspect of course implementation that drew her to a specific type of environment. While it did not seem that Student 2 knew the format of the course before enrolling, she stated that from her experience in this course, she enjoyed the ability to Control whether she would go to the

lecture or watch the videos online (Control of Component-Activity) and the ability to control the pacing of the videos (with the ability to re-watch them) was beneficial and could be a selling point of the online version of the course.

Table 5.3.41
Decision to Participate in Course for Students 1-5

Description of Decision	Decision Processes	Framework Area Influences on Decision
Student 1 (Summary of Discussion of the Decision during the Interview): Was drawn to this particular course because he wanted to gain knowledge in the subject but did not want a highly technical course. Took the course as an elective. Did not know that there was an online version of the course available but would not have chosen to enroll in the online course even if he had known	Information Gathering Theory Development Efficiency Evaluation: Contribution to Goals or Interests; Content Learning; Time/Effort; Affect Satisfaction	Student Input: Interest in subject; Preference for Learning Environment
Student 2 (Summary of Discussion of the Decision during the Interview): Mainly just needed a GE in this area. Chose the in-person because the in-person section showed up on the university catalog before the online section and it fit in her schedule. Also enjoyed the in-class lectures but there were times that she would watch the online lectures instead of go to class. Felt that if students were only given an option between online videos and an in-person lecture, the online videos would have been more helpful for learning the material since you could re-watch them and they went more in-depth.	Information Gathering Theory Development Efficiency Evaluation: Contribution to Goals or Interests; Access (Fit with Schedule); Content Learning; Time/Effort; Affect Satisfaction	Student Input: Requirement for graduation; Time Conflicts; Preference for Learning Environment Control of Component-Activity; Pacing
Student 3 (Summary of Discussion of the Decision during the Interview): Took this course because the professor had given three guest lectures in another course his first quarter and he was really interested in the subject and had a similar major. Even though he stopped attending the in-person lectures, he prefers the in-person discussions and thinks it is a better environment for him. He tries to avoid too much time on the computer. He has had an online discussion in the past and does not think it would be a good environment for him every week. Would have signed up for a section with a different TA because he felt his was not very good and he had taken a section in a different course with another TA in this class that he felt was good.	Information Gathering Theory Development Efficiency Evaluation: Contribution to Goals or Interests; Process performance; Affect satisfaction; Content Learning	Student Input: Requirement for graduation; Interest in subject; Prior Experience; Preference for Learning Environment; Compatibility for Learning Environment or Instructional Practice
Student 4 (Summary of Discussion of the Decision during the Interview): Needed to fulfill a GE requirement. She had never taken an online course before and does pretty well in in-person courses and just did not want to take an online course	Efficiency Evaluation: Contribution to goals; Content learning; Affect satisfaction	Student Input: Requirements for graduation; Prior Experience

Table 5.3.41 Continued
Decision to Participate in Course for Students 1-5

Description of Decision	Decision Processes	Framework Area Influences on Decision
Student 5 (Summary of Discussion of the Decision during the Interview): Mainly chose the course because he was looking for a class that fulfilled a GE requirement. Chose the in-person because he did not originally see the online option but also because he is a student at that university and living in the same city as the university so he "might as well go to class"	Theory Development Efficiency Evaluation: Contribution to goals; Access (Place access)	Student Input: Requirements for graduation; Distance from the University

While each of the students had unique reasons for their decision to enroll in the course, a pattern of where students pull information to make decisions has already begun to emerge. Students seem to be pulling information about their decisions from input information (Internal and External) and from ideas about the course (real, hypothetical, or ideas from prior experiences). And from that information, they try to decide what is the most efficient path towards achieving their goals. So far, this pattern is consistent with the theory of decisions provided in this dissertation.

Examples of the decision to enroll in this course for Students 6-10 are listed in Table 5.3.42 below. Students 7, 8, 9, and 10 described a process of gathering information about the course before making a decision to enroll. Each student described developing a theory about the course and efficiency evaluation criteria. All five students named some form of access as a reason for taking the course. For example, Student 8 was taking four other courses and this course allowed him to take a course that would fit in his already full schedule. Student 7 also needed an additional course to fit his schedule. Similarly, Student 10 described how this course helped his schedule with work. Student 7 and 9 liked the course because they did not have to travel to campus. Each student was influenced by some form of Student Input: Students 6 and 7 had an interest in the subject;

Students 6, 7, and 9 stated that they needed the course in some way as a requirement for graduation; Students 8, 9, and 10 all explained that they had time conflicts. An interesting difference that this group had from Students 1-5 was the description of how the course operated as a reason for enrolling. Students 6, 8, 9, and 10 all described some type of control as a reason for enrollment: Student 7, Control of Location; Student 8, Control of Timing; Student 9, Control of Location; Student 10, Control of Pacing. Student 7 described the amount of work as a reason to take it; the course was three units and did not seem like much of a commitment.

Table 5.3.42
Decision to Participate in Course for Students 6-10

Description of Decision	Decision Processes	Framework Area Influences on Decision
Student 6 (Summary of Discussion of the Decision during the Interview): Took the course to get GE credits but also enjoys the subject. He got an email that informed him that there was an online version of the course available, so he elected to "just give it a try" and take it. He was taking a lot of units that term so thought it would be good to not have to spend as much time on campus	Theory Development Efficiency Evaluation: Contribution to goals / interests: Time/Effort; Access (Place access)	Student Input: Interest in the Subject; Requirements for Graduation Control of Location
Student 7 (Summary of Discussion of the Decision during the Interview): He needed three units and roommate was taking he course and recommended it because it seemed convenient. Otherwise did not know there were online courses at this university. He was also interested in the subject. Was not interested in the in-person course because it did not fit schedule and already had access to the online videos. Did not think it was going to be as big of a time commitment	Information Gathering Theory Development Efficiency Evaluation: Time/Effort Contribution to goals / interests; Access (Course Format; Fit with Schedule)	Student Input: Other (had a roommate in the course); Preference for learning environment; Requirements for graduation; Interest in Subject Features of Curriculum: Amount of work
Student 8 (Summary of Discussion of the Decision during the Interview): This was his fifth course (all other courses were in-person), so he figured he could work on this course in between class periods. He felt that he would not have been able to take five courses at the same time if they were all online though because it would have been too distracting/un-motivating.	Information Gathering Theory Development Efficiency Evaluation: Process performance; Content learning; Access (Course Format; Fit with Schedule; Other External Possibilities)	Student Input: Motivation/Focus/ Time Management; Personal Environment; Time Conflicts Control of Timing
Student 9 (Summary of Discussion of the Decision during the Interview): She needed units to graduate this quarter and she was commuting two days per week from 90 miles away and this was the only class that fit her schedule	Information Gathering Theory Development Efficiency Evaluation: Time/Effort; Money/Resources; Contribution to Goals; Access (Place Access; Course Offering)	Student Input: Distance from university; Requirements for graduation; Time Conflicts Institutional Issues (listing of the course) Control of Location
Student 10 (Summary of Discussion of the Decision during the Interview): Saw that it was an online course on the university catalog and that he could learn at own pace. He worked a job during the day and figured he could study at night	Information Gathering Theory Development Efficiency Evaluation: Time/Effort; Affect Satisfaction; Access (Fit with schedule; Other external possibilities)	Student Input: Time Conflicts Institutional Issues (listing of the course) Control of Pacing

As with the other students, Students 6-10 had a consistent pattern of making decisions. The process included gathering information, forming a theory, and then conducting an efficiency evaluation. Areas connected to the process included their own input (internal and external characteristics) and aspects of the course, such as features of curriculum and control. Interestingly, institutional issues seemed to also play a role in student decisions to participate in the course (listing of the course). Students 6-10 each had unique decisions to make and named unique influences on their decisions. However, the overall decision process seemed consistent across each student and this process was consistent.

Examples of the decision to enroll in this course for Student 11-15 are listed in Table 5.3.43. Students 11, 12, 13, and 14 described a process of gathering information about the course and Students 11, 12, 13, and 15 described developing a theory about the course. All them described some type of efficiency evaluation. While each of the students used two or more efficiency evaluation criteria, all of these students listed Access as one of the criteria they used and each of them described Course Offering or Fit with Schedule as one of the types of Access. Each student referenced some personal characteristic as an influence on the decision. Students 11, 12, 13, and 14 described a preference for the learning environment as a reason for taking the course. Student 11 wanted to see what the course was like, Student 12 had a friend that recommended taking the course (in the online format), Student 13 took the online class because it was the only class she needed that also fit her schedule, and Student 14 actually wanted the in-person course if it had been offered. Student 14 had a background in the area and was taking the course as a GPA booster. And Student 15 had a baby, so this course seemed convenient. Unlike the

other online students that described features of the course as having an influence on their decisions, only Student 11 listed a type of Control (Location) and Student 14 listed a Feature of the Curriculum and Content (level of complexity/difficulty) as a reason for taking this course. Thus, this group seemed more similar to the in-person students than the winter online students in their lack of citing course operation in their reasoning for choosing the course.

Table 5.3.43
Decision to Participate in Course for Students 11-15

Description of Decision	Decision Processes	Framework Area Influences on Decision
Student 11 (Summary of Discussion of the Decision during the Interview): Saw that it was an online course on the university catalog that it was an online course. Decided he wanted to see what it was about and thought it would be good for him because he does not like having to leave the house much	Information Gathering Theory Development Efficiency Evaluation: Time/Effort; Affect Satisfaction; Access (Place Access; Course Format; Course Offering)	Student Input: Preference for Learning Environment; Other student internal Institutional Issues (listing of the course) Control of Location
Student 12 (Summary of Discussion of the Decision during the Interview): Decided to take the online course because she knew someone that was taking the course and they suggested it (recommended the course for the format and the professor) and she thought it would work well with her schedule	Information Gathering Theory Development Efficiency Evaluation: Access (Course Format; Course Offering; Fit with Schedule); Other Efficiency Evaluation (Interested in taking course from the professor)	Student Input: Other Student Internal; Prior Experience; Preference for learning environment
Student 13 (Summary of Discussion of the Decision during the Interview): Took the course because she was interested in the topic. Only took it online because it was the only GE course that fit her schedule	Information Gathering Theory Development Efficiency Evaluation: Contribution to Goals/Interests; Access (Course Offering; Fit with Schedule; Course Format)	Student Input: Requirements for graduation; Preference for a learning environment; Interest in Subject Institutional Issues (Only GE course offered that she needed)
Student 14 (Summary of Discussion of the Decision during the Interview): Looking for lower division science and society courses to fill up his schedule. Took online version of the course but would have taken in-person course if it had been an option. Took the course as a GPA booster since he was a senior science major and taking a lower division GE course	Information Gathering Efficiency Evaluation: Contribution to Goals/Interests; Access (Course Offering; Fit with Schedule; Course Format)	Student Input: Background and Abilities; Requirements for graduation; Preference for a learning environment Features of Curriculum: Complex or Difficult Institutional Issues (Only GE course offered that he needed)
Student 15 (Summary of Discussion of the Decision during the Interview): Took this specific course because it was a prerequisite course AND Decided to take the online version of the course because she had a 6-month old son and it was easier to take it online than in-person	Theory Development Efficiency Evaluation: Access (Fit with Schedule; Other External Possibilities; Place Access); Contribution to Goals; Time/Effort; Other Efficiency Evaluation	Student Input: Requirement for Graduation Personal Environment; Student Internal Other, Student External Other

This last group of students was another step toward confirming the theory of decision-making that this dissertation had developed. While some students left out a particular process, such as forming a theory about the course, there seemed to be a consistent pattern of student decision-making. Generally, used this process: gather information about the course; develop a theory about the course; and conduct an efficiency evaluation. These processes seemed to be linked to student input; course operation properties and processes (such as features of curriculum and control); and institutional issues (mainly course offering).

A majority of students explained that they decided to take the course because the course contributed to their goals or interests. While not all students stated a reason that related to goals or interests, it was most reasonable that students took the course because it contributed to their advancement toward degree, was perceived to potentially increase GPA, or the student had a general interest in the subject. Even if the goal was to meet the instructor of the course or take a class with someone the student likes, there would be a goal or interest involved. Most students probably did not enroll in the course just to pass time. However, not all students gave a reason such as this and therefore not all statements were coded as such. But this was probably due to the questions asked of the students and more consistent questions that asked about student goals may have unveiled goals and interests for every student. Future research could help uncover the different goals and interests that influence the decisions to enroll. Also, the goals and interests involved in enrolling in a course are potentially different than the goals and interests involved in participating in particular component-activity within the course. And it may be that

students would be more prone to name a goal or interest when explaining their decision to enroll in the course than their decision to participate in a component-activity.

Also important to note was that the decision to enroll is influenced by a variety of variables. These variables that students consider may be of interest to institutions deciding whether or not to develop and run an online course or program. Institutions might make decisions about online course offering based on student performance in online courses. However, as many of the students described as a reason for taking this course, it was the only option available given their need and circumstances. Students might enroll in an online course because it is the most practical and possibly only option available. Therefore, when deciding to offer an online course, the way online courses creates availability should be weighed against other factors, such as who does better in online courses. Institutions may want to determine the wants and needs of the student stakeholder when making decisions about online course creation and implementation.

Decisions about participation during the course. Whereas the first kind of course decisions for students was a decision to participate (enroll) in the course, the second kinds of decisions are those that students make once they are in the course. Two main types of decisions students make once they are enrolled are examined in the below subsections: the first kind of decision is *if* they will participate in certain component-activities; the second kind of decision is *how* they will participate in the course and component-activities. A third kind of decision, whether to stay enrolled or exit the course, was not examined in this dissertation but would be advantageous to study in the future. The analyses of decision types examined below found that these student decisions were influenced by a combination of student decision processes, student input characteristics,

external variables related to the course, and external variables unrelated to the course. The next two subsections examine these two types of decisions students make once they are in the course and the variables involved in those decisions.

Decisions to participate in component-activities. Examples of student decisions to participate in specific component-activities within the course are listed for Students 1-5 in Table 5.3.44 below. Students 2 and 3 developed a theory about the component-activity before participating. Student 2 had a theory that the videos and in-person lecture were similar but this theory was challenged and changed when the TA informed her that the videos actually went more in-depth than the in-person lectures. Student 3 had a theory that the textbook is necessary for every course. Each of the students described an efficiency evaluation process and criteria for making the decision. With the exception of Student 5, each student described content learning as one of the criteria they used for making the decision. Student 5 was describing when to skip the lecture, so his focus was on other external possibilities. All of these students described some other area of the framework that had an influence on the decision to participate in the component-activity. Students 2, 3, and 4 described some aspect of Curriculum and Content as an influence on their decision. Students 2, 3, and 4 mentioned an issue related to multiplicity. Each of these students described the choice they had between different forms of media. The instructor's intervention with Student 2 helped convince her to start watching the videos. Students 4 and 5 described control over the Component-Activity as a factor in the decision process. Student 5 did not attend in-person lectures when it was close to the time for exams in other courses since the lecture was not mandatory or graded and he could watch the online lectures instead.

Table 5.3.44
Decisions to participate in a component-activity for Students 1-5

Description of Decision	Decision Processes	Framework Area Influences on Decision
Hypothetical Choice Between Online Videos and In-Person Lecture Student 1 (Excerpt 8082-8414): In order to pass the course I would choose the videos, however, I enjoyed the lectures more than videos. But strictly for obtaining a higher grade I would choose the videos, but in terms of interest, I preferred the lectures.	Efficiency Evaluation: Content Learning, Affect Satisfaction	Student Input: Preference for a learning environment, Compatibility for Learning Environment
Decision to start watching videos Student 2 (Summary of Excerpt 7773-8166): Decision to start watching the videos. Was not aware that the videos went more in depth than the in-person lectures until the TA told her. After that, she would watch the videos before attending in-person lecture	Information Gathering Theory Development Efficiency Evaluation: Time / Effort, Content Learning	Instructor / TA, Instructor Participation, Features of Media, Multiplicity Features of Curriculum and Content: Navigation or Organization
Decision to read the book Student 3 (Excerpt 4794-5147): Yes, I absolutely think that the textbook for every single course is necessary, but this class this textbook is probably the best textbook that I have ever read, it is extremely readable and presentable and everything in it is online, all of the videos related back to the book so it was extremely beneficial to read the book ahead of time.	Theory Development Efficiency Evaluation: Content Learning	Features of Curriculum and Content: Navigation or Organization, Alignment Features of Media: Multiplicity
Watching videos and attending the in-person lecture Student 4 (Summary of Excerpt 4792-5331): She did not go to lecture one time because she watched the online videos but also preferred the lectures because if the professor comments and he answers questions	Efficiency Evaluation: Content Learning	Control: Component-Activity Feature of Curriculum and Content: Alignment and Other (Lectures had a different quality) Features of Media: Multiplicity
When to skip lecture Student 5 (Excerpt 3104-3454): Most of the time I went to lecture. Every now and then I had a test because my only point of taking this class was for credits, so if I had a test in another course that I needed to study for you know if I was working on a project for something else, or I would just watch the lectures online later. But for the most part I went to class.	Efficiency Evaluation: Contribution to Goals / Interests, Access (Fit with Schedule, Other External Possibilities)	Control: Timing, Component-Activity Features of Media , Anytime or Anywhere,

Examples of student decisions to participate in specific component-activities within the course are listed for Students 6-10 in Table 5.3.45 below. Students 8, 9, and 10 developed a theory about the component-activity. Student 8 watched the podcasts of the in-person lectures and theorized that the two were essentially the same, the only difference was that with the videos, they were more concise and allowed for one to skip forward or backward. Student 9 developed the theory that there was no point to watching the videos because there was too much information. She felt that she did just as well on the final as she did on the midterm, even after she had stopped watching the videos. All of the students described criteria by which made an efficiency evaluation. And each of the students included process performance as one of those criteria. Student 8 and 9 both used Time/Effort as a criterion but the reasons were opposite. Whereas Student 8 described how much time the videos saved, Student 9 described them as a waste of time. Each of the students described a different area of the framework as an influence on their decision to participate. Student 10 described other students, which was somewhat obvious given his decision was about interacting with other students. Only Student 6 described a type of control as being influence on the decision to participate when he chose the videos over the book.

Student 9 described a number of Curriculum and Content issues that she had trouble with. She felt that the videos covered too much information, there was too much work involved, and ultimately, they were not aligned with the assessments in the course. Part of the problem for Student 9 was actually unique to her situation. Somehow, she was able to attend the in-person discussion sections. But, she did not attend the in-person lecture. By doing this, she inadvertently missed some important instructions that would

have narrowed the content she would have needed to focus on. The instructor told those in the in-person lecture what was important to focus on in the lecture, book, and videos. Because he was not able to individually talk to all the online students, according to Student 10, he made an appearance in each of the online discussion sections to inform them on what the important content was and what could essentially be skipped over. Student 9 also did not have any friends in the course, so she did not receive the information from word of mouth either. Thus, even a small change in how a student participated in the course made a terrible difference in other areas of this students' experience.

Table 5.3.45
Decisions to participate in a component-activity for Students 6-10

Description of Decision	Decision Processes	Framework Area Influences on Decision
Watching videos over reading book Student 6 (Excerpt 10863-11769): There wasn't that much reading, I had the book my roommate didn't, he did just as well I did without the book. So the book was pretty much optional. Because the lecture notes actually were.. the book was written by the professor, so the lecture videos were, most of it was just straight reading from the book, we were able to, I looked at the book, he was just reciting what he had written in the book. So I guess it could have gone the other way. I could have not watched the lecture videos and just read the book and got the same information, but it was actually kind of nice to have that choice, to watch the videos instead of having to read the book. Cause it was a nicer diagram in the lecture video, and he would actually explain it, and it was just easier to hear someone read it, here the person who wrote the book would read it to you.	Efficiency Evaluation: Content Learning, Process Performance, Access (Course Format)	Control: Component-Activity Feature of Curriculum and Content: Alignment Features of Media: Media Form, Multiplicity
Emailing professor Student 7 (Summary of Excerpt 15206-15636): He was comfortable with the idea of sending an email to the instructor but never felt like he needed to	Efficiency Evaluation: Affect/Satisfaction, Process Performance	Instructor Participation
Videos over lecture Student 8 (Excerpt 5323-5899): Well one of the favorites things was kind of like the [replayable] videos. I have to say they were pretty good. The, I looked at that and the lecture podcasts that he posted online and they were exactly the same almost and like I felt that like sometimes in class like I get bored because its like taking too long so. Looking at the [replayable] videos and its short, concise, straight to the point, like what I need to know for the course was very good. I felt that was one of my favorite parts.	Information Gathering Theory Development Efficiency Evaluation: Time / Effort, Content Learning, Process Performance	Student Input: Compatibility for Learning Environment Features of Media: Media Form Features of Curriculum and Content: Other (Conciseness of Videos)

Table 5.3.45 Continued
Decisions to participate in a component-activity for Students 6-10

Description of Decision	Decision Processes	Framework Area Influences on Decision
Discontinued watching videos Student 9 (Summary of Excerpt 7681-8605): She felt there was too much information in the videos to memorize, so she gave up on them and stopped watching them after the midterm. She felt that she did just as well on the final as the midterm, despite discontinuing watching. (This student did not go to the online discussion sections and also did not attend the in-person lectures - the only two places where the instructor gave specific advice on what to spend time on for studying)	Information Gathering Theory Development Efficiency Evaluation: Time / Effort, Content Learning, Process Performance	Control: Component-Activity Features of Curriculum and Content: Alignment, Amount of Work, Complex or Difficult, Instructional Coherence; Other Features of Curriculum and Content Student Input: Personal Environment,
Interaction with other students Student 10 (Summary of Excerpt 13369-13958): He did not feel like there were opportunities to interact with other students; did not expect there to be interactions; and did not think many other students taking an online course expected to interact with other students.	Theory Development Efficiency Evaluation: Process Performance, Affect Satisfaction	Other Students

Examples of student decisions to participate in specific component-activities within the course are listed for Students 11-15 in Table 5.3.46 below. Each student described efficiency evaluation criteria that they used in the decision process. Student 11 simply liked the book more than the videos or lecture. Student 12 felt that the ungraded quizzes helped her learn but the process of getting to the videos was problematic with access issues. Student 13 did not spend time on Piazza because she thought it was confusing. Student 14 thought the essays were good practice for writing better but did not help him learn, whereas the quizzes did help him learn. Student 15 would use the book or other information sources to help her learn the material.

Each of the students also had some other aspect of the framework influence their decision. All of them described control over the decision to participate in the component-activity. Student 12 found it difficult to navigate to the quizzes and only with the help of

a friend that she had prior to enrollment in the course did she find them. These quizzes helped her learn because they provided instructional coherence by hinting at what she needed to know (Narrowing of the material). Student 15 found that when the material was too complex or difficult, she was inspired to look for the answers from another source.

Table 5.3.46
Decisions to participate in a component-activity for Students 11-15

Description of Decision	Decision Processes	Framework Area Influences on Decision
Reading the book versus lecture Student 11 (Summary of Excerpt 16996-17621): He would read the book because he liked the book as a source of information. He would not have wanted to attend an in-person lecture if it had been an option. And he did not watch the online lecture videos because they were optional and he liked the book more.	Efficiency Evaluation: Affect Satisfaction, Other Efficiency Evaluation (Optional and liked reading more)	Control: Component-Activity
Participating in the ungraded quizzes Student 12 (Summary of Excerpt: 13789-14648): Used the ungraded quizzes to study for the exam because she did not know how else to study and she found these helpful. She did not know about the ungraded quizzes until her friend told her about it. The quizzes were on another website and she saw no links to that website on the main course website. She would not have been able to use them if her friend had not told her.	Efficiency Evaluation: Content Learning, Contribution to Goals / Interests, Process Performance, Access (Course Format)	Other Student (friend) Control: Component-Activity Features of Curriculum and Content: Navigation or Organization, Instructional Coherence Features of Media: Media Structure Student Input: Other (Having a friend in the course prior to taking it)
Decision to use Piazza (discussion board) Student 13 (Summary of Excerpt 3778-4259): She did not use Piazza (because it was confusing) except when it was required for an assignment	Efficiency Evaluation: Time / Effort, Process Performance	Control: Component-Activity
Decision to read the textbook Student 14 (Excerpt 21468-22223): Yeah umm I don't know that the essays helped me learn the material it was more just for me I felt like it was good practice writing things, to improve my writing. But I don't know if it really, I mean I learned some stuff, but not tons. I think the most effective thing for learning were probably the quizzes because they forced me to actually search for the answers in the textbooks so that's probably were I got the most learning. And then I also did those multiple choice questions in the back of the chapters in the book in preparation for the midterm and final. So that's probably where I gained the most knowledge from this class.	Information Gathering Theory Development Efficiency Evaluation (Content Learning, Contribution to Goals / Interests)	Control: Component-Activity Features of Curriculum and Content: Instructional Coherence

Table 5.3.46 Continued

Decisions to participate in a component-activity for Students 11-15

Description of Decision	Decision Processes	Framework Area Influences on Decision
Decision to read the textbook or use other resources Student 15 (Summary of Excerpt 7442-8704): If she was struggling with an idea or terminology in the videos, she would turn to the book. And she would also use Google to look things up.	Information Gathering, Efficiency Evaluation: Content Learning, Process Performance, Access	Control: Component-Activity, Content Features of Curriculum and Content: Complex or Difficult Features of Media: Multiplicity, Non-linearity, Media Form

Decisions of how to participate in the course and component-activities.

Examples of student decisions about *how to participate* in specific component-activities within the course are listed for Students 1-5 in Table 5.3.47 below. Each of the students described the use of efficiency evaluation criteria as part of their decision process. Students 1, 2 (example A), 3, 4, and 5 all factored in the cost of Time/Effort in decisions of how to participate. For example, Student 1 would not spend extra time on the videos if he felt like he already knew the material. Or if he wanted to know more about the topic, he would use the supplementary materials. Student 2 (example A) realized that if she watched the videos before attending lecture, it led to a more effective learning experience. Student 5 avoided any additional interaction with other students since he had a busy quarter already. Student 3 also had a busy quarter, which is why he decided to not invest any extra effort than was required in the course. Student 2 (Example B) did not use Time/Effort criterion but instead kept pace with the course through the access to various materials and fitting time into her schedule to watch videos.

Each of the examples except for the one from Student 3 shows connections to other variables described by the framework. For Student 1, there was a connection to

control over component-activities and control of pacing when he was working to manage his time. If he needed to learn more on a subject, he would look for additional sources, if he already had background knowledge, he chose to skip over sections. Student 2 (Example B) described a similar process of managing time through the control of component-activities and pacing. Student 4 described a process that included the internal attribute of time management and an ability to reach out to the TA for office hours when the material seemed too difficult.

Table 5.3.47
Example descriptions of students describing decisions about how to participate in a component-activity or the overall course for Students 1-5

Description of Decision	Decision Processes	Framework Area Influences on Decision
Managing time Student 1 (Excerpt 21251-21800): Yeah, I was definitely able to monitor my understanding, If I felt like I knew or had some background on a topic I was able to skip through the videos pretty quickly and take the quiz and be done. Or if I wanted to go a little more in depth on a certain topic I could watch all of the videos. And there were certainly other supplemental materials that I could look at if I wanted a deeper understanding of a certain topic.	Efficiency Evaluation: Time / Effort, Content Learning	Student Input: Background and Abilities, Interest in Subject Features of Media: Non-linearity, Multiplicity Control: Component-Activity, Pacing
Sequencing of Videos before In-person Lecture Student 2 (Example A: Summary of Excerpt 8352-8828): She would watch the online videos before attending lecture and that would help her listen rather than have to furiously take notes during lecture. Could listen to see if anything was said differently	Theory Development Efficiency Evaluation: Time / Effort, Content Learning, Process Performance	Control: Sequencing Features of the Curriculum: Alignment Features of Media: Multiplicity
How to keep pace in the course Student 2 (Example B: Excerpt 10398-10495): Well having the assignments due at the end of the week helped. As well as having the textbook on top of the live lecture that you had the option to go and the online lecture and he also had additional resources. There were just lots of resources that you could use. And I don't know, although I wasn't in the online section, what I liked about if I didn't go to lecture, I could watch the videos whenever I had time to and I could fit that into my schedule.	Information Gathering Efficiency Evaluation: Access (Fit with Schedule, Course Format)	Control: Component-Activity, Pacing Features of Media: Multiplicity Characteristics of Online, Organization and Distribution of Content
Kept effort at a minimum Student 3 (Excerpt 10398-10495): I didn't really have time to expand too much on the material I was learning, I had a busy quarter	Efficiency Evaluation: Time / Effort, Contribution to Goals / Interests	

Table 5.3.47 Continued
Example descriptions of students describing decisions about how to participate in a component-activity or the overall course for Students 1-5

Description of Decision	Decision Processes	Framework Area Influences on Decision
Managing time Student 4 (Excerpt 13209-13980): Well I keep a calendar for everything that I do, so yeah but I think its like at least when you get an assignment, looking over the topic, reading the prompt, for the exercise question if possible and assessing if something that is going to be easy for me or if its something that I'm going to need help on. Because if I assess that this something that I know I am going to need help on it, okay then I'm like: "let me schedule office hours or let me email my TA" or something like that. If its easy then I would say that it was between like "should I do it now? or is it something that I can put off because it's easier?"	Information Gathering Theory Development Efficiency Evaluation: Time/Effort, Content Learning, Process Performance, Access (Fit with Schedule)	Student Input: Motivation / Focus / Time Management, Background and Abilities Instructor/TA Participation Control: Timing, Pacing
Interacting with others in the course Student 5 (Summary of Excerpt 28013-28653): He did not desire additional interactions in the course, mainly because he had a very busy quarter and felt this would take effort away from where he would have liked to have spent it. This course was very low priority for him.	Efficiency Evaluation: Time/Effort, Contribution to Goals/Interests	Student Input: Time Conflicts, Other Internal (Other Priorities)

Examples of student decisions about *how to participate* in specific component-activities within the course are listed for Students 6-10 in Table 5.3.48 below. Students 6, 8 (Example A), 9, and 10 all described information gathering as part of the decision process. Student 6 gathered information by going to the website and looking up what needed to be done each week. Student 9 described being reliant on the TA for information about the assignments. Student 10 would get an early start by looking at the assignment so that he could plan his week accordingly. Each example, except for Student 7 described the process of developing a theory about the component-activity during the decision process. Student 8 (Example A) described his theory that one would need to have the book open while watching the videos to make sure not to miss any of the

information that might be on the quizzes or exams. Each of the students described efficiency evaluation criteria in their decision process. Students 8 (example A and B), 9, and 10 all used content learning as part of their criteria. Student 6 used process performance as he described the it being very easy to find on the course website the information he needed on what to spend time on.

Each of these examples also connect in some way to another part of the framework. Student 6 described the navigation and organization of the course material online as a positive influence on how he managed his time. Further, he was able to pace his efforts out through the week. Student 7 described how another class he was in had priority as it was one of his major courses. Sometimes the quiz for that class coincided with the due date of an essay, so he would postpone the submission of the essay even after the time it was due. When describing how he spaced out his weeks in the course, Student 10 stated that he had excellent time management skills. Further, the course provided the ability to control the timing and pacing for the week.

Table 5.3.48
Example descriptions of students describing decisions about how to participate in a component-activity or the overall course for Students 6-10

Description of Decision	Decision Processes	Framework Area Influences on Decision
Knowing what to spend time on Student 6 (Excerpt 18655-19292): Yeah definitely, that was, it was very clear, the course was nice, because it was very clear what we needed to do, when. There were modules set up, and each module corresponded to current week, and in that module was basically, the lecture video for that week, the quiz for that week, the assignment for that week, and any additional or supplemental links I guess for that week. So it was really nice to be able to just go through there and be like here's the module for this week, here is exactly what I need to do.	Information Gathering Theory Development Efficiency Evaluation: Process Performance	Control: Pacing Features of Curriculum and Content: Navigation or Organization
Managing time for this course Student 7 (Excerpt 6963-7340): [I did not find it difficult to manage my time in the course], unless it coincided with one of my major classes. Like every time I had a bio chem quiz it was right before an essay was due. So it kind of like, it kind of put pressure me on those weeks. Because this class was a filler class for me so it kinda low on my priority.	Efficiency Evaluation: Contribution to Goals / Interests, Time / Effort	Student Input: Requirements for Graduation, Time Conflicts
Reading book while watching videos; Strategy for overcoming difficult content STUDENT 8 (Example A: Excerpt 12048-13317): Content, well sometimes like, the material and the, the lecture the material was less time, it was more condensed than the book so sometimes I wasn't sure umm, there was some practice questions and some of the questions did not refer to the lecture it self it kinda refereed back to the book and that kind of forced me to have both opened at the same time and I just don't know how other people in lecture would have like gotten the same material like they would have to you know bring the book to class, and have it open while the professor is lecturing, which is kind of hard. But for me like I had the book open that was kinda weird because I would think that whatever the professor talked about on the videos would be the same as what he is quizzing us about but apparently it wasn't so, content wise that was kinda weird but I mean I could manage to do that and I guess it makes sense since he wrote the book, he can you know he should be able to ask questions about stuff in the book.	Information Gathering Theory Development Efficiency Evaluation: Content Learning	Features of Curriculum and Content: Alignment, Accuracy of Information or Assessments Features of Media: Media Structure, Multiplicity

Table 5.3.48 Continued
Example descriptions of students describing decisions about how to participate in a component-activity or the overall course for Students 6-10

Description of Decision	Decision Processes	Framework Area Influences on Decision
How time was spent Student 8 (Example B) invested most of his time in completing the essays/assignments because it was such a big portion of the grade (even more than the midterm and final combined). Spent less time reading. He put two hours towards the quiz and four towards the essay/assignment. Student 8 (Excerpt 9577-10244): I think I allocated it towards doing maybe the assignments because the assignments were a huge part of my grade actually like overall the assignments constituted more than the midterm and the final combined, which that's kinda weird, so I allocated most of my time to writing the essays and the exercises and a little bit less time like reading the material it was more like a, two four split in terms of hours, like two hours for like the quiz and the material and maybe four hours to like researching what I need to write about and how I would edit it and word it to submit.	Theory Development Efficiency Evaluation: Time / Effort, Contribution to Goals / Interests, Content Learning	Features of Curriculum and Content: Other (Grading Scheme)
When to start work on assignments/essays Student 9 (Summary of Excerpt 3510-4226): She realized that she should start working on the assignments/essays early in the week (potentially the weekend before) because they took up a lot of time and she did not have a lot of time during the week. However, the TA was partly to blame because the specifics of the assignment/essay were not unveiled until Monday or Tuesday	Information Gathering Theory Development Efficiency Evaluation: Process Performance, Content Learning, Access (Fit with Schedule)	Instructor Participation Control: Timing, Pacing, Content, Component-Activity Features of Curriculum and Content, Other Features of Curriculum and Content (Instructor Preparation of Materials for the Week)
Spacing out the study time Student 10 (Summary of Excerpt 4721-6838): Student spaced out the work for the course each week instead of cramming (he does this for all his courses). He would use strategies such as putting off personal plans and estimating how long it would take to do something. He also felt that enjoying the course subject helped.	Information Gathering Theory Development Efficiency Evaluation: Time / Effort, Content Learning, Process Performance	Student Input: Motivation / Focus / Time Management, Control: Pacing, Timing

Examples of student decisions about *how to participate* in specific component-activities within the course are listed for Students 11-15 in Table 5.3.49 below. Students 11 and 13 (Example A and B) both described a process of gathering information in their examples. Student 11 gathered information through the experience of both reading the book and watching the videos. After this, Student 11 decided that the book was a better option. Student 13 (Example A) did the same information gathering but came to the opposite conclusion, watching the videos was better for her and she only used the book as reference. Student 13 (Example B) described learning what to focus on after spending some time in the course and gathering information about what was important and on the assessments. Each student described efficiency evaluation criteria in their decision process. Student 11 and Student 13 (Example A and B) were concerned with content learning. Student 12 described how nice it was to have access to the course and syllabus before the course started. Student 14 described a process of waiting until the last minute to do all of the work for this course. By doing this, Student 14 felt like he was contributing to other goals he had outside of the course. And the way the pacing of the course was set up provided access for him to do that.

Each of these examples also has connections to other areas described by the framework. Student 11 described the media form and nonlinearity (being able to bookmark) of the book as an influence on his decision to mainly use the book. Student 13 (Example A and B) described instructional coherence as playing a role in the decision of how to participate. In Example B, Student 13 learned what she should spend time on from her experience with the assessments in the course. Students 11, 12, 13 (Example A and B), 14, and 15 all connect to different types of control. Student 11 and 13 described

control of component-activities. Student 11 decided to stop watching videos, Student 13 decided to stop reading the book aside from reference. Student 15 described control over the way the media functioned. This type of control was previously unlisted in this dissertation, adding a potential type of control.

Table 5.3.49
Example descriptions of students describing decisions about how to participate in a component-activity or the overall course for Students 11-15

Description of Decision	Decision Processes	Framework Area Influences on Decision
Reading the Book did not watch videos; Sequencing; How to read the book Student 11 (Summary of Excerpt 1152-3068): Decided to start just reading the book and stop watching the videos because the book was faster to get through. When there was a difficult section, he would not have to keep rewinding, he could just bookmark it and easily find it again. He would get an early start on the material by reading the book during the weekend and get it done before discussion.	Information Gathering Theory Development Efficiency Evaluation, Content Learning, Contribution to Goals / Interests, Process Performance	Control: Timing, Pacing, Sequencing, Component-Activity Features of Media: Media Form, Non-linearity
Accessing and Interacting with materials Student 12 (Excerpt 14938-15844): All the materials are posted right before the class started, like right before the quarter started and so that was super helpful because you could keep everything, like know when all your deadlines were and what was due, so I was able to put everything into my calendar and accessing the instructions was super straight forward, so it really helped.	Efficiency Evaluation: Process Performance, Access (Course Format)	Media Input (Technology, Assembly, Subject/Content) Course Assembly Input, Features of Curriculum and Content: Navigation or Organization Control: Pacing, Sequencing
Watching the Videos and Reading the Textbook Student 13 (Example A: Summary of Excerpt 20129-22079): She felt that the videos highlighted all of the important material and while the textbook was helpful, it was too extensive to just read. Instead, she would just use the textbook to look information up. She liked the videos very much but would sometimes supplement them with the textbook because it was more informative but not as fun and did not reflect the instructor as much (who she thought was fun). The videos were also helpful because they just highlighted the most important content while the textbook was too extensive to straight read. So, she would watch the videos and then would look at the quiz questions at the end of the chapter and if there were any she did not know after watching the videos, she would look them up in the book. Otherwise, she thought the book covered way more than she wanted or what the course required.	Information Gathering Theory Development Efficiency Evaluation: Time / Effort, Content Learning	Features of Curriculum and Content: Instructional Coherence, Amount of Work, Other Features of Curriculum and Content (Requirements for the course) Control: Content, Component-Activity

Table 5.3.49 Continued
Example descriptions of students describing decisions about how to participate in a component-activity or the overall course for Students 11-15

Description of Decision	Decision Processes	Framework Area Influences on Decision
Knowing what to focus on after getting used to the course and assessments; Knowing what to spend time on Student 13 (Example B: Summary of Excerpt 14697-16655): The first two weeks, she did not know what to spend her time on. But after taking the quizzes and doing the first assignment and then essay, she had a better sense of what was expected of her. She also watched the introduction videos that helped her immediately know how to navigate the course and use different software. She also thought the course was well laid out and that helped. She said that this introductory time was similar to what she experiences in other classes	Information Gathering Theory Development Efficiency Evaluation: Content Learning, Process Performance, Time / Effort	Control: Pacing, Component-Activity, Content Features of Curriculum and Content: Instructional Coherence, Navigation or Organization Features of Media: Media Structure, Multiplicity
Time Allocation Student 14 (Excerpt 1859-2428): So there were like deadlines usually like on Friday nights. We had to take like a weekly quiz and write a weekly either exercise or essay. Those were usually due midnight on Friday. So I tried to do things during the week, like they had online videos to watch so I tried to fit those in during the week but I typically saved the text and the writing things for Friday afternoon because I was trying to focus on some of my other classes during the week. So it was usually just watching the videos during the week and working on assignments and quizzes Friday afternoon.	Efficiency Evaluation: Contribution to Goals / Interests, Access (Other External Possibilities), Other (Other Priorities)	Control: Timing, Pacing, Sequencing Features of Curriculum and Content: Other (Course Restrictions) Student Input: Motivation / Focus / Time Management, Time Conflicts, Other (Other Priorities)
Participating in online discussion section Student 15 (Excerpt 10736-11887): Um, there was a little chat box that we could type in, or our TA would have us take turns turning our mics on so we could talk and do group presentations and stuff. But yeah, it was usually just typing or using the microphone...she'd ask like a general question, because she had her mic on, so she would say the question and we would respond in the chat box, because if we all had our mics on at one time it would be kind of chaotic [Each student would be allowed to speak on the mic once per session for her or his presentation]... Our screen could be shared if we had something on ours that we wanted to present, we could do it that way. It was pretty much up to us.	Efficiency Evaluation: Process Performance, Access (Course Format)	Control: Other (Control of Media) Features of Curriculum and Content: Other (Facilitation of Communication) Features of Media: Media Form, Synchronicity, Symmetry Other Student Participation Instructor / TA Participation

Summary of decisions about participation in the course. This section reviewed decisions students made in the course by examining the descriptions of decisions and corresponding processes for the following types of decisions:

- The Decision to Participate in this Course
- The Decision to Participate in a particular Component-Activity
- How to Participate in the Course or a particular Component-Activity

Samples pulled from each of the student interviews were analyzed in comparison to the decision process and other related areas of the framework. The decision process proposed in this dissertation was showed that each student roughly followed the decision process predicted by the framework. This process included Information Gathering, Theory Development, Efficiency Evaluation, and Decision to Participate or How to Participate. Closely related to the process were the areas of Student Input (Internal and External Characteristics), Course Operation (Control, Features of Curriculum and Content, and Features of Media). Also, a surprising finding was that the institution played a role in many of the decisions to enroll in the course. However, this influence has a logical connection from a student point of view when it is revealed that the influence was course availability for general education. Other influences that an institution might have on a course that affects student decisions are probably less visible to an individual student, such as institutional control over content or operation of component-activities.

Some of the excerpts did not show evidence that the student had gathered data and/or formed a theory about the course that was then used to assist in the decision process. These instances could be related situational or methodological factors. In other words, in these instances, students could have either not have engaged in these actions or the interview was not set up in a way that was able to capture these processes

appropriately. However, seems clear that in general, students follow the decision making process in which they gather information, form a theory, evaluate for efficiency, and make a participation decision. Future research can be conducted to confirm. And with more extensive future research, these processes can be explored in greater detail. In addition to the processes of making decisions in an online course, the variables that influence these decisions (Student Input variables and Course Operation properties and processes) can be explored in greater detail.

An unexpected finding from this section was that it appears that the interviewed students were more likely to list contribution to goals or interests as an influence on their decision to enroll in the course than their decision to participate in a specific component-activity or when describing how they participated in the course or a component-activity. Indeed, when looking at cross-coding for all the excerpts of these students, there were 35 uses of the code "Decision to Participate in Course". Of these 35 excerpts, 15 (approximately 43%) were also coded as Contribution to Goals or Interests as part of the efficiency evaluation. Meanwhile, the cross-coding for decisions to participate *during* the course with Contribution to Goals or Interests were approximately 12% for Participate in a Component-Activity; 18% for How to Participate in Course; and 15% for How to Participate in Component-Activity. There could be a number of reasons for this difference. Students may perceive the need to explain the choice to participate in the overall course in terms of greater goals and interests. Or perhaps students have greater goals for the course (finishing General Education Requirements) and all choices made in the course are aimed to accomplishing those greater goals in the most efficient manner possible. More research could be conducted to determine if there are micro-goals within

the course that are being missed, if there is a connection to the greater goals for the course, or if there are just fewer decisions that students make during the course.

In this section, evidence was found that helped to confirm the decision processes theorized in this dissertation. Students seem to have a fairly consistent process of gathering information, developing a theory, evaluating the efficiency of choice options, and making a participation decision. While this is a strong start, future research can help flush out the specifics of the processes and variables involved.

Student Sequencing Cycles

The investigation of student decisions moves beyond participation and non-participation. The participation in one activity would mean a participation that had a participation time that was relative to other component-activities and other events in the life of a student. In other words, participation had a sequence. The research question below addresses this issue.

Student case study question 3.3: How do students incorporate class activities into their weekly routines?

Understanding the sequencing of components in a course is important because it gives clues to student decisions and has implications on student learning.

Two different student sequencing systems were observed: the *Course-Term Sequencing Schedule* and the *Week/Lesson Sequencing Cycle*. The first sequencing system was the Course-Term Sequencing Schedule. This sequencing was the general way in which students moved through the course over the entire quarter. This system seemed to be common across students in both sections of the course. The second sequencing system was the Week/Lesson Sequencing Cycle. This sequencing cycle was the regular sequencing that students had each week. Although there were some deviations from this sequencing, most students reported that they had a system of participating in component-activities that repeated each week. Only one student, Student 7, reported that he had no regular sequence to his learning. However, this was contradictory to statements he made in other parts of his interview and because of his descriptions later in the interview, his pattern of sequencing the course was possible to document as illustrated below.

Student course-term sequencing schedule. The Course-Term Sequencing Schedule was a general sequencing that students seemed to naturally organize their course participation to. This sequencing schedule corresponded with events that were happening in the course. In the beginning of the course, students spent time learning about the course and deciding which component-activities were worth spending time on. After the first week or two, students seemed to have made the majority of the decisions regarding their Week/Lesson Sequencing Cycle (as explained later in section). After this, students stuck to their Week/Lesson Sequencing Cycle and then would spike their participation the week before the midterm and the week before the final. These spikes in participation included their regular participation plus additional time spent studying for the midterm, which may have included spending time on practice problems and deciding what to write for the exam essay.

A theory of Course-Term Sequencing Schedule is described here with the help of a figure of how a sequencing schedule would work for a ten-week course that had a mid-term and final. While other courses can be longer in duration and have different assessment processes, it is predicted that students will naturally form a sequencing schedule for the course when they are able and other courses with a similar configurations will have students that develop similar sequencing schedules for the overall course.

Figure 3 below illustrates how a student course-term sequencing schedule could correspond with course events and processes. As this figure shows, the course has some events that are familiar to the average college student. During the first introductory part of the course, the course website opens and first classes begin. During this time, students

begin to get acquainted with the course, deciding how they are supposed to participate with particular attention to what participation is necessary and how they should set up their weekly sequencing to address the course requirements. After this time, there is regularity to the course activities and students can implement their typical weekly sequencing. Many courses have a mid-term and students might adjust their normal sequencing to address the need for additional studying. After mid-terms, students can make a decision to go back to the sequencing cycle they had developed prior to the exam or they can make adjustments based on the results or perceived results of the mid-term. Students then continue with their typical sequencing cycle for the week until just prior to the final. At that time, students will again adjust their normal sequencing to address any additional studying that might be needed.

Timeline		Course Events and Processes		Student Decisions and Participation
Pre-Course		• Course Site Opens	• Introductions to activities and content	• Decisions to stay enrolled and early decisions about how to participate
Week 1		• First Classes		• Early decisions about how to participate (**early adjustments to Week-Lesson Sequencing Cycle**) and course enrollment commitment decisions
Week 2				
Week 3		• Classes	• Regularity of Course component-activities	• Regularity in participation of course (Week-Lesson Sequencing Cycle)– course enrollment commitment decisions
Week 4				
Week 5		• Midterm Exam	• Component-activities could be altered to either help prepare students or allow for increased study time	• **Midterm study spike**
Week 6				• Some students make adjustments after midterm
Week 7				
Week 8		• Classes	• Regularity of course component-activities	• Regularity in participation of course (Week-Lesson Sequencing Cycle) – final course enrollment commitment decisions
Week 9				
Week 10				
Finals Week		• Final Exam	• Component-activities End	• **Finals study spike**
Post-Course		• Grades		• Post-Course Decisions

Figure 3 Illustration of example of theoretical student course-term sequencing cycle

Based on this theory, there are three main points at which time a student will adjust their weekly sequencing:

- At the beginning of the course when they are trying to get acquainted to the course and develop a weekly sequencing cycle
- After a major assessment, such as a mid-term
- Just before an exam, such as a mid-term or final, there will likely be a study spike

Because this is an online course and because students are given some ability to control their study sequencing, the way a student sequences their studying is seen as a choice. As such, the way a student sequences his/her course will be done following an evaluation of

efficiency. In other words, students will try to increase ***gains***, decrease ***costs***, and optimize operational functions.

The next few paragraphs below discuss changes that students made to their week-lesson sequencing during the quarter, which in turn became part of the process for their course-term sequencing schedule. These changes demonstrate that 1) students had a regular pattern of participation; 2) students sometimes deviated from that pattern either momentarily or sustained change. Students would sometimes change their normal pattern of participation at the beginning of the course, in the middle of the course, or might add additional time to study for the midterm or final or when there was a difficult assignment. Below, the three sections are discussed. Because, there were no specific questions asked about how students changed their timing, pacing, or sequencing, all of the answers they gave were voluntary. This has both a negative and positive effect on the data. On the one hand, some information about changes in sequencing might be missing since the students were not cued to talk about this specific change. On the other hand, students voluntarily offered their changes with little prompt, which helps validate the phenomenon as impactful on students. Thus, while there was no formal question in the interview protocol, any and all information that a student offered related adjustments to the week-lesson sequencing and study spikes are presented below.

Table 5.3.50 below show changes that occurred from how Students 1-5 normally studied from week-to-week. In the Adjustments to Week-Lesson Sequencing column, there appear to be two main types of changes: temporary adjustments and enduring adjustments. Students 1 and 5 had some temporary adjustments: Student 1 would put more time into the course each week if he forgot about an assignment or if he was

interested in the subject or if he realized he did not know enough about the subject from before; Student 5 would make short-term adjustments by skipping lecture if he had exams in other classes. Students 2, 3, 4, and 5 all made enduring adjustments to their sequencing. All of these students, except Student 2, made these changes in the first week or two. Student 2 made the change after the mid-term. Both Student 2 and Student 3 made dramatic changes: Student 2 started watching all of the online videos, while Student 3 stopped going to lecture and stopped watching the videos. For the Study Spikes, all of the students added new activities: students 1, 2, 3, and 5 used practice questions/quizzes for studying; Students 2 and 4 attended the class study session for the exams; Students 2, 4, and 5 reviewed some of the informational sources, such as the book or replayable lecture videos. Student 1 also had a time spike just before difficult essays were due.

Table 5.3.50
Adjustments to the week-lesson sequencing and study spikes for Students 1-5

Student	Adjustments to Week-Lesson Sequencing	Study Spikes
Student 1 (Winter In-Person)	Most weeks were similar but timing of participation would vary from week-to-week. There were some weeks he would forget about the assignment, so there might be a late start on it. If he was interested in a certain area, he might put more time into studying. Or if he was not interested and had background information, he would skip through the video or reading.	Used sample questions that the instructor printed out. Spent more time on the class during the weeks when there were essays
Student 2 (Winter In-Person)	After the midterm, started watching the videos after the TA told her that they went more in-depth than in-person lectures.	Re-watched some videos and took the online practice exams. Attended the mid-term study session.
Student 3 (Winter In-Person)	Stopped going to lectures and watching online videos. Most content information would come solely from the textbook with occasional references to videos	Added some time to do the practice exams
Student 4 (Winter In-Person)	At the beginning of the term, Student 4 turned assignments in on Thursday, as quarter got busier, student began turning the assignments in on Friday. At the beginning of the term, Student 4 completed the quiz on Thursday but later in the quarter, started completing them on Wednesday.	Just before the exam, Student 4 added more time to read the book; watch the online lectures; attend online study sessions through conferencing software
Student 5 (Winter In-Person)	After the first essay in the first week, he started working on the essays earlier in the week after he realized the difficulty. Some weeks, he had a test in another class, so he would skip the in-person lecture	Reviewed notes, watched online videos again, took practice exams.

Table 5.3.51 below show changes that occurred from how Students 6-10 normally studied from week-to-week. As with Students 1-5, in the Adjustments to Week-Lesson Sequencing column, there appear to be two main types of changes: temporary adjustments and enduring adjustments. Student 7 made temporary adjustments by reducing the amount of time spent in the course when he had exams in other major courses. Students 6, 8, 9, and 10 all made enduring changes. Unlike Students 1-5, most of these students did not say when the adjustment was made. Student 9 made a major change to her sequencing after the midterm. While all other students seemed to have

made adjustments earlier in the quarter, there was no clear statement from the other students when the adjustments were made. Students 6, 7, and 8 discussed some additional activity that was added as a Study Spike. Students 6, 7, and 8 added practice problems. Student 6 had extensive study sessions where he would re-watch the videos in addition to using practice problems and for the final, he studied for two days and pulled an all-nighter for the exam. Student 6 also stated that he added extra time when there was a more difficult assignment. A somewhat surprising finding was that Students 9 and 10 seemed to have either not added any extra activities in preparation for the exams or they did not state that they did. Perhaps using a set of questions during the interview that focuses on sequencing and deviation from that sequencing would yield more consistent behaviors in study spikes. Or there might just be students that keep a consistent level of effort and behavior pattern, even during exam preparation periods.

Table 5.3.51
Adjustments to the week-lesson sequencing and study spikes for Students 6-10

	Adjustments to Week-Lesson Sequencing	Study Spikes
Student 6 (Winter Online)	Figured out early that he did not need to read the book. Only used it for reference.	Along with roommate, who was also in the class, he increased study time during finals: re-watched of all video; took all the practice quizzes. There were increases of studying for midterm and final but he detailed that he studied for two days prior to the final and pulled an all-nighter the night before the final. Also set aside time during big group projects
Student 7 (Winter Online)	Would put less time on the course when he had exams in his other major courses, specifically Bio-Chemistry	Worked on practice exam problems and studied more with his roommate (these were the only times that he and his roommate interacted in regards to the course)
Student 8 (Winter Online)	Figured out that the exams were worth far less than the essays, so he decided to put much more time into the essays than studying for the exams Also realized after using some of the practice problems, that he needed to have the book open while he was watching the videos so that he would not miss important information	Used practice problems for studying
Student 9 (Winter Online)	Realized that she needed to put more time on the assignments as the course progressed. Stopped watching the videos mid-way through the course after taking the mid-term because she felt they had too much information.	Did not specify a study system for midterm or finals. She said that she did not know what to study for
Student 10 (Winter Online)	During a discussion section, the instructor informed the students what was important to pay attention to. After this, Student 10 adjusted his time allocation. Adjusted his work time each week based on the time he estimated it would take to do the work each week.	Actually put in less time during midterm and finals because of other priorities.

Table 5.3.52 below show changes that occurred from how Students 11-15 normally studied from week-to-week. Whereas with Students 1-10, the Adjustments to Week-Lesson Sequencing column had both temporary adjustments and enduring adjustments, Students 11-15 only reported enduring adjustments. While Student 11

decided to just read the book and stop watching the videos, Student 12 did the opposite by mainly watching the videos and only reading the book as a reference. Student 14 started reading the book to help with the quizzes. And Students 13 and 14 both found some of the work they did early on in the class helped them figure out what to focus on. Meanwhile, Student 15 perhaps unintentionally failed to adjust her schedule when she found it difficult to complete assignments on time. She would also add time to her studies when the assignments were more difficult. While it was not directly stated by some of the students, it seemed that Students 11-14 made adjustments early in the term. Indeed, both Students 11 and 13 stated that they made their adjustments within the first couple of weeks. Each of Students 11-15 added additional activities during the period before the exams. Student 11 would add any readings he had previously missed and Students 13 and 15 would re-watch some or all of the videos. Students 12, 13, and 14 used practice problems for the exam (while Student 12 and 13 used online interactive practice problems, Student 14 used the problems in the back of the chapters in the book). Student 13 would also use the online lecture notes. While Students 13 and 14 stated that they added additional time before each exam (2 hours and 8 hours respectively), Students 11 and 15 both stated that they did not add any extra time to course in the periods before both exams.

Table 5.3.52
Adjustments to the week-lesson sequencing and study spikes for Students 11-15

	Adjustments to Week-Lesson Sequencing	Study Spikes
Student 11 (Spring Online)	Decided to just read the book and stop watching the videos after the first few videos.	Just prior to the exam, he would catch up on any readings that were missed. He felt like there was not additional time spent because in the week before the midterm and the week before the final, there was not a big reading assignment or a big essay.
Student 12 (Spring Online)	Started to just watch the videos and only read the book when referencing specific information.	Studied using the online practice exams
Student 13 (Spring Online)	In the first two weeks, she did not know what to focus on. But after taking a couple quizzes and finishing the first essay and assignment, she had a better sense of what to focus her time on	Added a couple of hours of studying for a couple of days before the midterm and final. Reviewed the components on the instructor's personal website, including: lecture notes, videos, and online practice midterm and final questions. Attended exam study session with the instructor
Student 14 (Spring Online)	Found that the quizzes forced him to read the book Adjusted the time he started the essay every other week based on the work he had in other courses	Used the questions in the back of each chapter in the book to study for the exams Added an extra eight hours of work during the week prior to the midterm and the week prior to the final
Student 15 (Spring Online)	There were a couple of instances in which Student 15 had difficulty with time management and found it difficult to complete the assignments.	She felt like she did not increase or decrease the amount of time she spent on the courses during the midterm or final She did re-watch some of the videos that she thought were helpful right before exam. Would sometimes add an hour or two if the material or assignment for the week were difficult.

While there were a couple of exceptions, most of the interviewed students had both adjustments to their week-lesson sequencing and study spikes. As discussed earlier, there were both temporary and enduring adjustments. And of the students that stated when they made the adjustments, most made them at the beginning of the quarter in the first couple of weeks or after the midterm. These adjustments usually were made in reaction to an experience they had with assessments, whether it was a quiz, assignment,

or the midterm. Or they made the adjustment because the instructor or TA had instructed on them on what was important to spend time on for doing well on the exam. Almost all of the students had some study spike. Most of the students stated they made some changes around the time of the exam. A few students stated that they added time when they had a difficult assignment. For the students that talked about the time it took, most of these students said there was more study time added leading up to the exam. However, there were a few that said there was no increase in time added just before the exam. Students also used a variety of ways to study for the exams, some would just work on the practice problems; for some, it was just re-watching videos; other students had a number of activities they would participate in during the exam preparation period.

Student week-lesson sequencing cycle. The Student week-lesson sequencing cycle was a regular weekly sequence that each individual student maintained throughout the quarter. While some weeks this sequencing schedule changed, students seemed to have kept a fairly consistent process of moving through the component-activities each week. Part of the decisions on how to organize this schedule was based on how the media and component-activities were timed. For example, some days had mandatory discussion section and other days were the designated due dates for the quizzes and assignments/essays. This meant that students were compelled to participate in these component-activities at those specific times. The other component-activities were optional for students as to whether they were completed, when they were completed, and where they were completed. Below is a figure that shows the scheduling of component-activities. See Appendix A for a complete list of component-activities for the course.

Component-Activities[1]		
Scheduled Component-Activity		Unscheduled Component-Activity
Weekend		• Main Course Website (Institution-sponsored learning management system) • Instructor Website (Instructor-independent website) • Textbook • Online Textbook • Online Text-Readings (External Websites) • Online Lecture Videos • Practice Quizzes embedded in Lecture Video • Video Transcripts • Piazza • Email • External Website Resources
Monday		
Tuesday	• In-Class Lecture[2]	
Wednesday	• Instructor Office Hours	
Thursday	• In-Class Lecture[2] • TA Office Hours (Days Varied per TA) • **Discussion Section**	
Friday	• **Assignment/Essay Deadline**[3] • **Graded Quiz Submission Deadline**	
One-time or infrequent component-activities	• **Individual Presentation in Discussion Section** • **Group Presentation in Discussion Section** • Exam Study Sessions • **Midterm – Multiple Choice and one Essay (on Thursday during fifth week)** • **Final Multiple Choice and one Essay (during week of finals after tenth week)**	• Exam Study Guide • Online Exam Practice Quiz

Figure 4 Course week/lesson sequencing structure
[1]Bold items were mandatory attendance or completion for full grade
[2]Option only available to students in the in-person version of the course
[3]The assignment and essay alternated each week until the end of the quarter

The variety of sequencing possibilities becomes evident when looking at how students time each component-activity that they choose to participate in during their week/lesson sequencing cycle. The week/lesson sequencing cycles for the 15 student cases were documented for analysis. Over the next few pages, an abbreviated version of this documentation is provided in three separate tables (Students 1-5, Students 6-10, and Students 11-15) and described and analyzed (for a more detailed illustration of students' week-sequencing cycles, see Appendix J).

As illustrated by these tables, each student had a different sequencing cycle. These differences are partially due to the component-activities that students chose to participate in. As discussed earlier, students had different preferences for the component-activities and would often stop participating in some component-activities after the first week or two. And part of the reason that students participated in component-activities when they did was the efficiency of the component-activity. If students felt that the component-activity was contributing to their goals inside and outside of the class and the cost was not too much, then students were more likely to participate or continue participating in the component-activity. While more investigation will need to be done in this area, it appears that many of the same decision criteria that was used for participation decisions was used for how the students would

Table 5.3.53 shows how Students 1-5 sequenced the component-activities that they regularly participated in for the course. Despite only 25%-40% total in-person lecture attendance for the section, Student 3 was the only student from this group of interviewees that did not attend lecture. These lectures were on Tuesdays and Thursdays. Student 5 had discussion on Wednesday while the other students had it on Thursday before or after lecture. Student 2 and Student 3 started their work on the weekend. Student 3 completed the quiz Monday night while the rest of the students completed the quiz closer to the deadline on Thursday or Friday (with the exception of Student 1, who sometimes completed the quiz on Tuesdays). Student 3 would also be done with all of the work for the class by Thursday and would just attend discussion and make any adjustments that were needed to the weekly assignment/essay. In a sense, Student 3 lumped most of the work for the class early in the week and was able to make

adjustments and changes as the week went along. An interesting comparison to Student 3 is Student 4 who, with the exception of the Tuesday lecture, lumped most of the work at the end of the week. Student 1, Student 2, and Student 5 had more prolonged pacing. These three students also had the highest grades in this group of student cases with an A-, an A+, and an A-, respectively (Student 3 received a B but thought he deserved a higher grade due to grading errors on the part of the Teaching Assistant; Student 4 had an A- but indicated she received a higher grade than she felt she deserved due to the kind grading of her teaching assistant). It is possible that these students were able to boost their grades by spending time on the course on more days throughout the week. Indeed, Student 2 had the highest grade and also had the most drawn out pacing, starting on the weekend and finishing on Friday. Further, Student 2 (like student 3), started by reading the book. This allowed her to start work on the assignment and then attend the lecture having already picked up valuable information. Some of the work that students did was hidden from this sequencing cycle. For example, Student 2 would watch videos for reference when information was not clear and Student 5 would read the textbook as reference when working on the assignment/quiz. Additionally, some students would increase their usage of the textbook and the online replayable videos during the week before exams.

Table 5.3.53

Week/lesson sequencing cycle for winter in-person student interviewees*

	Student 1	Student 2	Student 3	Student 4	Student 5
Weekend		• Read the textbook • Started essay/ assignment	• Read the textbook • Watched videos • Completed quiz		
Monday					
Tuesday	• Attend lecture • Started essay/ assignment • Watch videos • Completed quiz (some weeks)	• Attend lecture		• Attend Lecture	• Attend lecture • Started essay/ assignment
Wednesday					• Attend discussion section
Thursday	• Attend discussion section • Attend lecture	• Attend lecture • Attend discussion section	• Attend discussion section • Turned in the essay/ assignment	• Attend lecture • Attend discussion section • Started essay/ assignment • Completed quiz	• Attend lecture • Turned in the essay/ assignment
Friday	• Watch videos • Turned in the essay/ assignment • Completed quiz	• Turned in the essay/ assignment • Completed quiz		• Turned in the essay/ assignment	• Completed quiz
Time spent on course	7-8 hours per week	6-7 hours per week	8-12 hours per week	6-7 hours per week	8-9 hours per week
Primary source for content information	• Replayable lecture videos • In-person lecture	• Textbook • In-person lecture • Online lectures	• Textbook • Replayable lecture videos	• Discussion section • In-person lecture	• In-person lecture • Replayable lecture videos • Textbook

*This table is meant for the purposes of comparison between the individual week/lesson sequencing cycles. See Appendix J for more detailed information about the week/lesson sequencing cycle for each of these students. Appendix J also includes notes for each student as well as information about spikes in activity during the week of preparation for both the midterm and final.

Table 5.3.54 shows how Students 6-10 sequenced the component-activities that they regularly participated in for the course. Unlike the in-person section, there was no optional in-person lecture to attend. Student 10 had a Monday online discussion section, Student 7 had it on Tuesday, everyone else attended on Wednesday. This is quite different than the in-person discussion section times that were mostly on Thursday. And this timing of the discussion section might make a difference in student performance. From one the words of Student 2 (excerpt 2905-3121):

> I would essentially have it done and if there were any last little things that the discussion leader was like "oh I want you guys to be sure to emphasize this" I would go make changes and then turn it in.

Students that had a discussion section early in the week had fewer chances to work on their studies before the discussion and were then less able to ask questions based on prior work.

There were also differences in how students spaced their participation in different component-activities throughout the week. These differences in the amount of days spent on the course may have boosted the student grades just as it might have done for the in-person section. For example, while Students 6, 7, 9, and 10 all had a straight B, Student 8 had the best grade of this group with an A- and also had one of the more spaced out sequencing cycles. Student 6 and Student 9 both explained how they waited until the last minute and then crammed all of the homework into Friday night. Student 7 was the only student that completed the quiz early but would wait until Friday to submit the assignment/essay. All of the other students both completed the quiz and submitted the assignment/essay on Friday (it is unknown when Student 10 turned in the quiz or completed the assignment/essay as part of the interview recording was lost). It is important to make the distinction between the amount of time that students spent on the

course and the amount of days. When comparing these cases, the students that spent the most amount of time on the course and the students that spent more of days on the course each week did not seem to do any better than the students that spent the least. However, even though the differences between students are not evident, time and days spent on the course may have affected the performance of individual students.

Student 6 would strategically procrastinate to make the situation urgent. He would make sure he would complete the quiz on time since that deadline could not be extended but would sometimes miss the deadline of the essay as Student 6 reveals here (excerpt 3878-4509):

> yeah every once in a while we would miss, we might miss a deadline here and there, but luckily it wasn't that bad from the two times, the quizzes if you missed them I believe you couldn't retake them, so that was like our top priority, was to get the quizzes out of the way, I turned in a couple of the assignments late but the point deduction was not enough to make me want to do them earlier I guess, like if I wasn't making up assignments on Friday I knew that I could just turn it in the next day and not lose enough points to change my grade.

But Student 6 also had a set of other really hard classes and had already learned much of the scientific information in this class from prior classes. He already knew a lot about the subject but was not willing to spend additional time on this course when he only wanted a decent passing grade and so he could get the credit for the course.

There were bigger differences in the time that the students from this group spent on the course each week than the in-person students. Some studied as little as three hours per week while others spent upwards of 12 hours per week. At the same time the in-person students studied at least six hours per week but some spent up to 12 hours. Part of this had to do with the lecture itself, which would require two hours of students' time if they decided to go. In other words, the online course and the option to not attend lecture allowed students to reduce their time by at least half.

Table 5.3.54

Week/lesson sequencing cycle for winter online student interviewees*

	Student 6	Student 7	Student 8	Student 9	Student 10
Weekend		• Watched the online videos			
Monday		• Watched the online videos	• Started watching the online videos • Start reading lecture notes		• Attended online discussion section
Tuesday		• Watched the online videos • Attended online discussion section			• Read the book
Wednesday	• Attended online discussion section	• Watched the online videos*	• Attended online discussion section	• Attended in-person discussion section	• Read the book
Thursday		• Watched the online videos	• Completed quiz		• Watched the online videos
Friday	• Crammed for everything • Watched the online videos • Turned in the essay/ assignment • Completed quiz	• Watched the online videos • Turned in the essay/ assignment • Completed quiz	• Turned in the essay/ assignment	• Crammed for everything • Watched the online videos • Read the book • Turned in the essay/ assignment • Completed quiz	• Watched the online videos
Time spent on course	3-4 hours per week	12 hours per week	5-6 hours per week	~5 hours per week	10-12 hours per week
Primary source for content information	• Replayable lecture videos	• Replayable lecture videos	• Replayable lecture videos • Lecture notes	• Replayable lecture videos • Textbook	• Textbook • Replayable lecture videos

*This table is meant for the purposes of comparison between the individual week/lesson sequencing cycles. See Appendix J for more detailed information about the week/lesson sequencing cycle for each of these students. Appendix J also includes notes for each student as well as information about spikes in activity during the week of preparation for both the midterm and final

Table 5.3.55 shows how Students 11-15 sequenced the component-activities that they regularly participated in for the course. As with the winter in-person section, there was no optional in-person lecture for these students and their discussion section was also online. All other component-activities were identical to in-person section. In this group, there were three different days on which the students attended discussion section: Student 11 had discussion section on Tuesday; Student 13 and Student 14 had discussion on Wednesday; and Student 12 and Student 15 had their discussion section on Thursday. None of the students in this section started their essay/assignment before the discussion section (it is unknown when Student 12 started her essay/assignment each week). The students in this section did better than the Winter online students, despite this sequencing of the discussion section before the essay/assignment each week. So, by this low-sample comparison alone, sequencing the essay before discussion does not seem to improve the course grade. However, as explained throughout this dissertation, there are multiple variables that could affect performance. And the reasons for sequencing it in this way could be different than other students. For example, some students that sequence the discussion before the essay could be doing other activities that help lead up to the essay, like creating an outline or a mapping that help with the essay. These students might not consider this as "starting" the essay but this type of activity could have a similar purpose as starting the actual writing before the essay. Further, some students might be consciously or unconsciously preparing ideas for the essay in their mind before the discussion section. Working on other component-activities in the courses, such starting the readings or watching the replayable online videos could enhance this type of preparation.

As opposed to the winter online section where two students crammed their work at the end of the week, each of the students in this group started working on the course very early in the week. Even though he had discussion on Tuesday, Student 11 had already started working on the course by reading on the weekend, well before discussion. Students 11 and 12 started by reading on the weekend, while Students 13, 14, and 15 started working on Monday by watching videos (Student 13 also read the book and read the lecture notes). Student 12 alternated between reading the lecture transcripts and watching videos, which she felt helped her get through the material quite a bit faster. Four of the students started watching the online lecture videos on Monday (Student 11 only read the textbook for content information).

With the exception of Student 15, who had a "D+" in the course, the interviewed students in the spring online section did better than the case students in the winter online course. The winter online course had all "B"s and one "A-" while the spring online cases had two "B+"s an "A-", an "A" and one "D+". Like the winter online section, there were larger differences in the amount of time that students spent on the course than the winter in-person students. For example, one Student 11 spent 3-4 hours on the courses each week while Student 13 spent 4-10 hours per week and Student 14 spent 7-8 hours on the course each week.

Interestingly, Student 15 had the lowest grade of all of the cases but spaced out the work during the week and worked on the course 5-7 hours per week, which was substantially more than some students that worked only 3-4 hours per week and crammed all of the work into one night. However, as with the performance of other students, there were potentially other variables that influenced Student 15. Student 15 had a baby,

worked at a job over 30 hours per week, and did not have a background in this area. It is difficult to convey textual evidence for this, but in the interview, Student 15 sounded tired and distracted. It is easy to understand how this was possible when she seemed to be taxed in so many ways. This points to the importance of a holistic understanding of the student experience in the course, since any one variable could influence a student in unanticipated ways. Even her well intentioned sequencing and time-on-task was unable to save Student 15 from such a low grade.

Table 5.3.55

Week/lesson sequencing cycle for spring online student interviewees

	Student 11	Student 12	Student 13	Student 14	Student 15
Weekend	• Read the book	• Started reading the book			
Monday		• Started watching the videos • Started reading through the video transcripts	• Started to watch videos • Started reading the book • Started reading the instructor's lecture notes	• Started watching the videos in the mornings	• Started watching the videos
Tuesday	• Attended discussion section				
Wednesday	• Started the essay/ assignment		• Attended online discussion section	• Attended online discussion section	
Thursday		• Attended online discussion section	• Started the essay/ assignment		• Started essay/ assignment • Attended online discussion section
Friday	• Turned in the essay/ assignment • Completed the quiz	• Turned in the essay/ assignment • Completed the quiz	• Turned in the essay/ assignment • Completed the quiz	• Started essay/ assignment • Turned in essay/ assignment • Completed quiz • Skimmed through book	• Turned in the essay/ assignment • Completed the quiz
Time spent on course	3-4 hours per week	6-7 hours per week	4-10 hours per week	7-8 hours per week	5-7 hours per week
Primary source for content information	• Textbook	• Textbook • Transcripts from lecture videos • Replayable lecture videos	• Replayable lecture videos • Textbook • Instructor's lecture notes on PowerPoint	• Replayable lecture videos • Textbook	• Replayable lecture videos • Textbook

*This table is meant for the purposes of comparison between the individual week/lesson sequencing cycles. See Appendix J for more detailed information about the week/lesson sequencing cycle for each of these students. Appendix J also includes notes for each student as well as information about spikes in activity during the week of preparation for both the midterm and final

Summary of Sequencing Findings

This section was meant to explore how students sequenced their participation in the course each week and was focused on answering the following research question:

Student case study question 3.3: How do students incorporate class activities into their weekly routines?

Some of the main findings were

- Students sequenced their course in different ways but patterns emerged
- Students have to make decisions around component-activities that have pre-set times
- The way that a student sequenced a course could affect their performance
- Other variables could interfere with the effect of sequencing on outcomes
- There seems to be at least four distinct patterns for how students organize their effort
- There appears to be certain strategies, grounded in an efficiency evaluation, which students use when making sequencing decisions.

These main findings are explained below.

- **Students sequenced their course in different ways but patterns emerged**

By mapping out how each student sequenced her/his participation each week, it became apparent that when given freedom of timing for different component-activities and when the course is high in multiplicity, students can have very different ways in which they sequence their participation in a course. Each of the students that were interviewed here had unique weekly sequences for course participation. Students would set participation times for the component-activities they were interested in for different times during the week. Each student that was interviewed had a unique sequencing cycle for the week.

However, interesting patterns emerged. There seems to be at least four different timing patterns for these students:

- Proactive Timing – Getting most of the work done early in the week
- Distributed Timing – Getting the work done throughout the week
- Delayed Timing – Getting the work done towards the end of the week
- Crammed Timing – Getting the work done at the last possible moment

Some students like to get all of the work done right away (Proactive Timing), some were early starters and late finishers (Distributed Timing), others would start mid-week and finish at the end (Delayed Timing), others like to cram everything last minute to the point that they would sometimes turn the essay/assignment in late (Crammed Timing). These patterns are not obvious and more research would be needed to see how these generalize to other courses and students.

Further, the course offered a number of options for course participation. Some students would use multiple sources to look up information to study for the quiz and write the essay – others used very little. The types of component-activities that students decided to participate in alone had implications on how students would sequence the course. For example, if a student watched videos and another just read the book for information, these students would have very different weeks of study. Further, for this course, the order of participation in these component-activities could be arranged in pretty much any order the students chose. For example, two students could both read the book and watch the videos each week but one might watch the videos first and the other might read first. These students might rotate between chapters and watching videos, making sure the content of the videos and book stay in close proximity. Or, when the content is close enough, students could watch the videos and flip pages to keep up in the

book and focus on the reading when more detailed information is needed. Other students might reverse engineer the quizzes and just use the readings as a reference for answering the quiz questions. Below are four of the ways students might sequence

- À la carte – Only one main information source is used before the assessment
- Service à la russe – Participate in one information source before the other (i.e. read text before watching videos)
- Service à la française – Participate in information sources simultaneously (i.e. watch videos and simultaneously consult book)
- Dessert during dinner – Participate in the weekly assessment and look up the relevant information from the information source simultaneously (i.e. take the quiz and consult book)

Any one of these sequences could be the most effective for this course. Further, different sequencing patterns could be more effective for one student than another or for one week over another. It is also unclear if different patterns of sequencing are better for certain courses but not others or between specific content in component-activities. More research is needed to understand when certain sequencing patterns work best.

- **Students have to make decisions around component-activities that have pre-set times**

This finding is important because of the implications it has on how students make decisions and the potential for manipulation by the instructor. Courses have different component-activities and different time limitations for completing them. In this course the in-person lecture (for the in-person section), the discussion section, the quiz, and the assignment/essay all had pre-determined timing. Thus, the only choice that students could make was whether they were going to participate (the assignment/essay is the exception since students could turn it in late and just get a lowered grade). And all of the interviewed students participated in some or all of these activities. And their participation

in these activities prompted the participation in other supplementary activities (students needed to gather information from the readings, videos, and/or lectures before they could take the quiz). Some students liked to start the assignment/essay before the discussion, while others would start it after. One student explained that this helped with the assignment because they could ask any questions that were preventing them from finishing the assignment. However, many students did not complete the assignment before the discussion and they were still able to get a good grade in the course. Perhaps it was more efficient to get many of their preliminary questions answered before starting the assignment but not all students could do that, wanted to do that, or realized the savings of time and/or effort.

This has implications on what they decide to make mandatory and what should be at a specific time. If an instructor feels that it is best to have students do a little bit of work throughout the week, they could make micro-activities that were mandatory every day or two. For example, the instructor could assign a time-sensitive quiz every other day. Students that wished to fulfill all mandatory assignments would complete those quizzes on time. This would semi-force the timing of the quiz, thus narrowing the choice option for the student (i.e. the student either completes the quiz or they do not complete the quiz). On the upside, this enforces the pedagogical design of distributed pacing. On the downside, it eliminates the option a student might need based on other variables in her/his life.

An interesting difference between the in-person and online discussion sections of the interviewed students was the meeting time in the week. While four of the in-person students had discussion section on Thursday and one on Wednesday, most of the online

students had a discussion section on Wednesday or before. Just this timing difference of the set meeting times can cause a ripple that could alter the decisions of when to time the participation in other component-activities.

Any mandatory timing or pacing can also add a cost to student time commitment. The lectures were not mandatory but students in the in-person course that attended lecture seemed to automatically add on two hours onto their work in the course for the week. Many students in the in-person section of the course chose to opt out of the in-person lecture but students in other classes may not have that option. Interestingly, students in the online section of the course were also able to receive the top grade of an "A" in the course. Other students that had different timing strategies, such as the students that crammed each week, were allowed to accommodate that strategy.

- **The way that a student sequences a course could affect their performance**

The way that a student sequenced their participation in the course could affect their performance. The reasons for this can range from obvious to obscure. An example that seems to be more obvious is how Student 6 would wait until after the deadline to submit his assignment/essay. Cramming work at the end of the week and submitting items late can have an obvious outcome of point loss – Student 6 would lose points on the assignment because they were submitted after the deadline. His style of cramming also left no room to adjust if there was additional time needed to learn the material for the quiz. In the opposite way, Student 2 also had a somewhat obvious example of how sequencing can affect the outcomes since she would get the majority of the work done on the assignment/essay prior to the discussion section. She did this so that she could ask

questions that would help her improve her writing. She left plenty of room for learning content before the quiz and writing the essay or completing the assignment before the time it was due. Sequencing could affect outcomes in the course. However, this is can be often left up to the student to make decisions about how to sequence and they might not know what is most effective for learning. Or the student might know how to best structure his/her course but she/he may have other commitments or interests that are causing them to make certain decisions.

- **Other variables could interfere with the effect of sequencing on outcomes**

Determining how much sequencing affects outcomes could be complicated by other variables. Some of the variables that could reasonably interfere with the effects of sequencing include:

  - Time-on-task
  - Amount of student effort
  - Presentation of the component-activity
  - Background of the student

As an example of time-on-task, two students could structure their sequencing in the exact same way, both working on the same things at about the same time; however, one student may put in double the amount of time as the other one. Also, as discussed in other parts of the dissertation, it could be difficult to determine how much effort a student put into the tasks, making it quality-time-on-task, versus passive learning or distracted learning. Also, it may be difficult to know how well the material is presented in one component-activity versus another. For example, one student might watch the videos while another reads the book. If the book has more information that is presented in a more user-friendly way, then the activity of the students could be unbalanced. Additionally, students that had a background in the area may do better no matter how

their week is sequenced. The students that crammed did just as well or better than students with a more distributed sequencing. However, even with these more obvious possible variables, there could be numerous other issues that could impact how students learn. Thus, while sequencing could impact student outcomes, it may be one of countless variables that may impact student learning.

- **There seems to be at least four distinct patterns for how students organize their effort**

There seems to be at least four distinct patterns for how students organize their effort: Load most work towards the beginning of the week/cycle; load most of the work towards the end of the cycle; maximally load all/most work at the extreme end of the week ("cram"); distribute work throughout the week. Distributing work throughout the week can also take at least two forms: working on all/most selected component-activities on a regular basis; working on just one thing at a time. The first of these is to work on most/all selected component-activities on a regular basis. This means that a student will alternate between component-activities. For example a student might watch the videos, complete the readings, and work on the assignment/essay every day, starting on the weekend or Monday. Students that work on just one thing at a time might start the week with the readings, then move to the videos, and finally complete the assignment at the end of the week, using the other materials as a reference.

- **There appears to be certain strategies, grounded in an efficiency evaluation, which students use when making sequencing decisions.**

The way that students plan out their participation in the course seems to be grounded in strategy that is built on efficiency criteria. From this study, evidence for efficiency criteria began to emerge. As predicted, the decisions that students make about

sequencing mirror other participation decisions processes. This includes criteria from efficiency evaluation:

- **Decrease Costs**: Reduce Time/Effort and Money/Resources
- **Increase Gains**: Increase Content Learning, Contribute to Goals/Interests, and Increase Satisfaction

Surprisingly, students did not evaluate efficiency based on the third type of criteria, operational function (process performance and access). However, like other participation decisions, students seem to consider other variables that make up other portions of the framework:

- **Course Operation**: Work around elements of the course (e.g. can only start an assignment when the instructions open up)
- **Student Input**: Study preference; Accommodate external influences (e.g. scheduling of other courses)

Course operation played an important role in how students sequenced their participation. Control was one issue that regulated the ability of students to make sequencing decisions. Some component-activities were set at a specific time. For example, discussion section was set at a specific time, therefore, there was no option to move the timing; the student either attended or did not attend.

One area of course operation that surprisingly seemed to have an affect on student sequencing was Instructional Coherence. Two students (Student 2 and Student 10) changed their participation behavior because of advice from the teaching assistant. Some of the students would participate based on the assessments. In some cases, students would make big changes to their weekly sequencing after the midterm exam. Some made big changes after the first essay or assignment. Others would plan their week of study based on the assessment each week. These assessments allowed the students to determine how

they should gather information from the book, videos, or other sources. In some instances, the instructional coherence led to changes in participation sequencing for the term and for other students, the assessments provided a guide for participation and was thus, the north star guiding their participation each week. In other words:

- **Instructional coherence has the ability to influence student sequencing cycles by providing a reference for what is needed to be successful each week. This guidance helps students *Increase Gains* and *Decrease Costs*.**

From the standpoint of an educator, the idealistic reasons for how a student sequences a their course would be to improve learning. However, students make decisions about sequencing with a range of criteria that might not always be improved learning. For example, students may sequence their courses so that they can reduce the time and effort they put into the course. They might also be trying to accommodate external influences, such as other courses.

Student input plays an important role in the sequencing of the course. As mentioned, having to accommodate external influences can play a role. These external influences could be other course schedules, family (i.e. Student 15 had a baby), work, or the distance to campus (Student 9 lived 90 miles from campus). Other variables that can influence student sequencing are internal characteristics such as interest in the course, goals, preferences for learning environments, and preferences for study timing. Understanding these characteristics can help educators make decisions about course implementation and potential study interventions.

As mentioned, one surprising finding was the lack of discussion of an optimized operational function. However, this could be the context in which they were describing their sequencing of the course. For example, in another area of the interview a student

might have described technology problems or issues of access but these were not described in relation to the sequencing of the course.

As explained, one of the criteria that students might use for how they sequence their course could be to maximize performance. For example, Student 2 had a strategy that was built mainly on the criteria of learning content knowledge, getting a good grade, and potentially working with the faculty member. This student majored in this area and was focused on doing well in this area in the short and long-term. The strategy of writing most of the assignment/essay before the discussion section each week was grounded in her desire to improve the assignment/essay.

Student 15 also had a sequencing cycle that was distributed throughout the week. However, it appears that her strategy was based more in feasibility and meeting the demands of external interests/goals (e.g. working a full-time job, taking care of a baby, on top of a normal course-load). Thus, this distribution of work was potentially chosen because it was the only way to get all of the work done for the course.

Student 6 crammed all of the work at the end of the week. This strategy was based on reducing time and effort spent in this course so that it could be applied to other competing interests (i.e. other courses with priority because they were part of his major). He crammed all of the work at the end of the week just before the quiz because it forced a prioritizing of effort (i.e. he had to finish the quiz before the deadline and he tried to submit the assignment/essay before the deadline).

Student 3 front-loaded most of the work at the beginning of the week when he could. The strategy behind this was a proactive preparation for the week. Student 3 stated that he had a number of other difficult courses and he would do the reading ahead of the

other activities because it was quick and they were simple enough that he would not need to watch the online lectures. He also felt that the lectures were not very good and so attending them would “not be efficient”. Lumping all/most of the work in one instance was a strategy meant to make the work easier:

> I just read the chapter in the book and understood them and took notes on them before watching the lectures, and I didn't always watch the lectures because some of the information in the chapters was fairly simple and straightforward; so when I didn't feel like I need the online lectures I just read the book and I just did the exercises usually just in one bout I wouldn't sit down and then the next day go at it again I would usually do the whole thing in one piece. That was just my tactic. That was a little bit easier for me.

Perhaps the justification for why a student sequences a course in a certain way is just as important in determining student success as how the student actually sequences participation in the various component-activities. So, it might be better to look at whether the student has a plan for sequencing and if learning drives that plan, as opposed to reducing effort or accommodating commitments to other interests. Further, it would be important to understand whether there is experience and strategy behind the plan and determine how close it matches research in this area.

Future research in the area of sequencing could explore the findings above in more detail. However any future research in this area should be advised to be careful in distinguishing temporal issues in the practice of research. It can be easier to distinguish between sequencing in concept than in application. The temporal control issues of Timing, Pacing, and Sequencing are closely related and have some overlap. For example, the decision to participate in a particular component-activity at a specific time is a timing issue. When the timing of that component-activity is referenced in terms of another component-activity, the type of control changes to sequencing. When the timing was referenced in relation to the speed with which one is participating or learning, then the

type of control is sequencing. While these concepts are different and each has important implications for learning, making the distinction between them can sometimes be tricky. Distinguishing between them when a student is talking about them can be particularly difficult since they often do not make the distinction without prompt or guidance. Future research will benefit from differentiating between these concepts in the methodology and instrumentation.

Results Summary for Study 3

The purpose of this study was to examine the student experience from the point of view of ten students in the online version of a course and five students in the in-person version of that same course. This study of the student experience was meant to both provide validation for the student portion of the framework that was proposed in Chapters 2 and 3 of this dissertation and provide greater insight into the workings of the student experience. The conceptualization of the framework relied on the experience of this researcher and articles about online education. As explained at the beginning of Chapter 3, this conceptualization was based on models already proposed for online education and higher education and resulted in a framework that combined many of the concepts of these models, which include Astin (1993), Bean and Metzner (1985), Tinto (1993), Rovai (2003), Pascarella (1985), Cole (1984 and 1996), Engeström (1997), Hiltz (1993), Benbunan-Fich and Hiltz (2003), Väljataga and Laanpere (2010), Anderson and Rogan (2011), Lowenthal et al. (2009), and Piccoli et al (2001). Because the framework were conceptualized by personal experience and through prior developed models, validation was needed. This study provided the third round of validation and framework modification through a reference of how students were experiencing the course, what variables they described, and how students described the processes of online education.

The main reason for conducting case studies of individual students was to understand the processes of a course at a local level without holding variables or processes constant. In other words, the researcher was able to look at the comments of students without imposing a set of variables for them to talk about. Part of the reason this was possible was that the interviews occurred long before the framework was developed.

This allowed the researcher to not only check the existing framework but to also look for new sections, processes, ordering, and variables in the framework. To answer the research questions, this study sought to determine if the different portions of the framework were described by the experiences of the students; determine if there was anything about the framework that was not described by the student descriptions; look for anything in the course that was not described by the framework; and look for evidence of connections between different sections of the framework. By using a qualitative approach that critically analyzed the existing framework while simultaneously looking for ways to expand the framework, the study benefitted from both a deductive and inductive process. Through this method, new processes and variables were discovered. As major new processes and variables were discovered, they were added to the coding scheme, including those found in Study 2. Thus, this study was meant as a both a validation of the original framework and a search for evidence that the framework could be adjusted.

From the analysis of student interviews, it became apparent that there was evidence of support for some sections of the framework, moderate support for other sections, and some areas were lacking evidence in the literature and hinted at the need for revision. Some interesting findings in this study included further confirmation of the framework, a more detailed look at the processes of Student Participation Decision-Making, and findings related to how students sequence their study for the course. This final study used all of the lessons learned from the results of the prior studies and incorporated them into the coding and analysis. Because the coding for the full framework follows so close to the predicted findings, the iteration of the framework for

this course and the generalizable framework for online courses are estimated to be nearing completion.

Case Match to Major Sections. There were a few analyses in this study. The first analysis was a descriptive look at student input variables and participation behavior. The detailed analyses of student decisions provided an intimate look at the decision processes of students. This analysis showed evidence that students were making decisions in ways that matched the hypothesized decision process. Additionally, as predicted by the framework, the Student Participation Decisions section of the framework seemed to have connections with both the Student Input section of the framework as well as with the Course Operation section of the framework. Another analysis looked at Student Sequencing for the course. This gave insight into student decisions and participation in the course as well as connections to student input variables and course operation. The coding of student interviews using the full framework allowed for analysis of each section of the framework. Each of these analyses allowed for a distinct look at different parts of the framework. For the major sections, the coding of the student interviews yielded the most information about the full framework.

- **Major Framework Areas:** The coding of the student interviews provided the expected evidence for each of the areas of the framework. The adjustments made as a result of the prior two studies put the framework were confirmed by this study. Future studies could work to confirm the framework and find how other course models would compare to this course.

- **Sections in the framework:** The predicted evidence for each of the framework sections was present in the student interviews.

- **Actors in the framework:** Matching the results of Study 2, the two actors that the students talked the most about were students and media. All of the students discussed the instructor, particularly instructor participation. And it is the

instructor participation that students are able to interact with the instructor and thus, would be the most observable aspect of the framework for the students. Other sections of the instructor portion of the framework were discussed but there was very little discussion there. The students discussed the institutional portion of the framework very little but this was expected since they have very little interaction any representatives of institutional administration during the course.

- **Online versus In-Person:** As with Study 2, the results for the online section were very similar to the in-person section. While some of the details were different, students in both types of course discussed the framework with similar frequency. This suggests that the framework could be useful for both environments.

Section variables. In addition to the major areas and major sections in the framework, this study coded student comments for specific variables that fell under the subsections of the framework. This coding included variables used and found in Study 2. New variables included processes related to student decision-making: Information Gathering and Theory Development. These variables were found in Study 2 but were not coded for until this study. Another new variable was Instructional Coherence. There were some hints of this variable in Study 2 but it became more apparent that formal coding was needed. Below are some of the main findings related to section variables.

- **Institutional Influence**: The institution can have an influence on student outcomes through the recognition of units for the course. Online/ Hybrid Courses could create less of a need for brick and mortar investment from the university. The institution can also have an influence on online portions of the course, for example, foundation of the online course website was developed by the university.

- **Instructor as described by students**: Students mainly discussed instructor participation. Other areas of the framework for the instructor were either difficult for the student to observe or the questions were not specific enough to elicit answers in the latent aspects of instructor involvement in the course.

- **Technology Input:** Can have a substantial impact on the implementation of component-activities but is sufficiently represented in the input area of the framework.

- **Control:** Students spoke about the area of control frequently. Even though they had not been exposed to the term, their comments signaled that the concept and issues related to control were important to them. In this study, students discussed the temporality control issues of *Pacing* and *Timing* most frequently with control over Component-Activity slightly less frequently. Surprisingly, there were only nine instances when students discussed control over location, which is a central issue related to online education (being able to work wherever the student likes). However, the reason for the lack of discussion around location could be that once it has been discussed a single time, it may not need to be mentioned again. There may still be other types of control that can be transferred between instructor, student, and media. From this research, there appear to be at least six main types of control (Location, Timing, Pacing, Sequencing, Content, and Component-Activities) that span the four sources of control (instructor, individual student, student groups, and media). The essential aspect of this control feature as described here is that it can be shared and transferred across the key actors in a course. Otherwise, control would just be seen as an inherent property. Other types of control were not yet explicitly added to the framework, however, other potential types of control (such as media form) and in what circumstances potential sources can be the source of control will need further research. For example, the instructor or institution generally control many other aspects of the course, such as class size, without shifting this control over to students.

- **Meta-Control and Negotiated Control:** Meta-control and negotiated control were discovered in Study 2 but evidence that it exists was confirmed in this study. Meta-control represents the ability to have control over and make decisions about who will have a type of control. For example, an instructor could have meta-control over the pacing of the course. The instructor could make the decision to allow greater student self-pacing or might decide that it is better to keep a rigid pacing schedule. Negotiated control represents a process of deciding meta-control or control through negotiation. For example, an institution may want certain content taught in a course but the instructor might want different content and the control over this could be negotiated between the instructor and the institution.

- **Curriculum and Content:** The comments from the interviewed students showed how influential even somewhat minor aspects of curriculum and content are on their experiences. With the exception of accuracy of information or assessments, all of the codes in this area had moderate to high usage. Additionally, Instructional Coherence was added as a code to the area of curriculum and content as a result of student comments.

- **Instructional Coherence:** Instructional coherence was added as a code for the area of Curriculum and Content. This code was added when it was realized that students were unsure about what they should focus on and when students described unorthodox ways of determining what to focus on, like looking at the assessments. Parameters for the course can be presented in at least three ways: an

information source, such as a book or video; a syllabus or guide to the course; or through activities and assessments.

- **Features of Media:** Students discussed the different features of media but did not use the same terms and often talked about these features without identifying the property of media. Media structure was added as a code for Study 3 and had a moderate frequency of application.

- **Student Properties and Processes:** All of the student properties and processes had moderate to very strong usage. Some of the specific variables related to student input were low but that was to be expected given the specificity and the lack of specific questions about these variables.

- **Information Gathering and Theory Development:** Information Gathering and Theory Development were used in the coding of student interviews. These processes were discovered in Study 2 but were not used for full coding until this study. These two processes are an integral part of the experiential loop. As students interact with their environment and experience certain aspects of the course, they gather information about the course. As this information is gathered, the students engage in a simultaneous process of theory development where a theory is developed about the workings of the course and aspects within the course. These processes make it possible for the framework to loop, which allows student experiences to continuously become input variables that students can then make decisions based on. Thus, in the framework, decisions can happen before the participation.

- **Student Participation Decisions:** The codes used for Student Participation Decisions were different in Study 3 from the student coding in Study 2. Study 2 examined the decision as an evaluation of positive or negative. However, Study 3 was aimed at capturing the decision and not the evaluation. Therefore the codes were used to mark the decisions of whether and how students participated in aspects of the course. While the evaluation a student gave, such as positive or negative review, could still have been examined; however, it was determined that this type of coding would not have been beneficial for this study. After the initial analysis of coding, an additional analysis was conducted for a more detailed understanding of student decision-making.

- **Communication and Interaction:** Online communication can be beneficial for increasing access. However, many of the students saw problems. Some students had problems with the technology. Other students felt that in-person communication was just more efficient. And others expressed a sense of experiential loss that only comes with embodied communication and interaction in the presence of others.

- **Decisions to Participate and How to Participate in the Course and Component-Activities**: While there were unique reasons for why students

participate and how they participate, there seems to be a consistent pattern to the process. Students consistently gathered information from their experience in the course to form a theory about the course and compare that to input variables that were either incentives or barriers to participation. From this theory, the students would conduct an efficiency evaluation to determine whether their participation or manner of participation was going to be efficient.

- **Decisions to Participate in a Course:** Students more frequently discussed the contribution to goals or interests as a reason for enrolling in the course than any other participation decision. This could be caused by methodological issues, the justification of participation in other activities as cumulatively helping achieve the goal or interest related to enrolling in the course, or it could be how students perceive the they way they should describe their overall participation rather than more minor decisions.

Other Findings. In addition to validating the framework and framework, this study had some important findings that related to the framework but did not have the primary role of validation. Some of these findings came from the coding for the full framework and others came from the descriptive look at student input variables and participation behavior, the detailed analysis of student decisions, and the detailed analysis of student sequencing. Below are some of these findings.

- **Favorite and Least Favorite Aspects of Course:** Favorite aspects of the course were clustered together; least favorite aspects were usually one-off. Many of the least favorite aspects of the course seemed to be the result of operational functions, such as the software not working, inaccuracy of information, or having to set up the exams at specific times with the instructor. Some students named their least favorite aspect of the course as an activity they had chosen even though the activity was optional with an alternative source of information available.

- **Regular Participation:** Each interviewed student had a unique set of activities that they regularly participated in. However, certain specific component-activities had more participation than others. In this way, many students would watch the videos and read the book but each student had their own regular participation in these and other activities. Amount of hours that a student worked on the course per week did not seem to correspond to whether they thought the course had too much work, too little work, or just right. Grades also did not seem to correspond

with the satisfaction score that students gave nor whether they felt they had too much work, too little work, or just right.

- **Student Friends:** From the interviewed students, it seemed more likely to have a friend in the class that you previously knew than to make a new one in the class. Students that had a prior friend in the course had to make less effort to communicate with a classmate; had the convenience of a readily available study partner; and could easily ask the friend about information regarding logistic information.

- **Primary Source of Information:** Most students gained their primary source of information about the course from either the online lecture videos or the textbook. One student was able to go without the online lectures or the textbook and still received an A- in the course. Further, most students either watched the online videos or attended in-person lecture. However, one student was able to go without instructor face time of the lecture or online videos and still gain a B+ for a grade.

- **Student Uniqueness:** When looking across the demographic and basic participation data for the interviewed students, it became clear that students had very unique circumstances and experiences. These unique qualities seemed to create dynamic interactions that concluded in unexpected outcomes. Thus, attempting to create student types or covariates could be difficult and potentially ill conceived.

- **Participation in Required versus Optional Component-Activities**: All of the interviewed students participated in the component-activities that required participation for a full grade in the course. The optional component-activities were not quite as uniform although students tended to regularly participate in similar optional activities with a few activities that were less frequented.

- **Student Sequencing Cycles:** There appear to be two primary sequencing cycles in a typical course: Course-Term Sequencing Schedule and the Week/Lesson Sequencing Cycle. The first of these represents how a course is sequenced for a student over the period of the whole course or term. The second represents how a course is sequenced for a student over the period of a typical week or "lesson". The first is overall life cycle of the course while the second is the more acute cycle for a week. Part of the Course-Term Sequencing Schedule was the way students created and adjusted their Course-Term Sequencing Schedule. During the term, the students would start out with a weekly sequence but then might adjust that in the first week or two. Then students often made adjustments in the middle of the term, just after the first major exam (midterm). Students would also add additional study time just before the exams. These changes and spikes in study times make up the main characteristics of the Course-Term Sequencing Schedule. Some of the main findings related to the two sequencing cycles were:

- Students sequenced their course in different ways but patterns emerged

- There seems to be at least four distinct patterns for how students organize their effort. In other words, there were four timing types
    - Proactive Timing – Getting most of the work done early in the week
    - Distributed Timing – Getting the work done throughout the week
    - Delayed Timing – Getting the work done towards the end of the week
    - Crammed Timing – Getting the work done at the last possible moment

- There were four sequencing types:
    - À la carte – Only one main information source is used before the assessment
    - Service à la russe – Participate in one information source before the other (i.e. read text before watching videos)
    - Service à la française – Participate in information sources simultaneously (i.e. watch videos and simultaneously consult book)
    - Dessert during dinner – Participate in the weekly assessment and look up the relevant information from the information source simultaneously (i.e. take the quiz and consult book)

- Students have to make decisions around component-activities that have pre-set times

- The way that a student sequences a course could affect their performance

- Other variables could interfere with the effect of sequencing on outcomes

- There appears to be certain strategies, grounded in an efficiency evaluation, which students use when making sequencing decisions:

    - Decrease Costs: Reduce Time/Effort and Money/Resources
    - Increase Gains: Increase Content Learning, Contribute to Goals/Interests, and Increase Satisfaction
    - Course Operation: Work around elements of the course (e.g. can only start an assignment when the instructions open up)
    - Student Input: Study preference; Accommodate external influences (e.g. scheduling of other courses)

- Instructional coherence has the ability to influence student sequencing cycles by providing a reference for what is needed to be successful each week. This guidance helps students Increase Gains and Decrease Costs.

CHAPTER 6: DISCUSSION

The main focus of this dissertation was gaining a theoretical and logistical understanding of how online courses operate. The Literature Review chapter of this dissertation explored the nature of online education and highlighted many of the issues that continue to be barriers to both research and practice. The Framework Conceptualization chapter of this dissertation explored theories and models already in use in online education research. A framework was then conceptualized based on these foundational models and research was provided to support this initial framework. This first iteration of the framework illustrated the main variables and how these variables could interact. Aspects of this initial framework were then supported or refuted by three different studies. The first study conducted a review of a literature, first to find support for the major sections, and then to find new potential sections and variables within those sections of the framework. The second study was a case study of a single course. This study helped further the understanding of the framework from the perspective of a single course. The third and final study looked at fifteen student cases (five in-person students and ten online students of the same course), which was used to help clarify the student portion of the framework. Based on the evidence found in these studies, portions of the framework (and specific variables within the framework) were removed, added, or adjusted. Each of these three studies contributed iteratively to the conceptualization of a final framework. The findings from these studies are discussed below.

Main Findings

Over the course of the three studies, the main finding was that the framework was supported but with changes. Most sections of the original framework were kept but some

adjustments were made. There were three main areas of Findings: Framework Structure; Processes or Variables within the Framework; and General Framework Properties. The findings related to Framework Structure were those that changed a major aspect of the framework, such as the addition or subtraction of a section, the addition or an actor, the reordering of the framework, or the addition or subtraction of variables within a section of the framework. The findings related to Processes or Variables within the Framework refers to, a finding related to a specific process or property in a section of the framework, or a connection between two or more sections of the framework. Below is a listing of each of these areas. This listing is then followed by detailed descriptions of each of the respective listings.

Framework Structure

- ***Final Framework Support***: The final framework was built on theory and evidence. The overall structure of the framework was sound. However, some changes were made based on theory and evidence.
- ***Actors***: Student is the only permanent actor in the framework. Media is a permanent entity but more research needs to be conducted to determine if media is an actor or artifact. The instructor, while many times plays a central and essential role in online course, some courses can and are run without an instructor. The institution is also an impermanent actor because it is not always centrally involved in the creation, implementation, or operation of the course. Online courses are often run outside of any institution.
- ***Other Actors***: Other actors can be added in the future, such as splitting a Teaching Assistant from the Instructor, adding an Instructional Designer, or Administrative Actors. However, the general shape of the framework should stay consistent and the relationship between the four actors already listed, as illustrated in the final framework, should also stay similar.
- ***Instructor and Media Independence***: Instructor as independent from course operation and media
- ***Section Losses***: Certain Aspects of the Course were not supported and no longer conceptually fit, such as instructor intended output, instructor intended outcomes
- ***Five Main Phases of Framework***: The final framework produced has five main phases or properties listed: Input; Operation and Participation Decisions; Operation and Participation; Output; Outcomes and Impacts

- ***Temporal Direction of Framework***: The final framework is set up to move from left to right with a couple of exceptions, the instructor and institution will contribute to media input and set the inclusion/exclusion criteria for students. Additionally, the experiential loop (explained below) feeds prior experiences in the course back into the input area for an actor.
- ***Experiential Loop***: In many instances, after an actor has an experience, it becomes part of Input as a Prior Experience Variable. This means that any knowledge that an actor has about the course (course characteristics, course structure, experiences that the student has) becomes an input variable. This input variable then can influence the decision process as the actor gathers information and forms a theory about the course.
- ***Reorder of Decisions and Participation***: Decisions section and Participation/Operation Section of Framework re-ordered
- ***Goals Moved and Impacts Added***: Goals moved to a variable of Input. Impacts added at the end (Goals attainment could be a long-term outcome or impact)

Processes or Variables within the Framework

- ***Variable Additions***: Addition of Variables Such As:
    - Instructor Decisions: Include thoughts about other actors, such as students and institutions.
    - Media Features: Media Structure
    - Features of Curriculum and Content: Accuracy of Information
    - Features of Curriculum and Content: Instructional Cohesion
    - Control: Location, Timing, and Media
    - Control: Meta-Control
    - Student Decisions: Information Gathering and Theory Development
- ***Efficiency Evaluation Criteria Categories***: Efficiency Evaluation for both Students and Instructors: Costs, Gains, and Operational Functions. Minimize costs, maximize gains, and reduce situations of poor operational function.
- ***Types of Access***: Distinction between types of access
- ***Source and Type of Control***: Separation of two aspects of Control: Source and Type
- ***New Types of Control***: Addition of new Types of Control: Location, Timing, Media Form, and Interaction
- ***Meta-Control and Negotiated Control***: New theories for how control is decided.
- ***Actor Prognosticator***: Actors make predictions about what the course will look like and what their experience will be like in the course.
- ***Instructor Naturalism***: In the illustration of the original framework, the instructor had properties of what might be ideal for students. This was changed to reflect an

independent actor with independent input and goals, decisions, participation, output, and outcomes.

- ***Instructor Coordinator***: Instructor as Coordinator/Conductor
- ***Student Properties and Processes Discovered****:* Important properties and processes discovered during studies
    - ***Student Decision Influences***: Variables in the course and student properties that influenced Student Decisions
    - ***Student Timing and Sequencing Patterns***: Students have different ways of sequencing their learning
    - ***Student Friends***: Having a friend in the course seems to make a difference.
    - ***Student Decision Unknowns***: There are still a lot of unknowns related to student decisions. For example, when do students look for areas of the course where they have control? Is it natural to do a scan and determine the "rules" of the course?

- ***Independence of Student Experience***. Based on the 15 student cases, it seems that students can have very different experiences in a course – almost to the extent that they seem to be taking different courses.

General Framework Properties

- ***Properties and Processes Big and Small***: The Framework Representation of Processes Big and Small
- ***Areas to Influence***: The framework as a guide for educators and researchers looking for areas of a course to change.
- ***Increasing Efficiency for Students***: Student Efficiency as a goal for online education.
- ***Student Reporting***: Why student self-reported data is important
- ***Student Types Caution***: Why creating types of students should only be done with caution
- ***Framework for Online and In-Person Courses***: Framework reflected both online and in-person courses
- ***Generalizability***: Whether the framework can be generalized

Framework Structure

Final Framework Support. As mentioned, the main structure of the framework was largely supported as each of the studies. However, some changes were made. In Appendix K are a series of tables related to the framework. Each of the tables represents a single actor (four total: Institution, Instructor, Media, and Student) and reflects the

framework for that actor and if there was support from the studies for the properties, processes, and variables. The tables show whether the framework area and variable were in the original framework and/or the final framework and whether there was support from the literature review, Study 1, Study 2, or Study 3, and whether the section or variable needs further research.

Through the course of the conceptualization and then implementation of the three studies in this dissertation, overwhelming evidence was found to support of the main aspects of the framework. For example, the instructor, students, media, and institution were all represented in the literature, case study, and student cases. Also, the separation of five areas of the framework (Input, Decisions, Participation and Operation, Output, and Outcomes and Impacts) was all supported in the three studies. Further, most of the conceptualized variables were supported by the studies. The studies supported the framework in these main ways:

- The major framework sections reflect data from studies
- Some specific variables were consistent across studies
- The system of the framework reflected processes for the different actors

In other words, all of the big picture aspects of the framework were represented in the different studies. However, as mentioned earlier, as the studies progressed, some modifications were made to better reflect. Through the process of conducting each study for this dissertation, some conceptual modifications in framework representation were made. Below are some of the additions, subtractions, and rearrangements in the framework. These changes were made on the basis of evidence and theory. Some portions of the framework found strong supporting evidence in the studies, while others

had weak evidence. Additionally, some portions of the framework had a weak supporting theory while other areas had a strong supporting theory. Below is a list of a resulting cross-section between strong evidence or weak evidence by strong theory or weak theory. The basis of a change in the framework came from how a framework property or process aligned with this set of potential evaluations.

- Strong Evidence and Strong Theory: These areas of the framework had the strongest support
- Strong Evidence and Weak Theory: These areas of the framework had evidence of variables in the literature but they did not fit the original framework as it was represented and were thus, moved to a different area. For example, the instructional outcomes had strong evidence but the theory was weak and ultimately they were moved to a specific type of decision that an educator would make.
- Weak Evidence and Strong Theory: Because the framework evolved over the course of a conceptualization period and three studies, most of the remaining sections have strong evidence from the studies. However, because all of the studies were conducted using data collected prior to the conceptualization of the framework, specific data related to the framework was collected without specific knowledge of the framework. As a result, some areas of the framework have little evidence because data collection did not reference the framework. Further, some of the sources of data may have had little information (i.e. the students may not have had very much information about the institution). Therefore, the sections still in the framework with weak evidence but strong theory have been left in the framework with a call for additional research in the future.
- Weak Evidence and Weak Theory: Areas of the framework that had weak theory and weak evidence were removed before the final framework.

Actors. The framework conceptualized and investigated in this dissertation has one definite permanent actor, the student. Media was found to be a permanent entity but more research needs to be conducted to determine if media should be considered an actor, an artifact, or whether it depends on the circumstance. No other actor seems to have a generalizable role in the framework. The instructor played an important role in the course studied and seems to play an essential role in many other courses in online education.

However, not all online courses require an instructor. Therefore, while important to represent for many courses, the instructor must be considered an impermanent actor. The institution was also investigated as an actor. In some cases, the institution can be influential in online courses. However, not all online courses are run through an institution. Therefore, institution must also be considered an impermanent actor.

In the original conceptualization of the framework, there were two main actors, student and instructor. The original conceptualization of the framework left space for the possibility that there was a third actor, media, and designated a place for the institution as a contextual influence. However, a major change to the framework that occurred as the studies progressed was the number of actors investigated for their role in the framework. Four main actors were investigated for their role in the framework: Institution, Instructor, Media, and Student.

There were a number of reasons for adding these additional actors into the investigation of the framework. First, at the outset, it was unclear which actors were permanent versus impermanent. Only over the duration of the dissertation was it clear that an instructor was not permanent. While this may seem like an obvious finding, it was not until the separation from media that this impermanence could be realized. Second, for Study 2 and Study 3, it was appropriate to research each of the four actors since they were each part of the course. Third, each of these actors was recognized as being, potentially, very influential on the implementation of a course. Fourth, there was recognition that the other actors were likely to have similar properties and processes as the other actors and illustrating their whole potential framework would help with further research. While it was already assumed that the institution played a role in the online

course framework, the literature review laid the foundation for the institution to be a complete actor in the framework with representation in all five portions of the framework (Input, Operation and Participation, Operation and Participation Decisions, Output, and Outcomes and Goals). Further, some of the comments from students in Study 2 and Study 3 reflected the idea that media had a purpose born of those that created it. Further research will need to look at both the designers (e.g. computer programmers and computer engineers) and educators to better understand media input, decisions, participation, output, and outcomes. However, the studies here found plenty of evidence to support at least the media input and participation (course operation) portions of the framework. And strong theory supports both the decisions portion of media and the output and outcomes. Fifth, as explained earlier, there is a need for actor independence: an instructor has different input, decisions, participation, output, and outcomes than students, the institution, and the media. Sixth, understanding each of the four actors as independent would help explain how each actor interacts and at what points in the framework. By investigating the each of these actors, the role and permanence of each of these actors became clear and understanding their role in the case study provided insight into how that course operated and how others may be different.

However, at the conclusion of the dissertation, only student had the definite generalizable status as an actor in the framework. Media has a permanent role as an entity in the framework but the status as an actor or artifact has been left as inconclusive. While the role of instructor is important for many or most online course, the role is not generalizable across all courses. Future studies of other courses will need to determine which actors are important to include in research; this includes actors not researched in

this dissertation. Some other potential actors that could influence a course are described in the next section.

Other Actors. Because this framework can be seen as a theoretical aid for understanding how online courses operate and because one of the main findings of this dissertation was that there are a potentially infinite number of variables in an online course, it is recognized that the addition of other actors into the framework is appropriate for other studies. Examples of additional actors could include:

- Specific administrators
- Instructional designers
- Teaching assistants (as separate from the instructor)
- Auditing Students

However, it is predicted that these actors would not need to deviate widely from the current framework. For example, specific administrators would still orbit around the institutional area of the framework; instructional designers would have a role that is somewhere between institution and instructor; teaching assistants would have a similar placement to the instructor; and auditing students would remain in the student area. Additionally, each actor would include each of the major sections: *Input*; *Participation Decisions*; *Participation/Operation*; *Output*; and *Outcomes and Impact*. Thus, any additional actors are not predicted to change the framework dramatically.

Instructor and Media Independence. While the nature of the framework stresses the interconnectedness of different actors, something the original framework missed was the independent track of different actors. This was particularly a problem for media and some aspects of the instructor portions of the framework. The framework represented instructor as being interconnected with the processes of media. Further, the output and outcomes of the instructor did not represent what the instructor but instead;

they were representations of the ideal output and outcomes of students. While this ideal represents a noble aim of student learning, it does not represent the individual output and outcomes of a real instructor. Media, as an actor/artifact, was in not represented as an independent entity in the original framework. In the final framework, media was represented as an individual actor/ artifact that was represented in each area. The separation of instructor and media was essential to understanding of generalizability of instructor versus media. Whereas during the conceptualization of the framework it was hypothesized that the instructor/media was a permanent actor in the framework, it was clear after the separation of media from instructor that media was the permanent, generalizable entity; meanwhile, the instructor, while often important and essential to an online course, is not an actor in all online courses.

Section Losses. Certain Aspects of the Course were not supported and no longer conceptually fit as an independent node. These sections included instructor intended output, instructor intended outcomes, instructor goals, and student goals. Each of these removals was an example of when the evidence was strong but the theory was weak. Therefore, even though these were removed as a node on the framework, they did not completely go away. For example, student goals became an internal input characteristic of the student and the potential attainment of goals was included in the node [*Student*] *Impacts and Goal Attainment*. This change helped to clarify goals as an internal characteristic of an individual while goal attainment is a type of result. Thus, the evidence still supported both but the representation in the framework was theoretically sounder. Similarly, Instructor Goals was changed to an internal characteristic of the instructor and the potential attainment of goals was included in the node [*Instructor*] *Impacts and Goal*

Attainment. Both instructor intended output and instructor intended outcomes were incorporated in the *Instructor Decisions* section of the framework a part of instructional operation decisions.

Five Main Phases of Framework. In the final version of the framework, there were five main phases (Input; Operation and Participation Decisions; Operation and Participation; Output; Outcomes and Impacts). From the findings in this dissertation, it seems that the actors may change and increase in new studies (e.g. add Teaching Assistants, Instructional Developers, or particular Institutional Administrators). However, the phases appear to be robust and the variable types and processes seem to be similar across actors (e.g. input variable types such as internal and external characteristics; decision-making processes such as efficiency evaluation; participation and operation; output; individualized outcomes). This section describes each of the actors and framework sections specific to that actor. As described earlier, it is important to separate different actors as independent entities with different input, decisions, participation, output, and outcomes. However, these different actors also interact and share similar characteristics.

Temporal Direction of Framework. The final framework is set up to move from left to right with a couple of exceptions, the instructor and institution will contribute to media input and set the inclusion/ exclusion criteria for students. Additionally, the experiential loop (explained below) feeds prior experiences in the course back into the input area for an actor. This directional component was made possible by switching the decisions phase of the original framework with the participation section of the original framework. Also, the addition of the concept of the experiential loop and the link from

instructor operation and institution operation with media and student input allows the direction of the framework to move from left to right. The movement from left to right is both theoretically sound and it simplifies the framework making it easier to understand.

Experiential Loop. One of the general observations is that after an individual has had an experience in a course, that experience will become internalized and feedback into *Internal Characteristics* as a prior experience variable. This information can be used to make decisions about future participation in that course or in future courses. This feedback loop helps fix a problem that was occurring in the original framework. In the original framework, participation in a course was logically ordered before decision-making. The reasoning behind this was that in order for individuals to make decisions about a course, they have to have some sense of what is happening in the course. Thus, the participation was placed before the decision-making and this decision-making helped inform future participation. However, it was not necessarily the participation that the individual was acting on, but instead it seemed that it was the internalized knowledge from experience that was helping the individual make decisions. Additionally, individuals might not make decisions based on their own experience in the course but instead might make decisions based on what they have heard from others. In this sense, actors *gather information* and then *develop a theory* about how their participation in the course will proceed. For example, an instructor might not teach an online course because of things they had heard from other instructors or a student might make a decision to register for an online course because he/she heard good things about it from other students and theorize that their participation will also go well. This new experiential loop, where prior experiences become internalized, solves this problem. This also helps explain how

students are making decisions in a course as they are using this experiential loop information, along with information about their own internal and external characteristics to predict what their experience in a course or component-activity will be.

Goals Moved and Impacts Added. One major change in the framework was the move of goals from a result to an internal characteristic. In place of goals as a result is *Impacts and Goal Attainment*. This provides a more clear illustration of where the goal resides (as an internal characteristic) and whether that goal was actualized as a result.

Reorder of Decisions and Participation. One major change to the framework was the order in which the framework was arranged. Originally, participation was placed temporally ahead of decisions. The reason for this was the idea that actors would need to encounter the information from a given situation before making a decision. However, two main changes allowed for these sections to be swapped. The first was the added processes of "Information Gathering" and "Theory Development" in the Decision area indicating an actor prognosticator. The other was the recognition of prior experiences as a Student Internal Attribute, thus there is an experiential loop. Thus, the final ordering of the phases of framework looks like this:

Input → Operation and Participation Decisions → Operation and Participation → Output → Outcomes and Impacts

Processes or Variables within the Framework

Addition of Variables. As the framework developed over the course of a literature review and three studies, additional of variables were found and included in the framework. These variables were added when there was both evidence and a strong theoretical backing. Below are just some of the variables that were added between the original and final framework:

- Instructor Decisions: Include thoughts about other actors, such as students and institutions.
- Media Features: Media Structure
- Features of Curriculum and Content: Accuracy of Information
- Features of Curriculum and Content: Instructional Cohesion
- Control: Location, Timing, and Media
- Student Decisions: Information Gathering and Theory Development

Efficiency Evaluation Criteria. It was found that actors use a set of efficiency evaluation criteria types as reasoning or justification of their decisions. For both Students and Instructors it was found that an efficiency evaluation was made up of: Costs, Gains, and Operational Functions. Costs were any expenditure for an actor as a result of participation. Costs included *Time-Effort* and *Money-Resources*. Time and Effort, and Money and Resources, were combined because of the difficulty in separating the two, creating the two cost variables: Time-Effort and Money-Resources. Gains included *Content Learning*, *Contribution to Goals or Interests*, and *Affect Satisfaction*. Finally, Operational Function describes the extent to which an operation will be smooth or problematic. The two criteria that make up Operational Function are: *Process Performance* and *Access*. An actor will aim to *reduce costs*, *increase gains*, and *optimize operational functions*. Below is a table that illustrates these aims

Table 6.1
Aim of Actor for Efficiency Type

Efficiency Type	Efficiency Criteria	Aim of Actor
Cost	• Time-Effort • Money-Resources	Reduce
Gain	• Content Learning • Contribution to Goals or Interests • Affect Satisfaction	Increase
Operational Function	• Process Performance • Access	Optimize

	Low Cost	High Cost
Low Gain	Neutral / Unknown	Negative Efficiency Evaluation
High Gain	Positive Efficiency Evaluation	Ambivalent

Figure 5
Illustration of how criteria affect efficiency evaluation result

Distinction between types of access. In Study 2, it became apparent that students discussed approximately six different types of access when they described making a decision: *Place Access*; *Interaction/Communication*; *Course Format*; *Fit with Schedule*; *Other External Opportunities*; and *Course Offering*. Some of these overlap substantially and may need to be combined: Fit with Schedule, Other External Opportunities, and Course Offering; Place Access with Course Format. However, there were enough students that discussed each of these in a distinct way to make them separate types. None of the students mentioned any need for additional services, for a disability. However, the survey and interview responses might not have captured the relevant data for this course in this area. And it should be assumed that at some point students would need access to materials based on a disability. Further research should be done in this area to confirm,

expand, or combine some of these access types. Nevertheless, the findings from both Studies 2 and 3 show that there are different types of Access and that have implications on the decisions that students make.

Source and Type of Control. One of the unique contributions of this dissertation was the separation of two aspects of Control: Source and Type. The literature review chapter of this dissertation describes Control and the separation of Source and Type in detail. In addition to a strong theoretical backing, the findings from this dissertation support this separation. Below is a listing of the original listing of sources and types of control.

Table 6.2

Evolution of Control Source and Control Type

	Control Source	Control Type
Original Listing	• Instructor • Student (Individual) • Student (Group)* • Media Control	• Pacing • Sequencing • Content • Component-Activity
Added	• Institution* • Researcher* • Government* • Society*	• Location • Timing • Media Form

*Theoretical only. Further research is needed to support

As described in the next section, the studies in this dissertation found at least three other types of control. Also, a result of the work on this dissertation, it is theorized here that there could be many more types and sources of control. For example, additional sources of control could include the institution, the researcher, government, and society. Institution is a strong candidate for Control Source since the institution can control certain aspects of the course, especially at certain institutions. At the institution studied,

for this particular course and the online program the course was in, the institution stayed as hands off as possible and tried to leave as many decisions to the instructor as possible. In other contexts, other actors may hold more control over various aspects of the course. Control might also indicate control over course set-up versus control during the instructional period. For example, the institution might have a lot of control over the set-up but the instructor might have the final say in what happens during the course. More research is needed in the proposed sources of control (Student-Group, Institution, Researcher, Government, Society) and timing of control.

New Types of Control. One of the major discoveries that occurred through this research was finding additional types of control: *Timing*, *Location*, and *Media*. Timing and Location were found in Study 2 while Media was found at the end of Study 3. This allowed more time to find data support for Timing and Location. Media will need more research. *Timing* is similar to *Pacing* and *Sequencing* in that it has to do with temporal issues. However, while pacing describes the rate in which learning takes place and sequencing describes the order in which learning will take place, *Timing* describes when the learning takes place. For example, being able to determine the day of learning or the time of day of learning is *Timing*. This can be important for students when they have other obligations, such as other courses or work, that may interfere with time-specific component-activities, such as discussion sections, live webinars, or group meetings. *Location* describes *Timing* and *Location* may have been overlooked in other studies since it is often assumed that online education automatically means *anytime* and *anywhere*. As mentioned in another section of the dissertation, media properties such as synchronicity allow for different degrees of anytime and the need for a power source or Internet limits

the prospects of learning happening anywhere. Thus, just the properties of the media can control the timing and location of learning. Further, media can control timing through prior programming or automated decisions based on data.

Something worth noting was the way control of *Timing* and *Location* was discovered. These forms of control were observed when looking at student decision-making. Students frequently described how they were able to choose the location or timing of the learning. During the first round through the coding, items that had to do with timing were coded as pacing and/or sequencing. However, it became clear that timing was a separate type of control. Also, location was coded as *Anytime-Anywhere* under media. However, it was realized that in fact, choosing a location of study was a form of control. It was particularly note-worthy that this was discovered during the investigation of student decision-making because this area of research differs from many of the online studies out there. *Timing* and *Location* may appear to have little to do with cognitive studies of the processes of learning. Instead, they seem to be more consistent with personal logistics and less with cognitive processes. And while it may appear to have less to do with learning, for the embodied learning environment of the student, timing and location could have a lot to do with how successful a student is in a course.

Control of Media Form represented a control type similar to component-activity but was slightly different. One type of control already accounted for was Component-Activity, which essentially meant, whether or not participation was required in the component-activity as a whole. *Control of Media Form* means that while participating in a component-activity, an actor has control over the media. For example, during an online discussion section over conferencing software, the ability to share a screen often is

controlled by the initiator of the conference. There were only a few instances that students in Study 3 referred to this potential control type; so more research is needed in this area for support.

One other type of control discovered in Study 3 that also relates to the control of component-activities was *Control of Interactions*. While this type of control can have some overlap with the control of component-activities and control of media form, whether a student can choose to interact and the types of interactions is important enough to list here. However, because this was a late find, like Control of Media Form, it will be important to conduct further research in this area.

Another important observation was that the decisions that students make are categorically linked to the way control is distributed in the course. In turn, those decisions could have an effect on student performance. The table below illustrates the types of decisions an actor might have to make, the way it links to types of control, and an example of the ways the decision could influence output and outcomes.

Table 6.3

Links between types of decisions control and potential influences on results

Type of Decision	Type of Control	Participation Decision	Means by Which it Could Impact Output and Outcomes
Where	Location	What type of environment (*location*) that a student will work in.	• Environment could be distracting or conducive to personal learning abilities and practices. • Environment could be distracting or conducive to synchronous communications.
When	Timing	What *time* of the day and what day of the week to study.	• Certain times could fit better into a students schedule • Certain times could be more conducive or harmful to the learning process.
	Sequencing	How to *Sequence* the learning experience.	• Certain knowledge may be necessary before moving onto other areas. • Certain learning sequences could make learning more efficient.
How	Pacing	What *Pace* to work at.	• Going too fast might mean that students miss important information. • Going too slow might mean that students get stuck in the weeds or forget information as the learning progresses.
	Media Form	How the *Media* can be manipulated to the preferences of the user.	• Could make the learning more convenient for the student. • Could follow or not follow multimedia learning principles.
	Component -Activity	What *Activities*, *Assignments*, and *Assessments* to participate in.	• Could emphasize learning and practicing of certain knowledge, cognitive processes, or skills. • Certain activities, assignments, and formative assessments could be more aligned with outcomes and summative assessments than others. • Activities that are more aligned with outcomes and summative assessments could make the learning experience more cohesive and enjoyable.
What	Content	What *Content* to study.	• Could emphasize learning and practicing of certain knowledge, cognitive processes, or skills. • Certain content could be more aligned with outcomes and summative assessments than other content. • Content that is more aligned with outcomes and summative assessments could make the learning experience more cohesive and enjoyable.
Who	Interaction	Who to study with and interact with in the course.	• Certain students could be more distracting or conducive to learning process than others.

The issue of control can play an important role in student learning. For obvious reasons the ability to control content and component-activities can play a role in what and how a student learns. But other forms of control can have more subtle influence on student learning. This is important to consider beyond just the convenience of who has control. For example, timing of participation in activities could have a significant impact on learning outcomes. Romero & Barberá (2011) found that students perform better on both individual and collaborative tasks when they are performed in the morning, rather than the evening. Evening is better time for scheduling synchronous collaborative activities but it is not necessarily the best time for performing tasks. Romero & Barberá (2011, p.132) wrote, "Time flexibility is reduced by increased course and activity structure, collaborative learning and, particularly, synchronic communication. Students' time flexibility, understood as the capacity to spend time-on-task at different times of the day and week, is reduced by their professional, social, and family commitments."

Meta-Control and Negotiated Control. Another concept that has emerged from this research is that of meta-control, or control over control. In some cases, an instructor can make decisions about where control over certain portions of the course lie when conceptualizing and building a course. So, the instructor could decide if it will be the instructor or the student in control of the pacing of component-activities. While an instructor that creates and operates the course often enjoys this meta-control, its ownership can also reside elsewhere. In some schools, it is the institution that has meta-control over much of the course. For example, some universities have a course pre-programmed ahead of the course offering and the instructor's role is less of a structural decision-maker but instead, the instructor role is to help make course run smoothly.

Regardless, it has emerged from this research that during the set-up and operation of the course, there is a form of control that allows how much of each type of control is allowed for the different actors in the course.

Another theory that could work against or in unity with Meta-Control is Control Negotiation. *Control Negotiation* means that two or more actors negotiate for control. In that way, not one person has total control over control. The source of control could also be a negotiation between multiple sources – for example, the institution might want certain material to be taught, and the instructor could work to accommodate that in a way they find acceptable. The location could be negotiated between class-size, the institution, and the demands of the instructor. However, most of the time, control is not negotiated, nor is it negotiable. While Meta-Control has a strong theoretical foundation, Control Negotiation offers an equally strong theory. However, these two theories do not have to be mutually exclusive and may be important theories for different scenarios. Nevertheless, more research in the area of meta-control and control negotiation is needed.

Actor Prognosticator. Actors make predictions about what the course will look like and what their experience will be like in the course. One of the more broad findings from this research was how each actor predicts the operation of the course and how different actors will function within the course. Each actor, perhaps with the exclusion of media, makes predictions about how a course will operate. This includes the actor's own function as well as other actors. More frequently, the instructor would make predictions about how students would function in the course, while students would rarely say much about the logical paths of the instructor. This could be an artifact of the instruments and methodology. However, it seems that it has more to do with the roles that each of these

actors play. While instructors are paid to think about how students will function in a course, students need to think about their own path to successfully make it through the course. In other words, there is no incentive for the student to think about the instructor's path through the course, while there is often incentive for the instructor to think about the students'. However, this inquisitiveness may change depending on costs, benefits, external pressures.

In a sense, both students and the instructor were creating logic models in their heads that helped them make decisions in regard to the course. The students and instructor explained this logic when discussing why they made certain decisions. And while their logic often matched the framework, it was most frequently just bits and pieces of the framework and often missed important connections or large pieces of the framework presented in this dissertation. It was unclear why students reasoning would not illustrate a whole framework. This lack of a full model could have been a lack of effort describing their processes or perhaps they did not recognize properties and processes of their own mental model. Nevertheless, it was clear that students and the instructor built mental models for how the course operated and would make predictions for the results of participation.

Instructor Naturalism. In the original version of the framework, the instructor was conceptualized as being ideal and seeking to only benefit the student. Starting with some evidence in Study 1 but particularly during Studies 2 and 3, it became apparent that this was not always the case. The instructor for the course was ideal and seemed to fight for student gains. However, there were many instances in which the students complained about the TA behavior in some cases, while in other cases, the behavior of the TA was

praised as ideal. In one case, a student discussed a TA always coming in late and looking like he had not slept. The TA could have had a sleeping problem. However, if this TA was like many of the other graduate students out there, he was overworked and also needed to find time to work on his own research. Similarly, instructors at some institutions (the one under investigation included) give very little incentive (especially very little in the area of promotion or advancement) for professors to teach well. Thus, the final framework characterizes the instructor as more natural with the potential for positive and negative characteristics rather than an idealized instructor from the start.

Instructor as Coordinator/Conductor. The instructor in the case studied here acted as a conductor of a symphony might, keeping his eye on multiple aspects of the course all at once. His concern moved beyond his own actions and results and instead also kept in mind the decisions, actions and outcomes of other actors, especially the students. This instructor was found to conduct efficiency evaluations on behalf of him, the institution, and students. He sought to reduce costs, increase gains, and optimize the operational function for all actors involved in the course. However obvious this may seem since it is the job of the instructor to run the course, it will be important in future studies to determine when instructors act in the way this instructor did, as a conductor, and when the instructor is more selfish or unconcerned. Indeed, the actions of the TAs even in this very course were varied. Students commented that some TAs were excellent while others were late and unprepared for discussion section. Thus, while the framework provides a path to understanding how instructors work, differing goals, motivations, and interactions that they have with media and others in the class means that there is not one "type" of instructor.

Student Properties and Processes Discovered. This section describes some of the important properties and processes related to the student that were discovered during the studies in this dissertation.

***Student Decision Influences*.** Student Decisions Influenced by Efficiency Evaluation as well as Student Input and Course Variables such as Features of Media, Features of Curriculum and Content, and especially Sources and Types of Control. These variables were consistent across the types of decisions students made (whether to participate in the course, whether to participate in a component, how to participate in the course or component-activity).

Student Timing and Sequencing Patterns. Students tended to have different sequencing patterns. These patterns occurred at the level of the course-term and week-lesson. When looking at the sequencing styles for the 15 student cases, one can see that not a single one of the students had exactly the same sequence. Further, the component-activities were very different for many of the students. Below are the Timing Patterns and Sequencing Patterns that were discovered. The extent to which students use these patterns was beyond the scope of this study and should be studied in the future.

Timing Patterns

- Proactive Timing – Getting most of the work done early in the week
- Distributed Timing – Getting the work done throughout the week
- Delayed Timing – Getting the work done towards the end of the week
- Crammed Timing – Getting the work done at the last possible moment

Sequencing Patterns

- À la carte – Only one main information source is used before the assessment
- Service à la russe – Participate in one information source before the other (i.e. read text before watching videos)
- Service à la française – Participate in information sources simultaneously (i.e. watch videos and simultaneously consult book)

- Dessert during dinner – Participate in the weekly assessment and look up the relevant information from the information source simultaneously (i.e. take the quiz and consult book)

There was evidence that students made decisions about their sequencing in similar ways that they made other participation decisions. From this study, the only difference between sequencing decisions and other participation decisions was the consideration of operational functions such as access and process performance. This finding may have been the result of methodological issues related to the interviews. Students may have been making sequencing decisions in relation to access and process performance but might not have stated such during the interviews. Further research in this area would be beneficial for understanding if there are differences in the processes of decision-making for different types of decisions.

Student Friends. Based on the observations of the 15 student cases, it seems that having a friend in the course, prior to starting the class can have multiple effects, such as: less effort to interact with others; easy access to study partner; source for logistic information. All of these seem to make the course easier with fewer problems in operational functions, easier content learning; fewer costs. This could be dependent on the course and the friend. While the student cases indicated having a friend in the course can make a difference, more research in this area is needed to determine the extent of influence.

Independence of Student Experience. As shown by the case studies, each of the students had a very different experience in the course almost to the extent that it seemed that all 15 students were in a different course. As students that were given control over many aspects of the course, with the ability to choose from a range of instructional

activities (multiplicity), students were able to diverge from any planned learning process. As described through the individual student case studies, the different students had distinct experiences in the course. Further, differences in course experience could be seen between students in both online and in-person courses. And because the attendance for lecture in the in-person course was not mandatory, there was greater potential for variation in student experiences for the in-person course. However, the sample of interviewees may not have captured the extent of this variation since four out of the five interviewees were in regular attendance of the in-person lecture, whereas, approximately 75%-80% of the class stopped attending the in-person lecture after the first week or two in the term.

General Framework Properties

Properties and Processes Big and Small. The framework is a representation of things big and small. It can represent small processes in a course or large processes. Big processes for students include the decision to enroll in a course or developing the weekly learning sequencing for the quarter. Small processes might include deciding how to approach a particular homework assignment. This representation of things big and small applies to how the other actors move through the course as well. And as discussed later, many of these experiences are recycled as prior experience in the input area for the respective actor. In short, for each time an actor encounters an experience in the course, the actor will draw on and be influenced by their own input as well as the situation they are acting in and they will make an operation or participation decision. The actor will then operate or participate in that situation which leads to positive or negative output and outcomes that ultimately leads to impacts and potentially towards goal attainment. While the framework is compact, it represents a large set of potential properties and processes of each actor in the framework.

Areas to Influence. There are certain points in the framework that seem to have more potential *for* manipulation and some variables seem to have more potential results *from* manipulation. Some of these areas include input and course operation. Instructors and Institutions will benefit from understanding where these points of influence are, what can be changed, and what those changes will do. The framework provides a map and quick guide on where to look for these areas of influence.

Increasing Efficiency for Students. While there is reason for educators to be selfish about their efficiency evaluation, good educators will take into consideration

student efficiency and will thus, attempt to increase gains, decrease costs, and improve operational functions for students. And they will benefit from recognizing the influences of student characteristics and features of the course that will influence both student decisions, student participation, and results related to the student.

Student Reporting. One argument against the student decision area could be that it is a post-hoc interview. Students were answering questions about their decisions after the decisions occurred. They may have forgotten what the process was that they went through. Or the decision process they described may not have been the process that actually occurred but instead was justification for the decisions. However, the pattern was consistent for all students: the variables were the same; the categories of gain, cost, and operational function were consistent; and the influences were similar across students. While the actual process of decisions should be explored further, the reasoning that students gave should alert educators. Even if these were not the actual reasons students made decisions, it was at very least, their justification. And an institution can build or lose a reputation based on the reasoning students give for participating or not participating.

Student Types Caution. Case studies show that student behavior in online courses was nuanced. Students that seemed to be a better fit for the course might not have done that well. Some students that may have otherwise have done well were negatively influenced and received a lower grade (e.g. TA was a hard grader, quiz questions graded incorrectly, they did not get the same instructional coherence as other students) or the student may not have done as well but the format suited their life better. Although it might seem reasonable to create student typologies, this framework and the student cases

show that moving from input to outcome can vary tremendously depending on a number of potentially unpredictable variables. Because each course is different, parsing through potential confounding variables can be difficult, especially for large-scale statistical studies with multiple courses.

Framework for Online and In-Person. The framework reflected both online and in-person courses**.** While there are differences between the formats, this framework should work for both online and in-person courses. As explained in Chapter 2 of this dissertation, the difference between online and in-person courses has blurred. This framework was designed to allow for these differences. As a result, this framework could be used for higher education courses across the board.

Generalizability. The final framework reflects the expansive nature of this dissertation. Sources that led to the final version of the framework came from the initial literature review, the study of literature, the single course case study, and 15 student cases. While the course case study and student cases suggest a narrow source of support, the literature and theory behind the framework should allow the framework to work for a large range of courses and can be used to describe single courses and individual students. In Chapter 2, it was suggested that educators and online education researchers want to know *What Works* in online education. The framework provides a means of answering "What Works?" by examining a course from multiple angles.

CHAPTER 7: CONCLUSION

As more technology becomes pervasive through society and creeps into systems of education an understanding of how different actors and systems of education act and interact becomes more important. The framework of online education described in this dissertation provides structure for understanding the processes of online education and the interaction of different actors. The final framework that was found and applied through research in this dissertation provides a guide for understanding how online courses operate. While the framework is fairly simple, each node and connection on the framework represents a dense collection of properties and processes. Thus, this framework provides some comprehensive order to understanding these complex and potentially chaotic processes. This structure provides a general explanation of these processes and can be used as a guide for future research.

The framework presented in this dissertation adds a number of important developments to the field including, the definition of online, efficiency evaluation of actors in the classroom and the processes involved, the distinction between source and type of control, the determination of the different sources and types of control, the introduction of the idea of meta-control, the recognition of the competing interests for an instructor and teaching assistants within the context of an online course, an examination of how online courses are filled with variation and an explanation of why it is dangerous to generalize even a large number of findings about online education to the field. In other words, this dissertation serves as a guide to the field of online education for both educators and researchers.

This framework and dissertation has illustrated the competing interests of various actors in an online educational environment. Each actor can potentially have similar or different interests. In the course that was studies, the instructor had the interests of other actors in mind. He wanted students to learn efficiently and the university to run more effectively at a lower cost. In other cases, the various actors may have competing goals. A course can be more difficult to negotiate between these competing interests.

While student learning may be the ultimate goal for education, not all actors will see student learning as their most important goal. Instructors may just want to pass tenure and institutions may just want to have positive review, student retention, and increased revenues. Efficient learning seems to be a main process of student decision-making. And students in the cases studies described that their satisfaction (or in some cases, dissatisfaction) was related to how efficient the learning process was. If efficient learning is determined to be important as either a primary goal or a secondary goal for any of the actors, then the actor would want to figure out what types of resources should be devoted to making efficient learning possible. For example, if course creators realize that videos should be developed in a specific way to improve learning but it costs some money or time, then they might seek assistance from the institution. The institution would then need to determine if they should provide the capital (possibly money, time commitment, and/or in consultation from experts) to develop these videos. Another important consideration that would require resources from educators is the willingness to invest in research that would inform what works and what does not work in an efficient manner. This model can help illustrate the various processes involved in the implementation of the

course. This can help educators understand competing interests or educators determine how each actor can influence a course.

The framework proposed in this dissertation points to some important areas to focus on. Course creators and operators can manipulate certain aspects of the course to influence the learning process. Two areas that can be influenced are Input and Course Operation. For example, one issue that can be influenced before and during the course is source and type of control for the course and component-activities. Part of the understanding of what makes learning efficient is getting a handle on what kinds of control should be in place. Research might suggest that a very structured type of environment, where certain things are sequenced in a certain order. For example, it might be determined that watching a video before reading the book or read the notes, or doing some other type of information gathering prior to completing problems is the most efficient way to learn a concept, process, or principle. But, if a student needs the ability or leeway to develop their own schedule because of conflicting interests, such as a job or another class, an efficient type of control situation that is determined by the instructor may not work for them. However, there is a possibility of a negotiated situation where the instructor lets the class know that in a psychology lab-type learning environment, this is the most efficient way. And so the instructor could set up a ground rule that if the student has a reasonable excuse to move out of this controlled situation, then they may act on that excuse and self-sequence. So, educators could adopt negotiated meta-control.

The framework in this dissertation shows that the actors have different and sometimes competing efficiency interests. Each actor has a prioritized interest in his/her own ability to be efficient with his or her own resources (Time, Effort, Money, and

Physical Resources). Consider the following hypothetical situation of various interests for different actors in a course:

- The student wants to have efficient learning or efficiently pass the course.
- The Institution wants to cut the costs, increase profits, decrease student attrition, and increase student enrollment.
- The media has learning outcome goals that are developed by the people that assembled the media (distributed intelligence).
- The instructor has a conductor type of role, where they are thinking about each of the actors in the framework but also has tenure and career advancement goals.

So, even the instructor that might have a conductor type of role could be thinking about their own interests while simultaneously calculating institutional costs, getting the student to learn as quickly as possible, and making sure that the media does what it is supposed to do in an efficient manner.

However, we do not know that each instructor is going to have the interests of others in mind, partly because of the instructor naturalism. Or the instructor could have conflicting goals. In the case examined in this dissertation, the teaching assistant seemed to have work or a sleeping schedule that interfered with this role as an instructor. In that situation, they put in less focused time into the course than the students needed. Further, the instructor can only do so much for each of the actors. Teaching a course that is efficient for student learning takes time and money and there is a finite amount of these resources for each instructor. An instructor can only put in a certain amount of time before they bump up against the natural time limits of the course, of their day, of the week, and other commitments, such as the basics like eating and sleeping. The same goes for money. The instructor is afforded only so much money in their budget (if any) and even if the instructor is altruistic and wants to invest their own money into the course,

they can only invest so much before there are limits (e.g. going into debt or second-guessing why they are investing the money).

For each actor, there is a balance in deciding how much to invest in a course and figuring out where that investment will come from. The students will invest more time, money, and effort if they feel the outcome is something that is going to be beneficial for them and meets their goals for the course. The institution will invest money and resources if they think that the course will provide help in meeting their goals. Actors have to also determine whether or not the investment is sustainable. So, if it is a one-time, one-shot course that will not continue with the resources developed, then an institution might not be willing to invest a lot into that course. But the institution may invest in a course that can be continued to be taught year-after-year with just the original development costs. By not developing an efficient learning experience, the costs get passed onto the student in terms of effort, time, and possibly money and resources. The creation of an efficient learning environment is a negotiated process that relates to control, making decisions about the course, deciding where the time, money, effort, and resources should be spent, and who should spend it.

The framework can help the various actors figure out what is involved in a course and a program. For example, an institution can look and see that learning processes are much more than just putting courses out there and hiring instructors. An instructor can reference the framework to determine where they can invest time in the creation and operation of a course. Using this framework can help researchers understand the logic of a course. Researchers can use the framework to reference what aspects of online education they are researching and what areas have been ignored. Researchers can better

spot the areas of an online course they might not have otherwise have thought about. This can help them offer competing analyses of their findings. Or it could help them explain why their research was causal. In other words, framework allows educators to reference where they can have influence in a course and allows researchers to reference what they have and have not researched in a course.

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**References used in the expanded review for Study 1. Articles may appear in other areas of the paper in addition to the review. For areas of the framework where the articles had variables identified, see Appendix H. As explained in the Methods and Results, not all articles in the expanded review are particular to online, distance, or hybrid.

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Appendix A: Course Components

Table A1
Components of the online course

Component-Activity Name	*Component-Activity Description*	*Mandatory or Optional*
Announcement (Online, LMS Announcement Section)	The instructor and TA provide students with periodic announcements related to the course and feedback on students' course progress.	Optional
Assignments, Student Presentations during Discussion Sections (Online, Adobe Connect)	Students conducted presentations on their essay assignments in their discussion section.	Mandatory
Assignments, Writing, Short Answer, Reading and Research, "Learning Exercises"	Students had one learning exercise due every other week and reviewed answers during their discussion sections. There were a total of five learning exercises. These exercises usually required readings and some external research. While the exercises had a short answer response format, they were often paired with the course essays for further conceptual examination.	Mandatory
Assignments, Writing, Short Papers / Essays	Every other week students were assigned an essay assignment on topic related to global climate change. There are a total of five essay assignments. Each of these short papers were 2-3 pages in length and had to include references. The essays had connections to the "Learning Exercises".	Mandatory
Discussion Section (Online, Adobe Connect)	Students attended weekly discussion sections.	Mandatory
Discussion, Question and Answer (Online, Piazza)	Students posted questions about the course at their convenience.	Optional
Exam Review Sessions, Midterm and Final (In-Person and Online through Adobe Connect)	Hosted by the instructor in a classroom or over Adobe Connect (Students could choose one or both), these meetings were held to review the material leading up to the exams. Students were informed of the review session through the Announcement Section (or through email update) on the LMS.	Optional
Exam, Final, Proctored (In-Person or Online through ProctorU)	The final exam consisted of 40 multiple-choice questions and one essay.	Mandatory
Exam, Midterm, Proctored (In-Person or Online through ProctorU)	The midterm consisted of 20 multiple-choice questions and one essay.	Mandatory
External Website, Subject-related, Supplemental Resource (embedded in LMS)	Students had the option to view supplementary external website that was embedded in the LMS. The website provided supplementary materials that could be helpful to the students' weekly exercises and essays.	Optional
Gradebook (Online, LMS Gradebook	This tracked students' completion of	Optional

Software)	assignments.	
Instructor Introductions by Instructor and TAs, Personal Profiles, Short Written Excerpt (Online, Profile Blog)	The instructor and TAs posted short paragraph form biographies about their interests and experience in the content area.	Optional
Lectures (Online, Replayable Videos)	Each week students were assigned to watch videos, which serve as the weekly lecture.	Optional
Office Hours (Online, Adobe Connect)	The instructor held one scheduled online office hour per week using Adobe Connect.	Optional
Quizzes, Graded (Online, Quizzing Software)	After students go through the weekly topic videos, readings, and assignments, they took a quiz associated with each weekly topic. There are a total of ten online quizzes – one for each week.	Mandatory
Readings, Text (PDFs and embedded webpages accessed on LMS)	Students were provided weekly readings that complemented the course lectures.	Optional
Readings, Textbook (Hard-Copy and Online copy available)	Each week students were assigned reading assignments that provided an overview of the week's course concepts. Some course readings were mandatory while others are optional.	Optional
Supplementary Video, Logistics, How to navigate the LMS operate Adobe Connect and Piazza and expectations from modules (Online, Replayable Video)	Videos were posted on the LMS that students were able to view to help them navigate the course site and some of the online applications/programs and a video explaining the course modules.	Optional
Supplementary Videos, Writing and Research Instruction, Developed through University Library (Online, Replayable Video)	Students had the option to view supplementary videos that were stored on the library website (embedded in the courses' LMS) that related to various topics such as writing a research term paper and conducting a literature review.	Optional
Text, Lecture Notes/Slides	Students were provided weekly lecture notes/slides to supplement the lectures for the week.	Optional
Text, Lecture Transcripts	Students were able to download and read through the lecture transcripts from the replayable videos if they chose to as supplement or replacement for the lecture.	Optional
Website, Main Course LMS (CoLE and Canvas)	The course ran on CoLE during the first implementation and on Canvas during the latter two. Online Course Website. Organizes course material in one location. There are various site-internal links that link to pages that provide information, materials, or links to materials.	Optional

Table A1 Continued
Components of the online course

Component-Activity Name	*Component-Activity Description*	*Mandatory or Optional*
Gradebook (Online, LMS Gradebook Software)	This tracked students' completion of assignments.	Optional
Instructor Introductions by Instructor and TAs, Personal Profiles, Short Written Excerpt (Online, Profile Blog)	The instructor and TAs posted short paragraph form biographies about their interests and experience in the content area.	Optional
Lectures (Online, Replayable Videos)	Each week students were assigned to watch videos, which serve as the weekly lecture.	Optional
Office Hours (Online, Adobe Connect)	The instructor held one scheduled online office hour per week using Adobe Connect.	Optional
Quizzes, Graded (Online, Quizzing Software)	After students go through the weekly topic videos, readings, and assignments, they took a quiz associated with each weekly topic. There are a total of ten online quizzes – one for each week.	Mandatory
Readings, Text (PDFs and embedded webpages accessed on LMS)	Students were provided weekly readings that complemented the course lectures.	Optional
Readings, Textbook (Hard-Copy and Online copy available)	Each week students were assigned reading assignments that provided an overview of the week's course concepts. Some course readings were mandatory while others are optional.	Optional
Supplementary Video, Logistics, How to navigate the LMS operate Adobe Connect and Piazza and expectations from modules (Online, Replayable Video)	Videos were posted on the LMS that students were able to view to help them navigate the course site and some of the online applications/programs and a video explaining the course modules.	Optional
Supplementary Videos, Writing and Research Instruction, Developed through University Library (Online, Replayable Video)	Students had the option to view supplementary videos that were stored on the library website (embedded in the courses' LMS) that related to various topics such as writing a research term paper and conducting a literature review.	Optional
Text, Lecture Notes/Slides	Students were provided weekly lecture notes/slides to supplement the lectures for the week.	Optional
Text, Lecture Transcripts	Students were able to download and read through the lecture transcripts from the replayable videos if they chose to as supplement or replacement for the lecture.	Optional
Website, Main Course LMS (CoLE and Canvas)	The course ran on CoLE during the first implementation and on Canvas during the latter two. Online Course Website. Organizes course material in one location. There are various site-internal links that link to pages that provide information, materials, or links to	Optional

materials.

Appendix B: Pre-Course Student Survey Questions

Table B1

Pre-course survey question 1: Demographic questions used in data analysis

Question Number	Item / Question	Answer Choices	Scale
1b	What is your date of birth?	Dropdown	Choose One
1c	What is your sex?	Male/Female	Choose One

Table B2

Pre-course survey question 3a: Reasons for taking the online version of the course

Question: *Why did you choose to take the online version of this course?*

Question Number	Answer Choices	Scale
3a	Flexibility in my schedule To be able to learn at my own pace Because I thought it would be easier I always wanted to take an online course It was the only section I was able to register for Because I have a job The in-person course wasn't offered this term Other (please specify) _____	Select All that Apply

Table B3

Pre-course survey question 4b: Reasons for taking the in-person version of the course

Question: *Why did you choose to take the in-person course rather than the online version of the course?*

Question Number	Answer Choices	Scale
4b	I like in-person interactions with other people I am used to learning this way Registration for the online section of the course was a hassle I like the lecture format I didn't know about the online course The online course wasn't offered this term Other (please specify)	Select All that Apply

Table B4

Pre-course survey question 5: Enrollment status

Question: *What is your [university name] enrollment this term?*

Question Number	Answer Choices	Scale
5	◊ Full-time ◊ Part-time ◊ Concurrently enrolled ◊ Enrolled through extension ◊ Will not be enrolled ◊ Graduated	Choose One

Table B5

Pre-course survey question 7: Years in college

Question: *How many years have you been in college (please round up for any half of year or more)?*

Question Number	Answer Choices	Scale
7	◊ Not officially in college yet ◊ 1 year ◊ 2 years ◊ 3 years ◊ 4 years ◊ 5 years ◊ 6 years ◊ More than 6 years of college	Choose One

Table B6

Pre-course survey question 8:

Question: *How many miles do you live from the campus where this course is offered?*

Question Number	Answer Choices	Scale
8	◊ I live on campus ◊ 5 miles or less ◊ Between 6 miles and 15 miles ◊ Between 16 miles and 50 miles ◊ More than 50 miles	Choose One

Table B7

Pre-course survey question 9:

Question: *How many online courses have you taken?*

Question Number	Answer Choices	Scale
9	◊ 0 ◊ 1 ◊ 2 ◊ 3 ◊ 4 ◊ More than 4	Choose One

Table B8

Pre-course survey question 10:

Question: *Why did you decide to enroll in this course?*

Item Number	Answer Choices	Scale
10a	To fulfill a prerequisite in another department	
10b	To fulfill a prerequisite in this department	
10c	To fulfill a requirement in my major/minor	
10d	To fulfill a general education requirement	
10e	For my own general interest	Select All that Apply
10f	It would look good to employers or others who may look at my transcript	
10g	A friend recommended this course	
10h	Other (please specify)	

Table B9

Pre-course survey question 11:

Question: *To what extent do you agree that the following characteristics are associated with online courses?*

Item Number	Item	Scale
11a	Online courses are self-paced.	Likert 1-7: Strongly Disagree --- Strongly Agree
11b	Online courses are accessible anytime/anywhere.	Likert 1-7: Strongly Disagree --- Strongly Agree
11c	Online courses have a high quality curriculum.	Likert 1-7: Strongly Disagree --- Strongly Agree
11d	Online courses promote a high level of interaction with *classmates* about course content.	Likert 1-7: Strongly Disagree --- Strongly Agree
11e	Online courses promote a high level of interaction with the *teaching assistants* about course content.	Likert 1-7: Strongly Disagree --- Strongly Agree
11f	Online courses promote a high level of interaction with the *instructors* about course content.	Likert 1-7: Strongly Disagree --- Strongly Agree
11g	Online courses promote a high level of interaction with the *course materials*.	Likert 1-7: Strongly Disagree --- Strongly Agree

Table B10

Pre-course survey question 12:

Question: *Which of these statements BEST describes your approach to learning?*

Item Number	Answer Choices	Scale
12a	◊ I work to perform better than other students.	
12b	◊ I work to understand the content of a course as thoroughly as possible.	
12c	◊ I do the minimum work necessary to pass the course.	Choose One
12d	◊ I work hard to get the best grade I can.	
12e	◊ I work to avoid performing worse than other students.	

Table B11

Pre-course survey question 13:

Question: *To what extent do you agree with the following statements about this course?*

Item Number	Item	Scale
13a	It is important for me to learn the content in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
13b	I am very interested in the subject area of this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
13c	I will be able to understand the most difficult material presented in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
13d	I will be able to learn the basic concepts taught in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
13e	I will be able to master the skills taught in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
13f	I have the prerequisite knowledge to perform well in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
13g	The content in this course is useful for me to learn.	Likert 1-7: Strongly Disagree --- Strongly Agree

Table B12

Pre-course survey question 14:

Question: *To what extent do you agree with the following statements?*

Item Number	Item	Scale
14a	The quality of online courses at the [university name] is lower than in-person courses at the [university name].	Likert 1-7: Strongly Disagree --- Strongly Agree
14b	The format of this course will allow me the freedom to organize my time more effectively.	Likert 1-7: Strongly Disagree --- Strongly Agree
14c	I feel comfortable using online applications to communicate with others.	Likert 1-7: Strongly Disagree --- Strongly Agree
14d	Communication about course content is better in-person than online.	Likert 1-7: Strongly Disagree --- Strongly Agree
14e	I learn better in courses that are in-person than in courses that are online.	Likert 1-7: Strongly Disagree --- Strongly Agree

Table B13

Pre-course survey question 15:

Question: *To what extent do you agree with the following statements?*

Question Number	Item	Scale
15a	After this course, I plan to take more classes in this *subject area.*	Likert 1-7: Strongly Disagree --- Strongly Agree
15b	I feel confident about my ability to perform well in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree

Table B14

Pre-course survey question 16:

Question: *In this course, how often do you feel that you will seek support from the following people?*

Question Number	Item	Scale
16a	Students enrolled in this course	Likert 1-7 & N/A: Never --- Very Often & (Don't Know)
16b	Students not enrolled in this course	Likert 1-7 & N/A: Never --- Very Often & (Don't Know)
16c	Teaching Assistants	Likert 1-7 & N/A: Never --- Very Often & (Don't Know)
16d	Instructors	Likert 1-7 & N/A: Never --- Very Often & (Don't Know)
16e	University support services (e.g. tutors, writing centers, EOP, Upward Bound, etc.)	Likert 1-7 & N/A: Never --- Very Often & (Don't Know)

Table B15

Pre-course survey question 17:

Question: *To what extent do you agree with the following statements?*

Item Number	Item	Scale
17a	During this course, I expect to develop a connection with my classmates.	Likert 1-7: Strongly Disagree --- Strongly Agree
17b	During this course, I expect to interact with classmates often.	Likert 1-7: Strongly Disagree --- Strongly Agree
17c	During this course, I expect to interact with teaching assistants often.	Likert 1-7: Strongly Disagree --- Strongly Agree
17d	During this course, I expect to interact with instructors often.	Likert 1-7: Strongly Disagree --- Strongly Agree

Table B16

Pre-course survey question 18:

Question: *How effective do you believe the following activities are in helping you learn course material?*

Item Number	Item	Scale
18a	Listening to an in-person lecture	Likert 1-7 & N/A: Extremely Ineffective --- Extremely Effective & (Don't Know)
18b	Having an instructor work out an example before I do it myself	
18c	Watching replayable videos (lecture, content, etc.)	
18d	Creating multimedia presentations	
18e	Using interactive applications (games, virtual labs, etc.)	
18f	Using online textbooks	
18g	Using web-based chat rooms	
18h	Using wikis	
18i	Contributing to blogs	
18j	Participating in discussion boards	
18k	Online office hours	
18l	In-person office hours	
18m	Giving presentations	
18n	Working on a group project	
18o	Working on a case study	
18p	Writing papers	
18q	Solving problems	
18r	Taking ungraded quizzes	
18s	Taking graded quizzes	
18t	Discussions with classmates about course readings/content	
18u	Discussions with teaching assistants about course readings/content	
18v	Discussions with instructors about course readings/content	
18w	Readings	
18x	Instructor's Lecture Notes	
18y	Working with others to solve problems	

Table B17

Pre-course survey question 19:

Question: *How effective do you believe the following assessments are in allowing you to demonstrate your knowledge of course content?*

Item Number	Item	Scale
19a	Multiple choice questions/tests	Likert 1-7 & N/A: Extremely Ineffective --- Extremely Effective & (Don't Know)
19b	Graded quizzes	Likert 1-7 & N/A: Extremely Ineffective --- Extremely Effective & (Don't Know)
19c	Ungraded quizzes right after learning content	Likert 1-7 & N/A: Extremely Ineffective --- Extremely Effective & (Don't Know)
19d	Essays	Likert 1-7 & N/A: Extremely Ineffective --- Extremely Effective & (Don't Know)
19e	Short answers	Likert 1-7 & N/A: Extremely Ineffective --- Extremely Effective & (Don't Know)
19f	Electronic portfolios	Likert 1-7 & N/A: Extremely Ineffective --- Extremely Effective & (Don't Know)
19g	Simulations	Likert 1-7 & N/A: Extremely Ineffective --- Extremely Effective & (Don't Know)
19h	Hands-on projects	Likert 1-7 & N/A: Extremely Ineffective --- Extremely Effective & (Don't Know)
19i	Homework sets	Likert 1-7 & N/A: Extremely Ineffective --- Extremely Effective & (Don't Know)
19j	Proctored exams	Likert 1-7 & N/A: Extremely Ineffective --- Extremely Effective & (Don't Know)
19k	Student presentations	Likert 1-7 & N/A: Extremely Ineffective --- Extremely Effective & (Don't Know)

Table B18

Pre-course survey question 20:

Question: *How would you identify your race/ethnicity?*

Item Number	Answer Choices	Scale
20a	American Indian or Alaska Native	Select All that Apply
20b	Asian	Select All that Apply
20c	Black or African-American	Select All that Apply
20d	Latino(a)/Chicano(a)/Hispanic	Select All that Apply
20e	Native Hawaiian or Pacific Islander	Select All that Apply
20f	White	Select All that Apply
20g	Other (please specify)	Select All that Apply
20h	[Text Box] [continuation of race_07 - For Summer 2012 on, this is not preceded by race_07 and only has open-ended response.]]	Select All that Apply

Appendix C: Post-Course Student Survey Questions

Table C1

Post-Course Survey Question 2

Question: *To what extent do you agree that the following characteristics are associated with this course?*

Item Number	Item	Scale
2a	This course was self-paced.	Likert 1-7: Strongly Disagree --- Strongly Agree
2b	This course was accessible anytime/anywhere.	Likert 1-7: Strongly Disagree --- Strongly Agree
2c	This course had a high quality curriculum.	Likert 1-7: Strongly Disagree --- Strongly Agree
2d	This course promoted a high level of interaction with classmates about course content.	Likert 1-7: Strongly Disagree --- Strongly Agree
2e	This course promoted a high level of interaction with the teaching assistants about course content.	Likert 1-7: Strongly Disagree --- Strongly Agree
2f	This course promoted a high level of interaction with the instructor about course content.	Likert 1-7: Strongly Disagree --- Strongly Agree
2g	This course promoted a high level of interaction with the course materials.	Likert 1-7: Strongly Disagree --- Strongly Agree

Table C2

Post-Course Survey Question 3

Question: *Which of these statements BEST describes your approach to learning in this class?*

Item Number	Answer Choices	Scale
3	◊ I worked to perform better than other students. ◊ I worked to understand the content of this course as thoroughly as possible. ◊ I did the minimum work necessary to pass the class. ◊ I worked hard to get the best grade that I could. ◊ I worked to avoid performing worse than other students.	Choose One

Table C3

Post-Course Survey Question 4

Question: *To what extent do you agree with the following statements about this course?*

Item Number	Item	Scale
4a	It was important for me to learn the content in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
4b	I am very interested in the subject area of this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
4c	I understood the most difficult material presented in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
4d	I learned the basic concepts taught in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
4e	I mastered the skills taught in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
4f	Looking back, I feel that I had the prerequisite knowledge to perform well in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree

Table C4

Post-Course Survey Question 5

Question: *To what extent do you agree with the following statements?*

Item Number	Item	Scale
5a	The quality of online courses at [this university] is lower than the quality of in-person courses at [this university].	Likert 1-7: Strongly Disagree --- Strongly Agree
5b	The format of this course allowed me the freedom to organize my time more effectively.	Likert 1-7: Strongly Disagree --- Strongly Agree
5c	I feel comfortable using online applications to communicate with others.	Likert 1-7: Strongly Disagree --- Strongly Agree
5d	Communication about course content is better in-person than online.	Likert 1-7: Strongly Disagree --- Strongly Agree
5e	I learn better in courses that are in-person than in courses that are online.	Likert 1-7: Strongly Disagree --- Strongly Agree
5f	If given the opportunity, I am likely to enroll in online courses at [this university] in the future.	Likert 1-7: Strongly Disagree --- Strongly Agree

Table C5

Post-Course Survey Question 5.1

Item Number	Question	Scale
5.1a	What would be the main reason for not taking an online course at [this university] in the future?	Open-Ended Question
5.2b	What would be the main reason for taking an online course at [this university] in the future?	Open-Ended Question

Table C6

Post-Course Survey Question 6

Question: *To what extent do you agree with the following statements?*

Item Number	Item	Scale
6a	After this course, I plan to take more classes in this subject area.	Likert 1-7: Strongly Disagree --- Strongly Agree
6b	I felt confident about my ability to perform well in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree

Table C7

Post-Course Survey Question 7

Question: *How often did you seek out the following supports for help with this course?*

Item Number	Item	Scale
7a	Students enrolled in this course	Likert 1-7: Never --- Very Often
7b	Students not enrolled in this course	Likert 1-7: Never --- Very Often
7c	Teaching Assistants	Likert 1-7: Never --- Very Often
7d	Instructors	Likert 1-7: Never --- Very Often
7e	University support services (e.g. tutors, writing centers, EOP, Upward Bound, etc.)	Likert 1-7: Never --- Very Often

Table C8

Post-Course Survey Question 8

Question: *To what extent do you agree with the following statements about this course?*

Item Number	Item	Scale
8a	I developed a connection with my classmates.	Likert 1-7: Strongly Disagree --- Strongly Agree
8b	I felt isolated from my classmates.	Likert 1-7: Strongly Disagree --- Strongly Agree
8c	I often interacted with my classmates.	Likert 1-7: Strongly Disagree --- Strongly Agree
8d	I enjoyed my interactions with my classmates.	Likert 1-7: Strongly Disagree --- Strongly Agree
8e	I often interacted with the teaching assistants.	Likert 1-7: Strongly Disagree --- Strongly Agree
8f	I enjoyed my interactions with the teaching assistants.	Likert 1-7: Strongly Disagree --- Strongly Agree
8g	I often interacted with the instructor.	Likert 1-7: Strongly Disagree --- Strongly Agree
8h	I enjoyed my interactions with the instructor.	Likert 1-7: Strongly Disagree --- Strongly Agree

Table C9

Post-Course Survey Question 9

Question: *To what extent do you agree with the following statements about this course?*

Item Number	Item	Scale
9a	There were many ways for me to check my understanding of the course material (e.g., quizzes, prompts, resources).	Likert 1-7: Strongly Disagree --- Strongly Agree
9b	I was often given helpful feedback from the instructor or teaching assistant.	Likert 1-7: Strongly Disagree --- Strongly Agree
9c	The material on the exams, papers, or other assessments tested what I was responsible for learning.	Likert 1-7: Strongly Disagree --- Strongly Agree
9d	When the content was too difficult, there were supports available to help me learn the material.	Likert 1-7: Strongly Disagree --- Strongly Agree
9e	I took advantage of the resources available in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
9f	The class material was organized in a way that made sense.	Likert 1-7: Strongly Disagree --- Strongly Agree
9g	I knew what I needed to do for this course each week.	Likert 1-7: Strongly Disagree --- Strongly Agree
9h	It was easy to find and access the work that I needed to do for this course each week.	Likert 1-7: Strongly Disagree --- Strongly Agree
9i	I participated in all course assignments and activities.	Likert 1-7: Strongly Disagree --- Strongly Agree
9j	I completed all of my assignments by the due date.	Likert 1-7: Strongly Disagree --- Strongly Agree

Table C10

Post-Course Survey Question 10

Question: *To what extent do you agree with the following statements about this course?*

Item Number	Item	Scale
10a	I enjoyed the course materials and/or activities.	Likert 1-7: Strongly Disagree --- Strongly Agree
10b	The course materials and/or activities sustained my interest.	Likert 1-7: Strongly Disagree --- Strongly Agree
10c	The course materials and/or activities made me rethink ideas that I had about course concepts.	Likert 1-7: Strongly Disagree --- Strongly Agree
10d	I found the course materials and/or activities to be intellectually challenging.	Likert 1-7: Strongly Disagree --- Strongly Agree
10e	The course materials and/or activities caused me to reflect on my understanding of the course content.	Likert 1-7: Strongly Disagree --- Strongly Agree
10f	I was able to connect the course content to information outside the course curriculum.	Likert 1-7: Strongly Disagree --- Strongly Agree
10g	The course material and/or activities helped me understand key course concepts and facts.	Likert 1-7: Strongly Disagree --- Strongly Agree
10h	The course material and/or activities helped me remember key course concepts and facts.	Likert 1-7: Strongly Disagree --- Strongly Agree

Table C11

Post-Course Survey Question 11

Question: *To what extent do you agree with the following statements about this course?*

Item Number	Item	Scale
11a	My classmates valued my thoughts and opinions.	Likert 1-7: Strongly Disagree --- Strongly Agree
11b	The teaching assistants and/or the instructor valued my thoughts and opinions.	Likert 1-7: Strongly Disagree --- Strongly Agree
11c	I learned how to interact more effectively with classmates to enhance my learning.	Likert 1-7: Strongly Disagree --- Strongly Agree
11d	I learned how to interact more effectively with the teaching assistants and/or the instructor.	Likert 1-7: Strongly Disagree --- Strongly Agree
11e	My classmates made me rethink ideas that I had about course concepts.	Likert 1-7: Strongly Disagree --- Strongly Agree
11f	I felt comfortable sharing my thoughts and opinions with my classmates.	Likert 1-7: Strongly Disagree --- Strongly Agree
11g	My interactions with classmates increased my understanding of course material.	Likert 1-7: Strongly Disagree --- Strongly Agree
11h	My interactions with teaching assistants and/or the instructor increased my understanding of course material.	Likert 1-7: Strongly Disagree --- Strongly Agree

Table C12

Post-Course Survey Question 12

Question: *How much did you like these course activities?*

Item Number	Item	Scale
12a	Watching replayable videos (lecture, content, etc.)	Likert 1-7: Really Disliked --- Really Liked
12b	Writing papers	Likert 1-7: Really Disliked --- Really Liked
12c	Taking graded quizzes	Likert 1-7: Really Disliked --- Really Liked
12d	Piazza	Likert 1-7: Really Disliked --- Really Liked
12e	Adobe Connect	Likert 1-7: Really Disliked --- Really Liked
12f	Watching student presentations	Likert 1-7: Really Disliked --- Really Liked
12g	Readings	Likert 1-7: Really Disliked --- Really Liked
12h	Listening to the in-person lecture from the instructor for this course	Likert 1-7: Really Disliked --- Really Liked

Table C13

Post-Course Survey Question 13

Question: *How effective do you believe the following activities were in helping you learn the course material?*

Item Number	Item	Scale
13a	Watching replayable videos (lecture, content, etc.)	Likert 1-7: Extremely Ineffective --- Extremely Effective
13b	Writing papers	Likert 1-7: Extremely Ineffective --- Extremely Effective
13c	Taking graded quizzes	Likert 1-7: Extremely Ineffective --- Extremely Effective
13d	Piazza	Likert 1-7: Extremely Ineffective --- Extremely Effective
13e	Adobe Connect	Likert 1-7: Extremely Ineffective --- Extremely Effective
13f	Watching student presentations	Likert 1-7: Extremely Ineffective --- Extremely Effective
13g	Readings	Likert 1-7: Extremely Ineffective --- Extremely Effective
13h	Listening to the in-person lecture from the instructor for this course	Likert 1-7: Extremely Ineffective --- Extremely Effective

Table C14

Post-Course Survey Question 14

Question: *How effective do you believe the following assessments were in allowing you to demonstrate your knowledge of the course content?*

Item Number	Item	Scale
14a	Multiple choice questions/tests	Likert 1-7: Extremely Ineffective --- Extremely Effective
14b	Graded quizzes	Likert 1-7: Extremely Ineffective --- Extremely Effective
14c	Essays	Likert 1-7: Extremely Ineffective --- Extremely Effective
14d	Homework sets	Likert 1-7: Extremely Ineffective --- Extremely Effective
14e	Proctored exams	Likert 1-7: Extremely Ineffective --- Extremely Effective

Table C15

Post-Course Survey Question 15

Question: *Overall, how many times did technology fail for this course?*		
Item Number	**Answer Choices**	**Scale**
	◊ Never ◊ 1-5 times ◊ 6-10 times ◊ 11-15 times	Choose One
15a	◊ More than 15 times	
15b	Please describe how the technology failed?	[Text Box]

Table C16

Post-Course Survey Question 16

Question: *How did you access online materials for this course?*		
Item Number	**Answer Choices**	**Scale**
16a	Desktop computer at home	Select All that Apply
16b	Desktop computer at the library	
16c	Laptop	
16d	Tablet	
16e	Smartphone	
16f	A friend's computer	
16g	Other	
16h	N/A(Not applicable for my experience in this course)[Note: Item is for In-Person courses only]	
16i	(please specify)_____	

Table C17

Post-Course Survey Questions 17 and 18

Item Number	**Question**	**Scale**
17	On average, how many hours per week did you spend on all aspects of this course?	[Text Box]
18	While taking this course, how many hours per week were you employed?	I was not employed 0-5 hours/week 6-10 hours/week 11-15 hours/week 16-20 hours/week 21-30 hours/week More than 30 hours/week

Table C18

Post-Course Survey Question 19

Question: *To what extent do you agree with the following statements about this course?*

Item Number	Item	Scale
19a	The rules for communicating online were clearly explained in this course. [Note: Item is for Online courses only]	Likert 1-7: Strongly Disagree --- Strongly Agree
19b	My attitude toward the subject matter improved as a result of this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
19c	Overall, I was satisfied with this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
19d	I would recommend this course to others.	Likert 1-7: Strongly Disagree --- Strongly Agree

Table C19

Post-Course Survey Question 20

Question*: *To what extent do you agree with the following statements?*

Item Number	Item	Scale
20a	I watched at least one site tutorial video for this course (i.e., Course Site Layout, Using Adobe connect, Using Piazza, and/or Learning Materials).	Yes/No with Skip Logic, if No, skip section
20b	The site tutorial videos made it easier for me to navigate through the course site.	Likert 1-7: Strongly Disagree --- Strongly Agree
20c	The site tutorial videos helped me learn to use the course's online applications (i.e., Piazza, Adobe Connect, etc.).	Likert 1-7: Strongly Disagree --- Strongly Agree
20d	The learning exercises were effective in helping me learn the course content	Likert 1-7: Strongly Disagree --- Strongly Agree & (N/A)
20e	I enjoyed the learning exercises.	Likert 1-7: Strongly Disagree --- Strongly Agree & (N/A)
20f	The learning exercises prepared me for the writing assignments.	Likert 1-7: Strongly Disagree --- Strongly Agree & (N/A)

*Question was used for all but the first item in this series

Table C20

Post-Course Survey Question 21

***Question*:** *To what extent do you agree with the following statements?*		
Item Number	**Item**	**Scale**
21a	I watched at least one Library Video on How to Conduct Research during this course.	Yes/No with Skip Logic, if No, skip section
21b	The Library Video(s) on How to Conduct Research helped me complete the course assignments.	Likert 1-7: Strongly Disagree --- Strongly Agree
21c	The Library Video(s) on How to Conduct Research taught me essential skills that will help me in other courses.	Likert 1-7: Strongly Disagree --- Strongly Agree

*Question was used for all but the first item in this series

Table C21

Post-Course Survey Question 22

***Question*:** *To what extent do you agree with the following statements?*		
Item Number	**Item**	**Scale**
22a	I watched at least one Library Video on How to Write a Research Paper during this course.	Yes/No with Skip Logic, if No, skip section
22b	The Library Video(s) on How to Write a Research Paper helped me complete the course assignments.	Likert 1-7: Strongly Disagree --- Strongly Agree
22c	The Library Video(s) on How to Write a Research Paper taught me essential skills that will help me in other courses.	Likert 1-7: Strongly Disagree --- Strongly Agree

*Question was used for all but the first item in this series

Table C22

Post-Course Survey Question 23

***Question*:** *To what extent do you agree with the following statements?*

Item Number	Item	Scale
23a	I used the course website at least once in this course	Yes/No: Skip Logic for Video_00: If Yes, move onto other CoLE_ questions, if No, skip section.
23b	I was satisfied with my experience using the online course website.	Likert 1-7: Strongly Disagree --- Strongly Agree
23c	I encountered difficulties accessing course material from the online course website.	Likert 1-7: Strongly Disagree --- Strongly Agree
23d	I reviewed all of the material on the online course website	Likert 1-7: Strongly Disagree --- Strongly Agree
23e	The layout of the course website allowed me to keep up with the flow of the class over time.	Likert 1-7: Strongly Disagree --- Strongly Agree
23f	I was able to find technical support for the online course website.	Likert 1-7: Strongly Disagree --- Strongly Agree & (N/A)
23g	Technical support helped me resolve problems that I had with the online course website in a timely manner.	Likert 1-7: Strongly Disagree --- Strongly Agree & (N/A)
23h	Do you have any suggestions for improving the online course website?	Open-Ended Response: [Text Box]

*Question was used for all but the first and last items in this series

Table C23

Post-Course Survey Question 24

***Question*:** *To what extent do you agree with the following statements?*

Item Number	Item	Scale
24a	I watched at least one video in this course	Yes/No: Skip Logic for Video_00: If Yes, move onto other video questions, if No, skip section.
24b	The videos operated reliably.	Likert 1-7: Strongly Disagree --- Strongly Agree
24c	I replayed the videos and watched them more than once.	Likert 1-7: Strongly Disagree --- Strongly Agree
24d	The videos were easy to follow.	Likert 1-7: Strongly Disagree --- Strongly Agree
24e	The content of the videos matched what we were graded on.	Likert 1-7: Strongly Disagree --- Strongly Agree
24f	The videos were too long to maintain my interest.	Likert 1-7: Strongly Disagree --- Strongly Agree

*Question was used for all but the first item in this series

Table C24

Post-Course Survey Question 25

***Question*:** *To what extent do you agree with the following statements?*		
Item Number	**Item**	**Scale**
25a	I was satisfied with the readings for this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
25b	I completed all of the required readings for this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
25c	I completed all of the optional readings for this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
25d	There were too many readings for this course.	Likert 1-7: Strongly Disagree --- Strongly Agree
25e	The content in the readings matched what we were graded on.	Likert 1-7: Strongly Disagree --- Strongly Agree
25f	The readings sustained my interest in the course material.	Likert 1-7: Strongly Disagree --- Strongly Agree
25g	I was able to get the help that I needed to understand the content in the readings.	Likert 1-7: Strongly Disagree --- Strongly Agree

*Question was used for all but the first item in this series

Table C25

Post-Course Survey Question 26

***Question*:** *Which of the following describes the way that you completed the readings for this course (select all that apply)*		
Item Number	**Answer Choices**	**Scale**
26a	Skimmed the readings	Select All that Apply
26b	Read the first and last sentence of every paragraph	
26c	Read to a point in the article or chapter but didn't finish	
26d	Read the full article or chapter word-for-word	
26e	Read the article or chapter more than once	
26f	Read just the summary	

*Question was used for all but the first item in this series

Table C26

Post-Course Survey Question 27

***Question*:** *To what extent do you agree with the following statements?*

Item Number	Item	Scale
27a	I attended office hours using Adobe Connect at least one time in this course.	Yes/No: Skip Logic: If Yes, go to the next set of questions. If No, go directly to the Open-ended
27b	Adobe Connect operated reliably.	Likert 1-7: Strongly Disagree --- Strongly Agree
27c	I was satisfied with my experience with Adobe Connect.	Likert 1-7: Strongly Disagree --- Strongly Agree
27d	I felt connected with other students as a result of using Adobe Connect.	Likert 1-7: Strongly Disagree --- Strongly Agree
27e	I felt comfortable using Adobe Connect to communicate with others.	Likert 1-7: Strongly Disagree --- Strongly Agree
27f	I attended all of the Adobe Connect sessions.	Likert 1-7: Strongly Disagree --- Strongly Agree
27g	I was able to find technical support for Adobe Connect.	Likert 1-7: Strongly Disagree --- Strongly Agree
27h	Technical support helped me resolve problems that I had with Adobe Connect in a timely manner.	Likert 1-7: Strongly Disagree --- Strongly Agree
27i	Is there anything else you would like to say about your experiences using Adobe Connect?	Open-Ended Response: [Text Box]

*Question was used for all but the first and last items in this series

Table C27

Post-Course Survey Question 28

***Question*:** *To what extent do you agree with the following statements?*

Item Number	Item	Scale
28a	I conducted at least one online presentation in this course	Yes/No: If Yes, go to the next set of questions. If No, skip section
28b	It was easy to complete the presentation assignments online.	Likert 1-7: Strongly Disagree --- Strongly Agree
28c	I prefer giving presentations online more than in-person.	Likert 1-7: Strongly Disagree --- Strongly Agree
28d	I experienced technical difficulties giving/creating my presentation online.	Likert 1-7: Strongly Disagree --- Strongly Agree

*Question was used for all but the first item in this series

Table C28

Post-Course Survey Question 29

***Question*:** *To what extent do you agree with the following statements?*

Item Number	Item	Scale
29a	I attended the discussion sections at least once in this course.	Yes/No: If Yes, go to the next set of questions. If No, go directly to the Open-ended
29b	I actively participated in the discussion sections.	Likert 1-7: Strongly Disagree --- Strongly Agree
29c	I felt connected to other students as a result of participating in discussion sections.	Likert 1-7: Strongly Disagree --- Strongly Agree
29d	I felt comfortable communicating with other students in the discussion sections.	Likert 1-7: Strongly Disagree --- Strongly Agree
29e	Is there anything else you would like to say about your experiences attending discussion sections?	Open-Ended Response :[Text Box]

*Question was used for all but the first and last items in this series

Table C29

Post-Course Survey Question 30

***Question*:** *To what extent do you agree with the following statements?*

Item Number	Item	Scale
30a	I used Piazza at least once in this course	Yes/No: If Yes, go to the next set of questions. If No, go directly to the Open-ended
30b	I often read posts on Piazza.	Likert 1-7: Strongly Disagree --- Strongly Agree
30c	I often added posts to Piazza.	Likert 1-7: Strongly Disagree --- Strongly Agree
30d	I was satisfied with my experiences using Piazza.	Likert 1-7: Strongly Disagree --- Strongly Agree
30e	Piazza was an effective tool for communicating online.	Likert 1-7: Strongly Disagree --- Strongly Agree
30f	When I saw that a post was endorsed, I was more likely to view that post.	Likert 1-7: Strongly Disagree --- Strongly Agree
30g	The instructors quickly responded to questions that were posted on Piazza.	Likert 1-7: Strongly Disagree --- Strongly Agree
30h	Is there anything else you would like to say about your experiences using Piazza?	Open-Ended Response: [Text Box]

*Question was used for all but the first and last items in this series

Table C30

Post-Course Survey Question 31

***Question*:** *To what extent do you agree with the following statements?*

Item Number	Item	Scale
31a	I took at least one quiz in this course	Yes/No: If Yes, go to the next set of questions. If No, skip section
31b	The course quizzes helped me recall and understand the material for the course.	Likert 1-7: Strongly Disagree --- Strongly Agree
31c	There were too many quizzes.	Likert 1-7: Strongly Disagree --- Strongly Agree
31d	I used the quizzes to decide whether I needed to review the course material.	Likert 1-7: Strongly Disagree --- Strongly Agree

*Question was used for all but the first item in this series

Table C31

Post-Course Survey Question 32

***Question*:** *To what extent do you agree with the following statements?*

Item Number	Item	Scale
32a	I took a midterm in this course	Yes/No: If Yes, go to the next set of questions. If No, skip section
32b	The material on the midterm(s) matched the content that was taught in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree

*Question was used for all but the first item in this series

Table C32

Post-Course Survey Question 33

***Question*:** *To what extent do you agree with the following statements?*

Item Number	Item	Scale
33a	I took a Final in this course	Yes/No: If Yes, go to the next set of questions. If No, skip section
33b	The material on the final matched the content that was taught in this course.	Likert 1-7: Strongly Disagree --- Strongly Agree & Haven't Taken It Yet (N/A)

*Question was used for all but the first item in this series

Table C33
Post-Course Survey Question 34

Item Number	Question	Scale
34	Is there anything else you would like to share with us about this course that we haven't already asked (e.g., things that you enjoyed; things that you did not enjoy; benefits; challenges; etc.)?	Open-Ended Question

Appendix D: Student Interview Questions

Table D1

Student Interview: Introductory Questions: 1-5

Question Number	Question
1	1. How did you decide to enroll in the online (face-to-face) section of the course?
1a	a. What were your expectations of this course when you first enrolled?
1b	b. How many other online courses have you enrolled in?
1bi	i. How would you rate the experience of this online course to other online courses that you've taken before?
2	2. Could you describe what your typical school week looked like for this course?
3	3. How would you describe your experience in this course?
3a	a. What were your favorite aspects of the course?
3ai	i. What did you like about these aspects?
3b	b. What aspects of the course did you least enjoy?
3bi	i. What didn't you like about these aspects?
4	4. Did you feel that you were able to learn at your own pace in this course?
	1 If no,
4a	a. What do you think made it difficult for you to learn at your own pace?
	2 If yes,
4b	b. What do you think helped you at learn at your own pace?
5	5. How much time did you spend on this course?
5a	a. How did you allocate your time in this course?
5b	b. Why did you choose to allocate your time this way?
5bi	i. Did you find it difficult to manage your time in this class?
5biA	A. What strategies did you use to manage your time?
5biB	B. Which strategies were most effective for you?
5biC	C. What might have allowed you to manage your time better?
5bii	ii. Can you describe an instance where you felt very frustrated learning the material? What could have helped you learn that material?
5biii	iii. Do you feel like you knew what you needed to spend your time on in this course?

Table D2

Student Interview: Interaction Questions: 6-12

Question Number	Question
6	6. What types of interactions did you have with students and faculty in this course?
6a	a. Were these interactions useful? If so, how?
6b	b. How could they have been more useful?
7	7. How did your experience compare to your initial expectations?
7a	a. Did you expect that you would frequently interact with instructor(s) or students?
8	8. What types of **opportunities** to interact with students or faculty did you have in this course?
8a	a. What other types of opportunities (formal or informal) did you have to interact with…?
9	9. Would you have liked to have more or different types of interactions in this course?
9a	a. What would those interactions have looked like?
10	10. Did you feel comfortable contacting instructors or students?
10a	a. Why or why not?
10b	b. Were these interactions helpful?
11	11. What could have improved the interactions in this course?
12	12. What could have facilitated those interactions to occur?(i.e., technology, video chat, faculty encouragement, student initiative, etc.)

Table D3

Student Interview: Student Backchannel Questions 13-14

Question Number	Question
13	13. Did you ever meet with classmates outside of class?
	If yes
13a	a. What did these meetings consist of?
14	14. Did the instructor encourage you to meet other students?
	if so,
14a	a. Did this encouragement motivate you to meet with other students?

Table D4

Student Interview: Class Activity Questions 15-16

Question Number	Question
15	15. Which class activities were most effective in helping you learn the class material?
15a	a. What is it about these class activities that helped you learn the material?
15b	b. What did you enjoy about these class activities?
15c	c. What didn't you enjoy about these class activities?
15d	d. To what extent did you find these activities challenging to complete?
16	16. Do you feel that the amount of work for the class was not enough, just right, or too much?

Table D5

Student Interview: Technology Questions 17-20

Question Number	Question
17	17. Can you describe your experience accessing and interacting with the materials for this course?
18	18. Were there any problems with the technology?
18a	a. What were they?
18b	b. How did you deal with them?
19	19. Were you able to locate help when you needed it?
19a	a. If yes, did it meet your needs?
19b	b. If not, why not?
20	20. How was your experience watching the videos?

Table D6

Student Interview: Course Satisfaction and Conclusion Questions 21-30

Question Number	Question
21	21. Did you feel that you had a high quality learning experience?
22	22. Did you feel connected with other students in the class?
23	23. Did you feel connected with the professor/TA?
24	24. How would you compare the **quality** of this online course to traditional face-to-face classes that you've taken before?
25	25. How would you compare your **experiences** in this online course to traditional face-to-face classes that you've taken before?
26	26. Do you feel like you monitored your own understanding of the course material?
27	27. Do you feel that the course prepared you for the long-term (future courses/career)?
28	28. Do you feel that this course helped prepare you to succeed in future courses?
28a	a. Do you believe that you would have been better prepared by taking the face-to-face (online) version of the course?
28b	b. Why or why not?
29	29. Overall, how satisfied are you with this course?
30	30. Is there anything else you would like to share with us about this course that we haven't already asked (e.g., things that you enjoyed; things that you did not enjoy; benefits; challenges; etc.)?

Appendix E: List of Codes for Student Surveys in Study 2

Table E1
Preliminary Codes to be used in case study

Title	Description
Not Described by Framework	Any reference to variables or actions that were not already included in the framework
Institution Issues (Input, Operation, Decisions, Output, Outcomes, Goals)	Any reference to institutional inputs, processes, or results.
Instructor / TA Characteristics Input	Any reference to input variables related to the instructor or TA characteristics
Subject / Content Input	Any reference to the subject or content of the course
Course Assembly Input	Any reference to the creation of the course
Technology Input	Any reference to the technology
Students (Combined)	Any reference to the combination of all or multiple students in a class, such as class size or how other students in the class might influence an individual student.
Student Internal Characteristics Input	Any reference to internal characteristics of the student
Student External Characteristics Input	Any reference to external characteristics of the student
Instructor Operation Decisions	Any reference to an instructor making decisions about the course
Student Participation Decisions	Any reference to a student making decisions about the course
Efficiency Evaluation - Main	Any reference to making an evaluation of efficiency
Actual Instructor / TA Participation	Anything that refers to the actual instructor or TA participation in the course
Course Characteristics and Operation	Any reference to characteristics or operation of the course
Component Characteristics and Operation	Any reference to a specific course component-activity, such as an assignment, a reading, a quiz, or a discussion section
Actual Student Participation	Any reference to how a student actually participated
Instructor Intended Output	Any reference to the output intended by the instructor
Actual Student Output	Any reference to actual student output
Instructor Intended Outcomes	Any reference to the outcomes intended by the instructor
Instructor Goals	Any reference to instructor goals
Actual Student Outcomes	Any reference to the actual student outcomes
Individual Student Goals	Any reference to student goals

Table E2
Sub-Codes of Course Assembly Input*

Title	Description
Alignment	Any reference to the alignment of two or more of the following: subject/content, material, component activities, assessment, or course outcomes.
Navigation or Organization	Any reference to actual or ideal form of how the course is organized online or how users are navigating the material.
Amount of Work	Any reference to the amount of work that students are required to put into the course, especially when in comparison to normal work per course.
Complex or Difficult	Any reference to the material being complex or difficult.
Accuracy of Information or Assessments	Any reference to the level of accuracy of information presented in the course or the accuracy of assessments.
Other Assembly Input	Any reference to the assembly of a course that is not represented by sub-codes.

*Codes developed post hoc based on a review of data from the Assembly Input code

Table E3
Sub-Codes of Student Internal Characteristics*

Title	Description
Motivation / Focus / Time Management	Any reference to an individual's motivation, focus, or time management.
Compatibility for Learning Environment or Instructional Practice	Any reference to a student having a compatibility to a learning environment or instructional practice
Interest in Subject or Learning Intervention	Any reference to a student having interest in the subject or learning intervention upon entry in the course.
Background and Abilities	Any reference to a student's background or abilities, such as academic major or ability to perform in a specific subject area upon entry in the course.
Preference for Learning Environment	Any reference to a preference for a learning environment
Prior Experience	Any reference to a student having a certain prior experience.

*Codes developed post hoc based on a review of data from the Student Internal Characteristics code

Table E4
Sub-Codes of Student External Characteristics*

Title	Description
Personal Environment	Any reference to a student's personal or home environment (e.g. distractions, lack of distractions, lack of community).
Money or Resources	Any references to a student's money or resources.
Distance from University	Any reference to the physical distance a student is from the university.
Requirements for Graduation	Any reference to having requirements for graduation or already fulfilling those requirements.
Time Conflicts	Any reference to times conflicts, such as other courses, work, family, or pets.

*Codes developed post hoc based on a review of data from the Student External Characteristics code

Table E5
Sub-Codes of Student Participation Decisions*

Title	Description
Participation Decision in Course	Any reference to a student decision-making process or criteria to enroll or participate in a course
Participation Decision in Component-Activity	Any reference to a student decision-making process or criteria to participate in a component-activity.
Towards In-Person	Any reference to a student's decision-making process or criteria in which an in-person course format is preferred
Towards Online	Any reference to a student's decision-making process or criteria in which an online course format is preferred

*Codes developed post hoc based on a review of data from the Student Participation Decisions code

Table E6
Sub-Codes of Efficiency Evaluation*

Title	Description
Criteria	Parent code for efficiency criteria (place-holder - not used for coding)
Idea for Improvement	Any comment in which a student raises an idea for improvement in the course or an individual component-activity
Positive Online	Any comment that suggests a positive regard for an online course(s)
Negative Online	Any comment that suggests a negative regard for an online course(s)
Positive In-Person	Any comment that suggests a positive regard for an in-person course(s)
Negative In-Person	Any comment that suggests a negative regard for an in-person course(s)
Positive Component Activity	Any comment that suggests a positive regard for a component-activity
Negative Component Activity	Any comment that suggests a negative regard for a component-activity
Positive In-Person Component Activity	Any comment that suggests a positive regard for an in-person component-activity
Positive Online Component Activity	Any comment that suggests a positive regard for an online component-activity
Negative Online Component-Activity	Any comment that suggests a negative regard for an online component-activity
Negative In-Person Component-Activity	Any comment that suggests a negative regard for an in-person component-activity

*Codes developed post hoc based on a review of data from the Efficiency Evaluation code

Table E7
Sub-Codes of Criteria for Efficiency Evaluation*

Title	Description
Access	Any reference to the use of access as criteria for decision-making
Affect Satisfaction	Any reference to the use of affect or satisfaction as criteria for decision-making
Content Learning	Any reference to the use of content learning as criteria for decision-making
Contribution to Goals / Interests	Any reference to the use of contribution to goals or interests as criteria for decision-making
Time / Effort	Any reference to the use of time or effort as criteria for decision-making
Money / Resources	Any reference to the use of money or resources as criteria for decision-making
Process Performance	Any reference to the use of process performance as criteria for decision-making. Process performance refers to the degree to which the process of instruction and learning takes place in a smooth manner.

*Codes developed post hoc based on a review of data from the Efficiency Evaluation code

Table E8
Sub-Codes of the Access code of Criteria for Efficiency Evaluation*

Title	Description
Place Access	Any reference to the use of access to a course from a location or place as criteria for decision making
Interaction / Communication	Any reference to the use of access to certain forms of or a certain quality of interaction or communication as criteria for decision making
Course Format	Any reference to the use of access to certain course format as criteria for decision making
Fit with Schedule	Any reference to the use of access to a course through its scheduling as criteria for decision making
Other External Possibilities	Any reference to the use of access to other external (outside of the course) possibilities that are the result of the course as criteria for decision making
Course Offering	Any reference to the use of access to a course because of when it is offered as criteria for decision making

*Codes developed post hoc based on a review of data from the Access code

Table E9
Sub-Codes of Course Characteristics for Key Characteristics of Online Education

Title	Description
Distance	Any reference to learning at a distance
Communication	Any reference to communication in the course
Organization and Distribution of Content	Any reference to organization and/or distribution of the content of the course
Content Interaction	Any reference to content interaction
Assessment	Any reference to assessment (formative or summative)

*Codes developed a priori to the coding based on a review of literature (see Key Characteristics of Online Education subsection in the introduction of this dissertation)

Table E10
Sub-Codes of Communication

Interaction or Presence	Any reference to interaction or presence.
Communication Breakdown	Any reference to a communication breakdown

*Codes developed post hoc based on a review of data from the Communication code

Table E11
Sub-Codes of Course Characteristics for Common Features of Media

Title	Description
Media Form	Any reference to the properties of media, such as how text is displayed within videos.
Media Structure	Any reference to the structure of media
Multiplicity	Any reference to multiplicity
Non-linearity	Any reference to linearity or nonlinearity in a course
Synchronicity	Any reference to synchronicity
Symmetry	Any reference to symmetry
Anytime or Anywhere	Any reference to the anytime or anywhere nature of online course or component-activities.

*Codes developed a priori to the coding based on a review of literature (see Idiosyncratic Variation of Media Features in Online Education subsection in the introduction of this dissertation)

Table E12
Sub-Codes of Course Characteristics and focused on Control

Title	Description
Control	Any reference to issues of control in the course.
Location	Any reference to the location of learning
Timing	Any reference to the timing of instruction or learning
Pacing	Any reference to the pacing of a course
Sequencing	Any reference to the sequencing of a course
Content	Any reference to the content of a course
Component-Activity	Any reference to the component-activities of a course

*Most codes developed a priori to the coding based on a review of literature (see Control Source and Type subsection in the introduction of this dissertation). The Location and Timing codes were developed post hoc based on a review of data from the first round of coding.

Table E13
Sub-Codes of the Component Characteristics and Operation Code*

Title	Description
Course Website	Any reference to the course website
External Website	Any reference to an external website(s)
Quizzes	Any reference to the course quizzes
Piazza	Any reference to Piazza
Discussion Section	Any reference to the discussion section
In-Person Lecture	Any reference to an in-person lecture(s)
Replayable Videos	Any reference to a replayable video(s)
Assignment	Any reference to an assignment(s)
Adobe Connect	Any reference to Adobe Connect
Midterm / Final	Any reference to the Midterm or Final
Textbook / Readings	Any reference to the textbook or other readings
Office Hours	Any reference to the office hours
Email	Any reference to email
Chat Room	Any reference to chat rooms
Practice Problems	Any reference to practice problems
Grade Postings - Grading	Any reference to grade postings on the course website or grading in general
Transcripts	Any reference to the video transcripts

*Codes developed post hoc based on a review of data from the Component Characteristics and Operation code

Appendix F: List of Codes for Instructor Interviews in Study 2

Table F1
Definitions for *Instructor Actor* Code

Framework Area	Definition of Code
Instructor Input Characteristics	Any reference to input variables related to the instructor or TA input characteristics. These characteristics refer to any permanent or semi-permanent characteristic that the instructor brings to the course upon entry or developed during the course.
Instructor Decisions	Any reference to a instructor making decisions about the course
Instructor Participation Decision (Participation in Course or Component OR How to Participate in Course or Component)	Any reference to the instructor making a decision to participate in the course, a component-activity, or the reference in how he/she will participate in either
Instructor Participation (Including Communication, Action, or Experience)	Any reference to Instructor Participation, including Communication, Action, or Experience
Instructor Output or Outcomes/Impacts:	Any reference to Instructor Output or Outcomes/Impacts

Table F2

Definitions of *Instructor Decisions* Code

Framework Area	Definition of Code
Online Positive	Any positive reference to the online version of the course
Online Negative	Any negative reference to the online version of the course
In-Person Positive	Any positive reference to the in-person version of the course
In-Person Negative: Any negative reference to the in-person version of the course	Any negative reference to the in-person version of the course
Instructor	Efficiency Target -- Any reference to the Instructor in regards to efficiency
Student	Efficiency Target -- Any reference to the Student in regards to efficiency
Institution	Efficiency Target -- Any reference to the Institution in regards to efficiency
Other	- Efficiency Target -- Any reference to another entity in regards to efficiency
Time - Past/Present	Any reference to the current state of the course or past experience
Time – Future	Any reference to an expectation or prediction for the future
Cost (Time-Effort or Money-Resources)	Any reference to costs such as Time, Effort, Money, or Resources
Gain (Learning, Goals, Satisfaction)	Any reference to gains, such as learning, goals, or satisfaction
Operational Functions (Access and Process Performance)	Any reference to the operational function, such as process performance or access

Table F3
Definitions of *Other Actors* codes

Framework Area	Definition of Code
Course-Media Actor	Any reference to the Course-Media Actor (Input, Decisions, Participation, Output, Outcomes)
Institutional Actor	Any reference to the theory or actual function of the Institutional actor (Input, Decisions, Participation, Output, Outcomes)
Student Actor	Any reference to the theory or actual function of the student actor (Input, Decisions, Participation, Output, Outcomes)
Other Actor	Any reference to the theory or actual function of any other actor (Input, Decisions, Participation, Output, Outcomes)

Table F4

Definitions of *Course and Media* codes

Framework Area	Definition of Code
Media Input (Assembly, Technology, Subject)	Any reference to the Course Input of Technology, Assembly, or Subject/Content of the course.
Course Operation	Any reference to the operation of the course
Media Decisions, Output, or Outcomes	Any reference to the decisions, output, or outcomes of the course media

Table F5

Definitions of *Course Operation through Media* codes

Framework Area	Definition of Code
Component-Specific	Any reference to a specific component activity
Communication and/or Interaction	Any reference to communication or interaction
Control	Any reference to Control (e.g. Location, Timing, Pacing, Sequencing, Content, Component-Activity)
Features of Curriculum and Content	Any reference to the Curriculum and Content of the course (Accuracy of Information or Assessments; Alignment; Amount of Work; Complex or Difficult; Navigation or Organization; Other)
Features of Media	Any reference to Media Features, such as Structure, Form, Multiplicity, Non-linearity, Synchronicity, Symmetry, or Anytime/Anywhere
Characteristics of Online	Any reference to the characteristics that contribute to the definition of an online course (Distance, Organization and Distribution of Content, Communication, Content Interaction, and/or Assessment)

Appendix G: List of Codes for Student Interviews in Study 3

Table G1
Definitions of *institutional issues* code

Framework Area	Definition of Code
Institutional Issues	Any reference to institutional inputs, processes, or results. Institutional input being any time, effort, money, or resource that the institution invests in the facilitation of a course. Institutional processes being any process that the institution engages (decisions and operation/participation) in relation to the course. Results being any output or outcome for an institution that relates to the course.

Table G2
Definitions of codes for *Instructor* sections

Framework Area and Definition	Definition of Code
Instructor / TA (General Code)	Any reference to the instructor in general
Instructor Input	Any reference to input variables related to the instructor or TA input characteristics. These characteristics refer to any permanent or semi-permanent characteristic that the instructor brings to the course upon entry or developed during the course.
Instructor Participation	Anything that refers to the actual participation of the instructor or TA in the course
Instructor Decisions, Output, and Outcomes	Any reference to latent characteristics/actions of the instructor that may be difficult to observe externally but could be theorized about. This includes the following: any reference to an instructor making decisions about the course; how much work or output the instructor has expended; and instructor outcomes from the course

Table G3
Definitions of *Media and Course* main sections codes

Framework Area	Definition of Code
Media Input (Technology, Assembly, Subject/Content)	Any reference to course or media input in general.
Course Operation	Any reference to characteristics or operation of the course. This includes any general characteristics or operations related to the course, such as when the course is offered or the format of the course overall.
Component	Any reference to the characteristics or operation of a specific course component-activity, such as an assignment, a reading, a quiz, or a discussion section
Media Decisions, Output, and Outcomes	Any reference to latent characteristics/actions of the course media that may be difficult to observe externally but could be theorized about. This includes the following: any reference to media making decisions; how much work or output the media has expended; and media outcomes from the course

Table G4
Definitions of *media input* codes

Framework Area	Definition of Code
Technology Input	Any reference to the technology infrastructure. This could refer to localized or external infrastructure that supports the course.
Course Assembly Input	Any reference to the creation of the course. This could refer to any processes or resources allotted to course development.
Subject / Content Input	Any reference to the subject or content of the course.

Table G5

Definitions of *Control* codes

Framework Area	Definition of Code
Control	Any reference to a source or type of control. A source of control being the entity that is in control (e.g. institution, instructor, media, student, or a group of students). A type of control being the way an entity or process is controlled (e.g. location, timing, pacing, sequencing, content, or component-activity)
Location	Any reference to the control issue of location but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students)
Timing	Any reference to the control issue of timing but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students).
Pacing	Any reference to the control issue of pacing but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students).
Sequencing	Any reference to the control issue of sequencing but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students)
Content	Any reference to the control issue of content but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students)
Component-Activity	Any reference to the control issue of component-activity but not limited to any particular source (e.g. institution, instructor, media, student, or a group of students)

Table G6

Definitions and Examples of Features of Curriculum and Content

Framework Area	Definition of Code
Accuracy of Information or Assessments	Any reference to the level of accuracy of information presented in the course or the accuracy of assessments.
Instructional Coherence: Focusing-Narrowing to Scattering-Broadening	Any description of the student on that falls in the spectrum of focusing-narrowing to scattering-broadening. Focusing-Narrowing is when the media or instructor focuses the attention of the students on particular aspects of the course. This could be by telling students what will be on an exam or what is worth credit. Or the instructor may just narrow the material presented to the students. Broadening is when the material is broadened. Scattering is when there is no focus of the instruction and students are therefore left to their own devices to decipher what is important.
Alignment	Any reference to the alignment of two or more of the following: subject/content, material, component activities, assessment, or course outcomes.
Amount of Work	Any reference to the amount of work that students are required to put into the course, especially when in comparison to normal work per course.
Complex or Difficult	Any reference to the material being complex or difficult.
Navigation or Organization	Any reference to actual or ideal form of how the course is organized online or how users are navigating the material.
Other Curriculum and Content Features	Any reference to curriculum or content features that is not represented by sub-codes.

Table G7

Definitions of *Features of Media* codes

Framework Area	Definition of Code
Media Structure	Any reference to the media structure of a course (e.g. *parallel, convergent, divergent*, and *mixed*).
Media Form	Any reference to the properties of media, such as how text is displayed, static image, moving image, sound
Synchronicity	Any reference to synchronicity, which means the timing of actor-to-actor information transfer through media in terms of both immediacy and automation
Symmetry	Any reference to symmetry or the degree to which there is two-way interaction or dialogue
Multiplicity	Any reference to multiplicity. Multiplicity mainly refers to the range in which different contexts, media, formats, activities, and assessments convey equivalent content.
Non-linearity	Any reference to linearity or nonlinearity in a course. This means, the extent to which a medium has dimensional navigation potentials, such as moving forward and backward in a book or conducting a search on a web browser.
Anytime or Anywhere	Any reference to the anytime or anywhere nature of online course or component-activities.

Table G8

Definition Other Students code

Framework Area	Definition of Code
Other Students	Any reference to all, multiple, or individual students (real or hypothetical) in a class, such as class size or how other students in the class might influence an individual student. (Whole Class, Groups, Individuals) - (Input, Operation, Decisions, Output, Outcomes, Goals)

Table G9

Definitions of *Student* actor main section codes

Framework Area	Definition of Code
Student Input	Any reference to student input characteristics as an enduring characteristic or characteristic that the student enters the course with
Student Decisions	Any reference to a student making decisions about the course
Student Participation	Any reference to how a student actually participated
Student Output	Any reference to actual student output. Student output being any student expenditure, such as time, effort, money, or resources that concludes in product form and can be observed through methods such as direct measurement or self-reporting.
Student Outcomes and Impacts	Any reference to the actual student outcomes. Student outcomes being any gains the student has had in the course, either positive or negative, and can be observed through methods such as direct measurement or self-reporting. OR Any reference to the impact of the course on the student or the student on other areas of their life

Table G10

Definitions of *student internal characteristics* area codes

Framework Area	Definition of Code
Student Internal Characteristics Input	Any reference to internal characteristics of the student. These characteristics refer to any permanent or semi-permanent characteristic that the student brings to the course upon entry or has developed during the course. This includes (but not limited to) characteristics such as goals, interests, learning preferences, and prior learning.
Motivation / Focus / Time Management	Any reference to an individual's motivation, focus, or time management.
Compatibility for Learning Environment or Instructional Practice	Any reference to a student having a compatibility to a learning environment or instructional practice
Prior Experience	Any reference to a student having a certain prior experience.
Background and Abilities	Any reference to a student's background or abilities, such as academic major or ability to perform in a specific subject area upon entry in the course.
Interest in Subject or Learning Intervention	Any reference to a student having interest in the subject or learning intervention upon entry in the course.
Preference for Learning Environment	Any reference to a preference for a learning environment
Requirements for Graduation	Any reference to what is required for a student to graduate or advance towards graduation
Other Student Internal	Any internal input characteristics that are not described by other subcodes

Table G11

Definitions of *student external characteristics* area codes

Framework Area	Definition of Code
Student External Characteristics Input	Any reference to external characteristics of the student. This includes (but not limited to) characteristics such as home environment, friends, and home distance from the university.
Money or Resources	Any references to a student's money or resources.
Distance from University	Any reference to the physical distance a student is from the university.
Personal Environment	Any reference to a student's personal or home environment (e.g. distractions, lack of distractions, lack of community).
Time Conflicts	Any reference to times conflicts, such as other courses, work, family, or pets.
Other Student External	Any external input characteristics that are not described by other sub-codes

Table G12

Definitions of codes for main section of *Student Decisions*

Framework Area	Definition of Code
Student Decisions	Any reference to a student making decisions about the course
Information Gathering	Any reference to a student gathering information about the logistics or overall theory of the course
Theory Development	Any suggestion that a student has developed a theory about how the course operates prior to making a decision or evaluation
Efficiency Evaluation	Any reference to making an evaluation of efficiency in relation to participation.
Student Participation Decisions	Any reference to a student making participation decisions about the course or component-activities within that course

Table G13

Definitions of *Efficiency Evaluation* codes

Framework Area	Definition of Code
Efficiency Evaluation	Any reference to making an evaluation of efficiency in relation to participation.
Time / Effort	Any reference to the amount of time or effort an individual invests or expends on participation
Money / Resources	Any reference to the amount of money or resources an individual invests or expends on participation
Affect Satisfaction	Any reference to an individual being emotionally satisfied, happy, or content with participation.
Content Learning	Any reference to the degree to which a student would learn the content in a course.
Contribution to Goals / Interests	Any reference to the degree to which participation would contribute to the individual's goals or interests.
Process Performance	Any reference to the degree with which an activity runs as intended without unintended or unexpected hold-ups or setbacks.
Access	Any reference to the ability to use or interact with materials, component-activities, or content in the course and/or the level at which this access occurs.

Table G14
Definitions of *Access* codes

Framework Area	Definition of Code
Place Access	Any reference to the degree to which one was able to use or interact with the course, materials, component-activities, or content from a desired location.
Interaction / Communication	Any reference to the degree to which one was able to communicate or interact with others in the course.
Course Format	Any reference to the degree to which one was able to use the format that she/he perceived as most suitable to their wants/needs.
Fit with Schedule	Any reference to the degree to which the course fit in with other activities in the schedule/calendar of an individual.
Other External Possibilities	Any reference to the degree to which participation would have an impact in being able to participate or take advantage of possibilities outside of the course.
Course Offering	Any reference to the offering of a course at the university.

Table G15
Definitions and examples of Student Participation Decisions

Framework Area	Definition of Code
Student Participation Decisions	Any reference to a student making participation decisions about the course or component-activities within that course
Decision to Participate in Course	Any reference to a student making participation decisions about the course
Decision to Participate in Component	Any reference to a student making participation decisions about component-activities within that course
How to Participate in Course	Any reference to a student making participation decisions about how to participate in the course
How to Participate in Component	Any reference to a student making participation decisions about how to participate in a component-activity within the course

Table G16
Definitions of *Student Participation* codes

Framework Area	Definition of Code
Communication / Interaction	Any reference to actual student communication or interaction within the course
Endorsed or Promoted Communication	Any reference to communication that has been promoted by the instructor or through course activities
Not Endorsed or Not Promoted Communication	Any reference to student communication that has not been officially endorsed by the instructor or promoted through course activities or technology
Hallway Interaction	Spontaneous communication outside of class time that occurs through the combination of right-place (real or virtual) and right time.
In-Person Communication	Any reference to in-person communication
Online Communication	Any reference to online communication
Action	Any reference to an action taken by a student
Experience	Any reference to a student experiencing an aspect of the course,

Appendix H: Articles that Discussed or Used Framework Area

Table H1

Articles that discussed or used Instructor Input variables or processes

2.1-- INTRUCTOR INPUT
Bachman & Stewart 2011; Bocchi et al 2004; Campbell et al (2011); Carey (2001); Collins (2000); Day et al (1998); Feist 2003; Frey et al 2003; Gros et al. (2012); Havard et al 2005; Hiltz (1993); Johnson et al (2000); Johnson et al. (2013); Jones and Gower 1997; Kuo 2005; Lan et al 2003; Maki et al (2000); McIsaac et al 1999; Meyer and Murrell, 2014a; Meyer and Murrell, 2014b; Meyer, 2014a; Naveh Tubin and Pliskin 2010 ; O'Dwyer et al 2007; Orr, Williams, and Pennington, 2009; Phipps et al 2000; Piccoli et al (2001); Rockwell et al 1999; Schmeeckle 2003; Schmidt (2002); Schneider et al 1999; Young 2004; Zion et al 2005
Articles related to area but not specific to Online Education:
Anderson and Rogan, 2011*; Borrego et al., 2013*; Coffield et al., 2004*; Eley, 2006*

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H2

Articles that discussed or used Course Content variables or processes

3.1.1 – COURSE CONTENT
Aberson et al (2000a); Aberson et al (2003); Al Jarf 2004 ; Beekman et al. 2009; Bello et al. 2005; Benjamin et al. 2008; Bergamin et al 2012; Beyea et al. 2007; Bocchi et al 2004; Boling et al 2010; Brown et al 2002; Buchanan (2000); Campbell et al (2011); Carroll et al. 2009; Collins (2000); Day et al (1998); DeBord et al 2004 ; Dellana (2000); Fleetwood et al (2000); Gilliver et al 1998 ; Glenn (2001); Gorsky et al 2010; Graff 2003; Gusev et al 2013; Harris et al. 2008; Hiltz (1993); Hurlburt (2001); Innes et al 2006; Jang et al. 2005; Johnson et al (2000); Koory (2003); Kuna 2012; Lan et al 2003; "LaRose et al. 1998; "; Levin et al 1999; Liou (1997); Lovett, Meyer, and Thille 2008; Maki and Maki 2001; Maki and Maki 2002 ; Maki et al (2000); Mann & Henneberry 2014 ; McManus 2000; Mehlenbacher et al (2000); Mentzer et al. 2007; Miller and Pilcher 2002; Navarro and Shoemaker 2000; Naveh Tubin and Pliskin 2010 ; Nguyen 2008; O'Dwyer et al 2007; Ocker and Yaverbaum (1999); Parker and Gemino 2001; Piccoli et al (2001); Poirier and Feldman 2004; Schmeeckle 2003; Schmidt (2002); Schoenfeld-Tacher et al. 2001; Sexton et al. 2002; Sholomskas et al (2005); Stanley 2006; Taraban et al 1999; Trekles & Sims 2013; Tuckman 2007; Wallace and Clariana (2000); Wang (2008); Weems (2002); Wilson 2007; Wilson and Whitelock 1998; Wilson et al (2002); Woodward (1998); Xu and Jaggars (2013c); Zhang 2005; Zhao and Lei 2005 - Meta Analysis
3.1.1 – COURSE CONTENT
Anderson and Rogan, 2011*

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H3

Articles that discussed or used Course Assembly variables or processes

3.1.2 – COURSE ASSEMBLY
Aberson et al (2003); Alhazmi and Rahman 2012; Altimari et al 2012; Bachman & Stewart 2011; Bacow et al 2012; Barbera and Clarà 2012; Bergamin et al 2012; Beyea et al. 2007; Bocchi et al 2004; Boling et al 2010; Boling et al 2011; Buchanan (2000); Carey (2001); Carroll et al. 2009; Caspi et al 2005; Chung et al 2013; Clayton et al 2010; Connors (2012); Dabbagh and Kitsantas (2013); DeBord et al 2004 ; Despotović-Zrakić et al 2012; Dow et al. 2011; Dwivedi & Bharadwaj 2013; Fazlollahtabar and Abassi 2012; Feist 2003; Fischer, R. (2007); Fischer, R. (2012); Fournier & Kop 2010; Gibbs (1999); Gilliver et al 1998 ; Glenn (2001); Graf and Kinshuk 2006; Gusev et al 2013; Hallgren (2002); Hamilton & Tee 2010; Harley et al 2003; Hartnett et al 2011; Hiltz (1993); Hodges 2009; Hoffman 2009; Hood 2013; Hrastinski 2008; Innes et al 2006; Johnson et al (2000); Jones and Gower 1997; Kalyuga & Sweller 2005 ; Ke and Xie 2009; Kim et al 2014; Koszalka & Ganesan 2004 ; Kuna 2012; Kuo 2005; Lei et al 2005; Levin et al 1999; Lim & Chiew; Liou (1997); Lonn et al 2012 ; Lovett, Meyer, and Thille 2008; Mabed and Köhler 2012; Mazza and Dimitrova 2004; McManus 2000; Meyer, 2014a; Miller, Risser, and Griffith, 2013; Naveh Tubin and Pliskin 2010 ; Orr, Williams, and Pennington, 2009; Pengnate and Antonego (2013); Phipps et al 2000; Pintz and Posey (2013); Roby et al 2013; Romero & Barberá 2011 ; Sanders et al 2007; Schmeeckle 2003; Schmidt & McCormick 2013; Schneider et al 1999; Sexton et al. 2002; Shaw 2013; Sun, Lin and Yu (2008); Taraban et al 1999; Thorley 2007; Trekles & Frampton 2013; Väljataga & Laanpere 2010; Wang (2008); Wilson and Whitelock 1998; Young 2004; Zacharia 2007; Zemsky and Massy 2004; Zhang 2005
3.1.2 -- COURSE ASSEMBLY
Anderson and Rogan, 2011*; Coffield et al., 2004*; Francis & Flanigan 2012*; Kester et al 2004*; Kester et al. 2006a*; Kester et al. 2006b*; Kozma 2003*; Oxford, R. (1995).*; Ryan, R. M. & Deci, E. L. 2009*; Sharma et al 2012*; van Gog & Paas 2008*; van Gog, Paas, & van Merriënboer 2008*

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H4

Articles that discussed or used Technology variables or processes

3.1.3 -- TECHNOLOGY
Altimari et al 2012; Bachman & Stewart 2011; Bocchi et al 2004; Buchanan (2000); Caspi et al 2005; Despotović-Zrakić et al 2012; Dow et al. 2011; Dwivedi & Bharadwaj 2013; Gibbs (1999); Gusev et al 2013; Hiltz (1993); Jang et al. 2005; Kuna 2012; Lan et al 2003; Lonn et al 2012 ; Lovett, Meyer, and Thille 2008; Maki and Maki 2001; Richards et al 1997; Roblyer 1999; Sanders et al 2007; Schmidt (2002); Sexton et al. 2002; Shaw 2013; Sun, Lin and Yu (2008); Taraban et al 1999; Trekles & Sims 2013; Wang (2008); Wilkinson et al 2004
3.1.3 -- TECHNOLOGY
Sharma et al 2012*

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H5

Articles that discussed or used Student Internal Characterstics variables or processes

4.1.1 -- STUDENT INTERNAL
Aberson et al (2000a); Al Jarf 2004; Arispe and Blake 2012; Ashong and Commander (2012); Bachman & Stewart 2011; Barber and Sharkey 2012; Benbunan-Fich and Hiltz 2003; Benjamin et al. 2008; Bergamin et al 2012; Bocchi et al 2004; Brown et al 2002; Buchanan (2000); Carey (2001); Caspi et al 2005; Chang et al. (2013); Chen & Jang 2010; Clayton et al 2010; Cochran et al. (2012); Connors (2012); Dabbagh and Kitsantas (2013); Day et al (1998); DeBord et al 2004 ; Desmarais et al. (1997).; Dotterweich and Rochelle (2012); Dunn (2014); Dwivedi & Bharadwaj 2013; Estelami 2014; Faux et al (2000); Fischer, R. (2007); Floyd et al (2012); Foster (2012); Frey et al 2003; Giesbers et al. (2013); Glenn (2001); Graf and Kinshuk 2006; Gusev et al 2013; Hamilton & Tee 2010; Han and Johnson (2012); Harris et al. 2008; Hart (2012a); Hartnett et al 2011; Hegelheimer, V., & Chapelle, C. (2000).; Hiltz (1993); Hodges 2009; Holzhüter et al 2013; Huang, Lin, and Huang (2012); Hung et al 2010; Ifenthaler 2013; Jang et al. 2005; Johnson et al. (2013); Joo, Joung, and Sun (2013); Joo, Lim, and Kim (2012); Kalyuga & Sweller 2005 ; Ke and Xie 2009; Keller and Karau 2013; Kerr et al 2006; Kim et al 2014; Koory (2003); Kuboni 2013; Kuna 2012; Kuo et al. (2013a); Kuo et al. (2013b); Ladyshewsky and Taplin (2013); LaRose et al. 1998; Lee and Choi (2012); Lee, Choi, and Kim (2013); Lim & Chiew; Liou (1997); Liu (2012); Logan et al (2002); Mabed and Köhler 2012; Maki and Maki 2001; Maki and Maki 2002; Maki et al (2000); McManus 2000; Mehlenbacher et al (2000); Mentzer et al. 2007; Miller and Pilcher 2002; Navarro and Shoemaker 2000; Nguyen 2008; O'Dwyer et al 2007; Piccoli et al (2001); Pintz and Posey (2013); Richards et al 1997; Richardson 2003; Ridley et al 1998; Roblyer (1999); Sanders et al 2007; Sansone et al 2012; Schellens et al 2008; Schmeeckle 2003; Schneider et al 1999; Schoenfeld-Tacher et al. 2001; Shen et al 2013; Sholomskas et al (2005); Sitzmann (2012); Stark et al. (2013); Sullivan 2002; Sun, Lin and Yu (2008); Taipajortus et al. (2012a); Taipajortus et al. (2012b); Taraban et al 1999; Trekles & Frampton 2013; Trekles & Sims 2013; Tuckman 2007; Väljataga & Laanpere 2010; Wallace and Clariana (2000); Wang (2008); Wang, Shannon, & Ross 2013 ; Weems (2002); Wells 2000; Wilkinson et al 2004; Wilson 2007; Wilson et al (2002); Wise et al 2004; Woodward (1998); Xu and Jaggars (2013c); Yukselturk and Top (2013); Zhang 2005; Zhang et al. (2006); Zhao and Lei 2005 - Meta Analysis
4.1.1 -- STUDENT INTERNAL
Arum & Roksa 2011 *; Coffield et al., 2004*; Credé & Kuncel 2008 *; Credé et al 2010 *; Darolia 2014*; Francis & Flanigan 2012*; George et al 2008*; Gurung et al 2010*; Haarala-Muhonen et al 2011 *; Hanson et al 2011 *; Hlasny 2014 *; Hogan et al 2013*; Kalyuga et al 2001*; Kolari et al 2008 *; Kozma 2003*; Liao 2011*; Masui et al 2012*; Oxford, R. (1995)*; Ryan, R. M. & Deci, E. L. 2009*; van Gog, Paas, & van Merriënboer 2008*

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H6

Articles that discussed or used Student External Characteristics variables or processes

4.1.2 -- STUDENT EXTERNAL
Barber and Sharkey 2012; Bocchi et al 2004; Chen & Jang 2010; Cochran et al. (2012); Hart (2012a); Hood 2013; Keller and Karau 2013; Ladyshewsky and Taplin (2013); Lee, Choi, and Kim (2013); Mann & Henneberry 2014 ; Richards et al 1997; Roblyer 1999; Romero & Barberá 2011 ; Schneider et al 1999; Sitzmann (2012); Stark et al. (2013); Sullivan 2002; Trekles & Frampton 2013; Trekles & Sims 2013; Xu and Jaggars (2013c); Yukselturk and Top (2013)
4.1.2 -- STUDENT EXTERNAL
Arum & Roksa 2011 *; Brint & Cantwell 2010*; Darolia 2014*; George et al 2008*; Haarala-Muhonen et al 2011 *; Hanson et al 2011 *; Hogan et al 2013*

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H7

Articles that discussed or used Course Operation variables or processes

2.2.1 -- COURSE OPERATION
Aberson et al (2003); Al Jarf 2004 ; Bachman & Stewart 2011; Barbera and Clarà 2012; Boling et al 2010; Buchanan (2000); Campbell et al (2011); Carey (2001); Clayton et al 2010; Dellana (2000); Desmarais et al. (1997).; Faux et al (2000); Fischer, R. (2012); Gilliver et al 1998 ; Graff 2003; Hiltz (1993); Hodges 2009; Hood 2013; Innes et al 2006; Johnson et al (2000); Kalyuga & Sweller 2005 ; Ke and Xie 2009; Keller and Karau 2013; Koory (2003); Lan et al 2003; Lei et al 2005; Levin et al 1999; Liu (2012); Lovett, Meyer, and Thille 2008; Maki et al (2000); McManus 2000; Mentzer et al. 2007; Naveh Tubin and Pliskin 2010 ; O'Dwyer et al 2007; Piccoli et al (2001); Poirier and Feldman 2004; Romero & Barberá 2011 ; Schmeeckle 2003; Sexton et al. 2002; Stanley 2006; Sun, Lin and Yu (2008); Taraban et al 1999; Trekles & Frampton 2013; Weems (2002); Wilkinson et al 2004; Wilson et al (2002); Xu and Jaggars (2013a); Young 2004; Zhang 2005; Zhang et al. (2006)
2.2.1 -- COURSE OPERATION
Anderson and Rogan, 2011*; Borrego et al., 2013*; Gurung et al 2010*; Hanson et al 2011 *; Kester et al 2004*; Ryan, R. M. & Deci, E. L. 2009*

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H8

Articles that discussed or used Component Operation variables or processes

2.2.2-- COMPONENT OPERATION
Aberson et al (2000a); Aberson et al (2003); Al Jarf 2004 ; Altimari et al 2012; Bachman & Stewart 2011; Bello et al. 2005; Beyea et al. 2007; Boling et al 2010; Buchanan (2000); Campbell et al (2011); Campbell et al 2008; Carey (2001); Carroll et al. 2009; Collins (2000); Dellana (2000); Desmarais et al. (1997).; Faux et al (2000); Fleetwood et al (2000); Giesbers et al. (2013); Gilliver et al 1998 ; Graff 2003; Gusev et al 2013; Hallgren (2002); Hara, Bonk, and Angeli 2000; Hiltz (1993); Hou 2011; Hrastinski 2008; Hurlburt (2001); Jang et al. 2005; Johnson et al (2000); Ke and Xie 2009; Klass et al (2000); Koory (2003); Koszalka & Ganesan 2004 ; Kuna 2012; Kuo 2005; Lei et al 2005; Logan et al (2002); Lovett, Meyer, and Thille 2008; Maki and Maki 2001; Maki et al (2000); Mann & Henneberry 2014 ; McManus 2000; Mentzer et al. 2007; Meyer and Murrell, 2014a; Miller, Risser, and Griffith, 2013; Parker and Gemino 2001; Piccoli et al (2001); Poirier and Feldman 2004; Romero & Barberá 2011 ; Sanders et al 2007; Schellens et al 2008; Schmeeckle 2003; Schmidt (2002); Shaw 2013; Sholomskas et al (2005); Sitzmann, Kraiger, Stewart, Wisher 2006; Stanley 2006; Sun, Lin and Yu (2008); Taipajortus et al. (2012a); Taipajortus et al. (2012b); Taraban et al 1999; Trekles & Sims 2013; Väljataga & Laanpere 2010; Wallace and Clariana (2000); Wang (2008); Wilkinson et al 2004; Woodward (1998); Zacharia 2007; Zhang 2005; Zhang et al. (2006); Zhao and Lei 2005 - Meta Analysis; Zion et al 2005
2.2.2-- COMPONENT OPERATION
Francis & Flanigan 2012*; Gurung et al 2010*; Kalyuga et al 2001*; Ryan, R. M. & Deci, E. L. 2009*; Sharma et al 2012*

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H9

Articles that discussed or used Student Participation variables or processes

4.2 --STUDENT PARTICIPATION
Artino and Jones (2012); Benbunan-Fich and Hiltz 2003; Bergamin et al 2012; Bernard et al 2004; Capdaferro and Romero 2012 ; Carroll et al. 2009; Connors (2012); Desmarais et al. (1997).; Dotterweich and Rochelle (2012); Fischer, R. (2007); Gibbs (1999); Giesbers et al. (2013); Gilliver et al 1998 ; Han and Johnson (2012); Hara, Bonk, and Angeli 2000; Hart (2012a); Hiltz (1993); Hrastinski 2008; Johnson et al (2000); Kang and Im (2013); Ke and Xie 2009; Koory (2003); Koszalka & Ganesan 2004 ; Kuo et al. (2013a); Kuo et al. (2013b); Ladyshewsky and Taplin (2013); "LaRose et al. 1998; "; Lee and Choi (2012); Levin et al 1999; Lin and Chiu 2013; Macfadyen and Dawson 2010; Maki and Maki 2001; Mann & Henneberry 2014 ; McIsaac et al 1999; Mentzer et al. 2007; Navarro and Shoemaker 2000; Parker and Gemino 2001; Romero & Barberá 2011 ; Schellens et al 2008; Schmidt (2002); Schoenfeld-Tacher et al. 2001; Sitzmann (2012); Sitzmann, Kraiger, Stewart, Wisher 2006; Sullivan 2002; Taraban et al 1999; Tuckman 2007; Wilson 2007; Wilson and Whitelock 1998; Wilson et al (2002); Wise et al 2004; Yukselturk and Top (2013); Zhang 1998; Zhao and Lei 2005 - Meta Analysis
4.2 --STUDENT PARTICIPATION
Arum & Roksa 2011 *; Babcock & Marks 2011 *; Francis & Flanigan 2012*; George et al 2008*; Gurung et al 2010*; Hanson et al 2011 *; Hlasny 2014 *; Hogan et al 2013*; Kolari et al 2008 *; Masui et al 2012*; McCormick 2011 *; Ryan, R. M. & Deci, E. L. 2009*; Sharma et al 2012*; van Gog, Paas, & van Merriënboer 2008*

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H10

Articles that discussed or used Instructional Operation Decisions variables or processes

2.3 -- INSTRUCTIONAL OPERATION DECISIONS
Aberson et al (2003); Bachman & Stewart 2011; Bello et al. 2005; Bocchi et al 2004; Boling et al 2011; Carroll et al. 2009; Dow et al. 2011; Fazlollahtabar and Abassi 2012; Fischer, R. (2012); Frey et al 2003; Gros et al. (2012); Hara, Bonk, and Angeli 2000; Hartnett et al 2011; Havard et al 2005 CT; Hou 2011; Ifenthaler 2013; Ke and Xie 2009; Kuo 2005; Lockyer et al 2013; Lonn et al 2012 ; Lovett, Meyer, and Thille 2008; Mann & Henneberry 2014 ; Mazza and Dimitrova 2004; McIsaac et al 1999; Miller and Pilcher 2002; Nguyen 2008; Phipps et al 2000; Sanders et al 2007; Schellens et al 2008; Schmeeckle 2003; Stanley 2006; Thorley 2007; Tuckman 2007; Wise et al 2004; Zemsky and Massy 2004; Zion et al 2005
2.3 -- INSTRUCTIONAL OPERATION DECISIONS
Borrego et al., 2013*; Eley, 2006*; Hanson et al 2011 *; Pujolà (2002)*; Ryan, R. M. & Deci, E. L. 2009*; van Gog & Paas 2008*; van Gog, Paas, & van Merriënboer 2008*

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H11

Articles that discussed or used Student Participation Decisions variables or processes

4.3.1 -- STUDENT PARTICIPATION DECISIONS
Aberson et al (2003); Altimari et al 2012; Arispe and Blake 2012; Artino and Jones (2012); Bachman & Stewart 2011; Beekman et al. 2009; Benjamin et al. 2008; Bergamin et al 2012; Bidarra & Araújo 2014; Bocchi et al 2004; Carey (2001); Chen & Jang 2010; Clayton et al 2010; Desmarais et al. (1997).; Dunn (2014); Fischer, R. (2007); Fischer, R. (2012); Frey et al 2003; Gros et al. (2012); Hartnett et al 2011; Hegelheimer, V., & Chapelle, C. (2000).; Hoffman 2009; Hood 2013; Innes et al 2006; Jang et al. 2005; Johnson et al. (2013); Ke and Xie 2009; Kim et al 2014; Kuboni 2013; Kuna 2012; Kuo et al. (2013a); Kuo et al. (2013b); Ladyshewsky and Taplin (2013); Lei et al 2005; Maki and Maki 2002 ; Mann & Henneberry 2014 ; McIsaac et al 1999; McManus 2000; Meyer, 2014a; Miller, Risser, and Griffith, 2013; Pengnate and Antonego (2013); Piccoli et al (2001); Richardson 2003; Roblyer 1999; Romero & Barberá 2011 ; Sansone et al 2012; Schellens et al 2008; Schmeeckle 2003; Schoenfeld-Tacher et al. 2001; Sexton et al. 2002; Shaw 2013; Sitzmann (2012); Sitzmann, Kraiger, Stewart, Wisher 2006; Sun, Lin and Yu (2008); Taipajortus et al. (2012a); Taipajortus et al. (2012b); Taraban et al 1999; Väljataga & Laanpere 2010; Wang (2008); Wang, Shannon, & Ross 2013 ; Weems (2002); Wilson and Whitelock 1998; Wilson et al (2002); Xu and Jaggars (2013c); Zhang 1998; Zhang 2005; Zhang et al. (2006); Zhao and Lei 2005 - Meta Analysis; Zion et al 2005
4.3.1 -- STUDENT PART' DECISIONS
Arum & Roksa 2011 *; Francis & Flanigan 2012*; Haarala-Muhonen et al 2011 *; Hanson et al 2011 *; Hlasny 2014 *; Kolari et al 2008 *; Kozma 2003*; Liao 2011*; Pujolà (2002)*; Ryan, R. M. & Deci, E. L. 2009*; Sharma et al 2012*; van Gog & Paas 2008*

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H12

Articles that discussed or used Student Sequencing Decisions variables or processes

4.3.2 -- STUDENT SEQUENCING DECISIONS
Barbera and Clarà 2012; Beekman et al. 2009; Bergamin et al 2012; Boling et al 2010; Boling et al 2011; Desmarais et al. (1997).; Dunn (2014); Dwivedi & Bharadwaj 2013; Fischer, R. (2007); Fischer, R. (2012); Hodges 2009; Kim et al 2014; Kuna 2012; Ladyshewsky and Taplin (2013); Mann & Henneberry 2014 ; McManus 2000; Miller, Risser, and Griffith, 2013; Richards et al 1997; Roblyer 1999; Romero & Barberá 2011 ; Schmeeckle 2003; Sexton et al. 2002; Sun, Lin and Yu (2008); Taraban et al 1999; Trekles & Frampton 2013; Wilson and Whitelock 1998; Zhang et al. (2006)
4.3.2 -- STUDENT SEQ' DECISIONS
Hanson et al 2011 *; Hlasny 2014 *; Masui et al 2012*; McCormick 2011*

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H13

Articles that discussed or used Instructor Intended Output variables or processes

2.4 -- INSTRUCTOR INTENDED OUTPUT
Gibbs (1999); Lin and Chiu 2013; Lovett, Meyer, and Thille 2008; McIsaac et al 1999; Schmeeckle 2003; Stanley 2006
2.4 -- INSTRUCTOR INTENDED OUTPUT
X

Table H14

Articles that discussed or used Student Output variables or processes

4.4 -- STUDENT OUTPUT
Artino and Jones (2012); Barber and Sharkey 2012; Benbunan-Fich and Hiltz 2003; Bocchi et al 2004; Buchanan (2000); Dotterweich and Rochelle (2012); Dunn (2014); Fischer, R. (2007); Gibbs (1999); Gorsky et al 2010; Han and Johnson (2012); Hart (2012a); Holzhüter et al 2013; Hou 2011; Hrastinski 2008; Huang, Lin, and Huang (2012); Joo, Lim, and Kim (2012); Ke and Xie 2009; Lee and Choi (2012); Lee, Choi, and Kim (2013); Lin and Chiu 2013; Lockyer et al 2013; Logan et al (2002); Macfadyen and Dawson 2010; McIsaac et al 1999; Miller, Risser, and Griffith, 2013; Phipps et al 2000; Poirier and Feldman 2004; Richards et al 1997; Schellens et al 2008; Schoenfeld-Tacher et al. 2001; Sitzmann (2012); Sun, Lin and Yu (2008); Taraban et al 1999; Väljataga & Laanpere 2010; Wallace and Clariana (2000); Wilson 2007; Wilson and Whitelock 1998; Wilson et al (2002); Xu and Jaggars (2013a)
4.4 -- STUDENT OUTPUT
Babcock & Marks 2011 *; Credé et al 2010 *; Francis & Flanigan 2012*; Hlasny 2014 *; Hogan et al 2013*; Kolari et al 2008 *; Masui et al 2012*; McCormick 2011 **; Sharma et al 2012**

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H15

Articles that discussed or used Instructional Intended Outcomes variables or processes

2.5 -- INSTRUCTIONAL INTENDED OUTCOMES
Aberson et al (2003); Bacabac 2010; Frey et al 2003; Keller and Karau 2013; Lovett, Meyer, and Thille 2008
2.5 -- INSTRUCTIONAL OUTCOMES
X

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H16

Articles that discussed or used Student Outcomes variables or processes

4.5 -- STUDENT OUTCOMES
Aberson et al (2000a); Al Jarf 2004 ; Arispe and Blake 2012; Artino and Jones (2012); Ashong and Commander (2012); Bacabac 2010; Bello et al. 2005; Benbunan-Fich and Hiltz 2003; Benjamin et al. 2008; Beyea et al. 2007; Bocchi et al 2004; Buchanan (2000); Campbell et al (2011); Campbell et al 2008; Capdaferro and Romero 2012 ; Carey (2001); Collins (2000); Day et al (1998); DeBord et al 2004 ; Dotterweich and Rochelle (2012); Faux et al (2000); Fleetwood et al (2000); Floyd et al (2012); Frey et al 2003; Gilliver et al 1998 ; Glenn (2001); Gorsky et al 2010; Graff 2003; Hallgren (2002); Han and Johnson (2012); Harris et al. 2008; Hart (2012a); Hiltz (1993); Hou 2011; Hrastinski 2008; Jang et al. 2005; Johnson et al (2000); Joo, Joung, and Sun (2013); Joo, Lim, and Kim (2012); Kang and Im (2013); Ke and Xie 2009; Keller and Karau 2013; Klass et al (2000); Koory (2003); Koszalka & Ganesan 2004 ; Kuna 2012; Kuo 2005; Kuo et al. (2013a); Kuo et al. (2013b); Ladyshewsky and Taplin (2013); Lan et al 2003; LaRose et al. 1998; Lee and Choi (2012); Lin and Chiu 2013; Liou (1997); Lockyer et al 2013; Logan et al (2002); Lovett, Meyer, and Thille 2008; Mabed and Köhler 2012; Macfadyen and Dawson 2010; Maki and Maki 2001; Maki and Maki 2002 ; Maki et al (2000); McIsaac et al 1999; Mehlenbacher et al (2000); Mentzer et al. 2007; Miller and Pilcher 2002; Naveh Tubin and Pliskin 2010 ; Nguyen 2008; O'Dwyer et al 2007; Ocker and Yaverbaum (1999); Parker and Gemino 2001; Pengnate and Antonego (2013); Phipps et al 2000; Piccoli et al (2001); Pintz and Posey (2013); Poirier and Feldman 2004; Richards et al 1997; Ridley et al 1998; Sansone et al 2012; Schellens et al 2008; Schmeeckle 2003; Schmidt (2002); Schoenfeld-Tacher et al. 2001; Shaw 2013; Shen et al 2013; Sholomskas et al (2005); Sitzmann, Kraiger, Stewart, Wisher 2006; Stanley 2006; Sullivan 2002; Trekles & Sims 2013; Tuckman 2007; Wallace and Clariana (2000); Wang (2008); Weems (2002); Wilson 2007; Wilson et al (2002); Wise et al 2004; Woodward (1998); Xu and Jaggars (2013a); Yukselturk and Top (2013); Zacharia 2007; Zhang 2005; Zhang et al. (2006); Zion et al 2005
4.5 -- STUDENT OUTCOMES
Arum & Roksa 2011 *; Brint & Cantwell 2010*; Credé et al 2010 *; Darolia 2014*; Francis & Flanigan 2012*; Kester et al. 2006a*; Kester et al. 2006b*; Liao 2011*; Sharma et al 2012*

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Table H17

Articles that discussed or used Faculty Goals variables or processes

2.6 -- FACULTY GOALS
Bacow et al 2012; Rockwell et al 1999
2.6 -- FACULTY GOALS
X

Table H18

Articles that discussed or used Student Goals variables or processes

4.6-- STUDENT GOALS
Bocchi et al 2004; Dabbagh and Kitsantas (2013); Gros et al. (2012); Joo, Joung, and Sun (2013); Keller and Karau 2013; McIsaac et al 1999; Richardson 2003; Schmeeckle 2003
4.6-- STUDENT GOALS
Arum & Roksa 2011 *; Haarala-Muhonen et al 2011 *; Hanson et al 2011 *; Hogan et al 2013*; Kolari et al 2008 *; Pujolà (2002)*

*Article was not specifically about online, distance, or hybrid education. The inclusion of article in the search for variables for the framework was based on the assumption that there are potential similarities in online and in-person education and the variables used in the study of education as a whole could also be used in the study of a framework of online education.

Appendix I: Example Excerpts from Student Surveys Representing Study Codes

Table I1:
Examples of student survey excerpts coded with *Institutional Issues* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Institutional Issues	Subject 003 (Excerpt 2256-2396)	"I've noticed it's getting harder to get a reasonable schedule going after the recurring budget cuts and an online class solves this problem."
Institutional Issues	Subject 049 (Excerpt 1564-1726)	"not many this kind of classes" (When asked "What would be the main reason for not taking an online course at [this university] in the future?")
Institutional Issues		"add people to the website by the 2nd day of class" (When asked, "Do you have any suggestions for improving the online course website?")

Table I2
Examples of student survey excerpts coded with *Instructor / TA Characteristics Input* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Instructor / TA Characteristics Input	Subject 030 (Excerpt 7190-7305)	"[The professor] was a good instructor and was very passionate. I only wished that some of his students were as passionate as he is."
Instructor / TA Characteristics Input	Subject 207 (Excerpt 7165-7255)	"Enjoyed the professor. He is passionate about the class, and I appreciated his enthusiasm." (When asked the question, "Is there anything else you would like to share with us about this course that we haven't already asked?")
Instructor / TA Characteristics Input	Subject 215 (Excerpt 5583-5780)	"They were nice. TA was very kind, but not very knowledgable [sic]. Honestly didn't know much more than I did coming into this course, and that is not good. Was very accessible, but just not very smart :/" (When asked the question, "Is there anything else you would like to say about your experiences attending discussion sections?")

Table I3
Examples of student survey excerpts coded with *Subject/Content Input* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Subject / Content Input	Subject 039 (Excerpt 1810-1964)	"Subject of the course" (When asked "What would be the main reason for not taking an online course at [this university] in the future?")
Subject / Content Input	Subject 105 (Excerpt 1565-1649)	"I would not take my core classes online due to the difficulty of the subject matter." (When asked "What would be the main reason for not taking an online course at [this university] in the future?")
Subject / Content Input	Subject 130 (Excerpt 2150-2302)	"It is all dependent on the material. I would never take an Engineering course for my major online, but for college requirements it is a different story."

Table I4
Examples of student survey excerpts coded with *Course Assembly Input* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Course Assembly Input	Subject 010 (Excerpt 3233-3438)	"Regarding transcripts and interactive lectures, make sure the reading transcripts correspond with the correct interactive lectures. A few transcripts were for different lectures which confused me at first."

Table I5
Examples of student survey excerpts coded with *Technology Input* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Technology Input	Subject 003 (Excerpt 2720-2891)	"Internet disconnected a few times when I was trying to speak to the class and I realized after I spoke for a minute no one could hear me so it complicated things a little."
Technology Input	Subject 006 (Excerpt 2824-3147)	Also, during online discussion, poor or non-existent audio normalization presents a challenge when listening to participants. Some participants have microphone broadcast volumes that are too loud and some that are too soft, where taking turns on the mic is also a scramble with how fast you can adjust your headset volumes.
Technology Input	Subject 011 (Excerpt 2452-3561)	"internet cut out the TA during discussions and completely shutdown at one point which ended discussion early." (When responding to, "Please describe how the technology failed")
Technology Input	Subject 016 (Excerpt 2033-2167)	"The application froze and was not able to reconnect. My computer froze and was not able to turn on until I went to see a professional." (When responding to, "Please describe how the technology failed")
Technology Input	Subject 023 (Excerpt 5388-5657)	"Though it's not something that can be controlled, but it'd be better if everyone had sufficient equipment and internet connection."
Technology Input	Subject 023 (Excerpt 1564-1801)	"Technical issues were a bit of a problem for me. The website stopped working on my computer part way through the quarter and I couldn't figure out the problem so I was forced to use my housemate's computer for all remaining assignments." (When asked "What would be the main reason for not taking an online course at [this university] in the future?")
Technology Input	Subject 078 (Excerpt 2388-2449)	"Site crashed, could not submit homework, or take quiz on time"
Technology Input	Subject 097 (Excerpt 1564-1711)	"The main reason for not taking an online course in the future is technical difficulties that interfere with the time allotted for instruction time."
Technology Input	Subject 125 (Excerpt 2105-2147)	"Projector would not work in class one day." (In-person section student responding to, "Please describe how the technology failed")
Technology Input	Subject 195 (Excerpt 2141-2319)	"Weak internet can prohibit me from truning [sic] in assignments in time. Internet can drop so all online work could be deleted. Computer could have problems. Online site could be down." (When asked "What would be the main reason for not taking an online course at [this university] in the future?")

Table I6:
Examples of student survey excerpts coded with *Students (Combined)* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Students (Combined)	Subject 001 (Excerpt 5970-6208)	"Simply that it was difficult to rouse the other students into communicating, though there may have been technical difficulties, not many students engaged in the subject matter or reviewed the materials properly before discussion sections."
Students (Combined)	Subject 001 (Excerpt 6777-6964)	"Students did not properly review course materials before asking questions, though, for collaborative writing assignments, students were clever enough to share their assignments via [the discussion board]."
Students (Combined)	Subject 006 (Excerpt 7035-7298)	"Also, how about providing an option for low-population discussion sessions to merge with other low-population discussion sessions. It's all subjective, though, but maybe having 5 students in a discussion isn't numerous enough to provide a diverse set of opinions?"
Students (Combined)	Subject 028 (Excerpt 6739-6826)	"Participating was made easier with the smaller class size and with the TAs' initiation."

Table I7
Examples of student survey excerpts coded with *Student Internal Characteristics Input* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Student Internal Characteristics Input	Subject 006 (Excerpt 8458-8569)	"The biggest challenge was accepting a whole new way to learn. The new learning method took a while to adapt to."
Student Internal Characteristics Input	Subject 032 (Excerpt 1806-2020)	"A lot of work got put off until a later time for me. It is easy to procrastinate."
Student Internal Characteristics Input	Subject 032 (Excerpt 1565-1600)	"Lack of motivation to view lectures"

Table I8
Examples of student survey excerpts coded with *Student External Characteristics Input* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Student External Characteristics Input	Subject 155 (Excerpt 1795-1906)	"Allows for greater flexibility and, at least for me, it would allow me to not be so dependent on bus schedules."
Student External Characteristics Input	Subject 011 (Excerpt 1820-2128)	"It allows me to freely allocate my time and learn the lectures in my own personal time. Whereas, in an in person course, I am forced to attend a lecture at a certain time period at which I may not be fully attentive due to external factors such as lack of sleep, or worrying about tests after the class, etc." (When asked "What would be the main reason for taking an online course at [this university] in the future?")
Student External Characteristics Input	Subject 030 (Excerpt 2047-2417)	"It is nice to schedule studying and seeing lectures on my own time. It allowed me to focus on this class when I needed to but I could also ignore it at times if my other classes were being very demanding during a certain time in the quarter."
Student External Characteristics Input	Subject 034 (Excerpt 6367-6852)	"Really want to emphasize that the flexibility of the course helped out because I have a curve of tons of homework at a certain point of the week and nothing to do on the other days so the ability to choose whenever to do the work was extremely helpful."
Student External Characteristics Input	Subject 040 (Excerpt 1709-1946)	"Allows me to budget my time according to my schedule so that I don't become overwhelmed when taking 17+ units"
Student External Characteristics Input	Subject 159 (Excerpt 1801-1891)	"I work full time so I will choose online over in-person just because of scheduling issues." (When asked "What would be the main reason for not taking an online course at [this university] in the future?")
Student External Characteristics Input	Subject 202 (Excerpt 1630-1750)	"I tend to get distracted with the online sessions because I am in an environment where I can get distracted more easily." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Student External Characteristics Input	Subject 206 (Excerpt 2145-2403)	"The only reason that I would not take an online course would be if I did not have a laptop or computer to access the internet, which is very unlikely." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Student External Characteristics Input	Subject 228 (Excerpt 2397-2498)	"Being able to watch the lectures online when I miss class (a common occurrence for a varsity athlete)" (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")

Table I9
Examples of student survey excerpts coded with *Instructor Operation Decisions* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Instructor Operation Decisions	Subject 199 (Excerpt 3675-3812)	Please, for those of us who don't procrastinate, make the quizzes available and allow the assignments to be turned in at 22:01 on Friday.
Instructor Operation Decisions	Subject 171 (Excerpt 6529-6683)	"Work on the midterm to match it with the rest of the class. You can't grade everything reasonably and then grade the midterm really hard. That isn't fair."

Table I10
Examples of student survey excerpts coded with *Student Participation Decisions* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Student Participation Decisions	Subject 34 (Excerpt 6367-6852)	"Really want to emphasize that the flexibility of the course helped out because I have a curve of tons of homework at a certain point of the week and nothing to do on the other days so the ability to choose whenever to do the work was extremely helpful."

Table I11
Examples of student survey excerpts coded with *Efficiency Criteria* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Efficiency Criteria	Subject 038 (Excerpt 1564 – 1654)	"Online classes often has a more demanding workload to compensate for a lack of class time." (When asked "What would be the main reason for not taking an online course at [this university] in the future?")
Efficiency Criteria	Subject 027 (Excerpt 6037-6225)	"Just not enough interest in the student body for it to work. If everybody used it, it would be fine, but it wasn't promoted enough. Maybe incentives... extra credit? Participation grade?"
Efficiency Criteria	Subject 089 (Excerpt 6323-6746)	"This course was a shocker. It was an extreme amount of work for only three units. Additionally some of the exercises dragged on to the point where it felt like I was rewriting full articles. A disappointing course over all."
Efficiency Criteria	Subject 159 (Excerpt 1565-1656)	"They generally are harder than their in-person counterparts and generally assign more work." (When asked "What would be the main reason for not taking an online course at [this university] in the future?")
Efficiency Criteria	Subject 172 (Excerpt 1565-1650)	"I learn better in a classroom. I paid to go to a good college not take online courses" (When asked "What would be the main reason for not taking an online course at [this university] in the future?")
Efficiency Criteria	Subject 182 (Excerpt 1778-1812)	"its easier and less time consuming." (When asked "What would be the main reason for taking an online course at [this university] in the future?")
Efficiency Criteria	Subject 184 (Excerpt 6945-7124)	"homework assignments were too many. one quiz + one essay per week doesnt [sic] do justice to 3 units, if the class was worth 4 units, all the homework assignments would have made sense." (When asked, "Is there anything else you would like to share with us about this course that we haven't already asked?")
Efficiency Criteria	Subject 196 (Excerpt 2336-2473)	"less time needs to be put in, plus the website allowed to contact the peers through piazza if any problems on assignments were encountered" (When asked "What would be the main reason for taking an online course at [this university] in the future?")
Efficiency Criteria	Subject 224 (Excerpt 2150-2208)	"They are often very hard and lack ability to ask questions" (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")

Table I12
Examples of student survey excerpts coded with *Characteristics and Operation* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Course Characteristics and Operation	Subject 10 (Excerpt 6597-6933)	[This course] is a very important class. I am glad that i am taking it and i think that it should be a required course for all students.
Component Characteristics and Operation	Subject 30 (Excerpt 1806-2009)	discussion sections were very slow moving and I felt that they were somewhat of a waste of time.

Table I13
Examples of student survey excerpts coded with *Actual Instructor Participation* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Actual Instructor Participation	Subject 097 (Excerpt 6161-6376)	"I attempted to meet with my TA twice and both times we made an appointment and both times he did not show up. This made it extremely difficult for me to get help from him and talk about how I could improve my grade." (When asked, "Is there anything else you would like to share with us about this course that we haven't already asked?")
Actual Instructor Participation	Subject 100 (Excerpt 1565-1722)	"Lack of communication from my past TA. Had to send three emails before I got a response in a 2 week span. e-mailed me other stuff while avoiding my question." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Actual Instructor Participation	Subject 207 (Excerpt 2806-2990)	"internet connection issues, an issue with logging into adobe connect, issues with online submission, a few videos, and a few sofware [sic] glitches. The instructor took care of these issues." (When responding to the question, "Please describe how the technology failed")

Table I14
Examples of student survey excerpts coded with *Actual Student Participation* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Actual Student Participation	Subject 047 (Excerpt 1795-2010)	"It is very convenient and a lot of ways to become more interactive during the lecture." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Actual Student Participation	Subject 098 (Excerpt 5868-5914)	"online discussions frequently slipped my mind."

Table I15
Examples of student survey excerpts coded with *Instructor Intended Output, Instructor Intended Outcomes, and Instructor Goals* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Instructor Intended Output	Subject 220 (Excerpt 1566-1803)	There was a lot more busy work involved just to prove that I watched the internet lectures. Very time consuming and not necessary.
Instructor Goals		No excerpts found in student comments
Instructor Intended Outcomes	Subject 007 (Excerpt 6630-6831):	"Quizzes and tests focused on inane bits of information straight from the book. Students were rewarded for memorizing tidbits of trivia from the text rather than understanding the concepts of the class."

Table I16
Examples of student survey excerpts coded with *Actual Student Output* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Actual Student Output	Subject 224 (Excerpt 6803-7067)	"This class required way to much work for a typical 3 unit class."
Actual Student Output	Subject 184 (Excerpt 6945-7325)	"homework assignments were too many. one quiz + one essay per week doesnt do justice to 3 units, if the class was worth 4 units, all the homework assignments would have made sense."
Actual Student Output	Subject 087 (Excerpt 1802-2058)	"Course load. This class was only 3 units but it required a ton of extra work. I would say that this class is AT LEAST 4 units worth of time and work."
Actual Student Output	Subject 042 (Excerpt 1802-1992)	"Too much busy work in comparison to in person lectures."

Table I17
Examples of student survey excerpts coded with *Actual Student Outcomes* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Actual Student Outcomes	Subject 136 (Excerpt 6995-7093)	"This course was one of the most fun and interesting that I have ever taken at [at this university]" (When asked, "Is there anything else you would like to share with us about this course that we haven't already asked?")

Table I18
Examples of student survey excerpts coded with *Individual Student Goals* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Individual Student Goals	Subject 004 (Excerpt 1808-2078)	"The main reason for not taking an online course at [this university] in the future would simply be if I have no reason to take a class. If there are no units or graduation requirements I need that can be satisfied by an online course, than I won't take an online course"

Table I19
Examples of student survey excerpts coded with the *Sub-codes for Student Internal Input Characteristics* in Study 2

Internal Characteristic	Excerpt Location	Example Excerpt
Background and Abilities	Subject 168 (6599-6859)	"As a physics major, I really enjoyed the emphasis on science." (When responding to, "Is there anything else you would like to share with us about this course that we haven't already asked")
Background and Abilities	Subject 026 (1802-2119)	"It is very hard and is graded like a 4 unit class. The professor does not assume that we may not have a background in the field of study and teaches as if we were all science majors." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Compatibility for Learning Environment or Instructional Practice	Subject 217 (2489-2683)	"It'll be easier to manage time and it's better for people who work/concentrate better alone" (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")
Compatibility for Learning Environment or Instructional Practice	Subject 197 (2149-2353)	"I learn better in person than online. I prefer the lecture room environment, it keeps me focused." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Compatibility for Learning Environment or Instructional Practice	Subject 095 (1810-2037)	"Attending lectures keeps me on pace with the class, and reminders make more of a difference to me if they are in person" (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Interest in Subject or Learning Intervention	Subject 032 (6590-6991)	"I really enjoyed the essay assignments. Normally, I don't like writing homework--me being a science major. But I felt like I got a better grasp on the impact of [the subject area] by writing essays."
Interest in Subject or Learning Intervention	Subject 102 (651-802)	"something new, plus good topic" (When responding to, "Why did you choose to take the online version of this course?")
Interest in Subject or Learning Intervention	Subject 053 (662-831)	"To see what it is like to have an online course. " (When responding to, "Why did you choose to take the online version of this course?")
Motivation / Focus / Time Management	Subject 218 (1566-1846)	"I feel more confortable being in a classroom setting rather than sitting in front of my computer. This way I am able to concentrate on the material without any distractions."
Motivation / Focus / Time Management	Subject 032 (1806-1994)	"A lot of work got put off until a later time for me. It is easy to procrastinate." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")

Table I19 Continued
Examples of student survey excerpts coded with the *Sub-codes for Student Internal Input Characteristics* in Study 2

Internal Characteristic	Excerpt Location	Example Excerpt
Motivation / Focus / Time Management	Subject 217 (2489-2683)	"It'll be easier to manage time and it's better for people who work/concentrate better alone" (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")
Motivation / Focus / Time Management	Subject 200 (2149-2350)	"I would have to rely on my own willpower to finish the course work if I take an online class." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Motivation / Focus / Time Management	Subject 164 (2164-2334)	"I learn better and am more focused in an actual class setting."
Motivation / Focus / Time Management	Subject 145 (2170-2350)	"Time management would be the biggest reason to not take an online course."
Motivation / Focus / Time Management	Subject 134 (1565-1727)	"I'm not motivated enough to do the work on my own time." When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Motivation / Focus / Time Management	Subject 102 (5994-6293)	"I wish people would have gone prepared for discussion. I honestly felt i was the only who kept up with the material. Too bad for those that didnt really cared about the course or discussion!"
Motivation / Focus / Time Management	Subject 054 (2082-2393)	"It gives me a lot of free time because I do manage my time well and can treat this as another class. If I don't have time to go today I will make time to go later so it makes my schedule a lot more flexible." (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")
Preference for a Learning Environment	Subject 221 (2142-2353)	"I prefer in-person because questions are answered better and the interaction is often much more helpful." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Preference for a Learning Environment	Subject 218 (1566-1846)	"I feel more confortable being in a classroom setting rather than sitting in front of my computer. This way I am able to concentrate on the material without any distractions."
Preference for a Learning Environment	Subject 093 (1830-2149)	"It is flexible with my other classes and I can watch the lectures when ever. It is nice to learn in the comfort of your own home but that also could leave room for procrastination. overall, it was a good experience." (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")
Prior Experience	Subject 054 (2613-2771)	"The students and I did not know how to work the online chat room but after we did it was all working fine."
Prior Experience	Subject 009 (1561-1715)	"Entirely depends on course material, but I'd say I wouldn't take an online course in the future because I'm more familiar with courses that are in-person."

Table I20
Examples of student survey excerpts coded with *Sub-codes for Student External Characteristics* in Study 2

External Characteristic	Excerpt Location	Example Excerpt
Distance from University	Subject 165 (Excerpt 1954-2094)	"It is convenient as one doesn't have to go all the way to campus just to attend lecture, especially for those who live far away from campus." (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")
Money or Resources	Subject 085 (Excerpt 1564-1682)	"Had to purchase a webcam" (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Money or Resources	Subject 085 (Excerpt 1563-1694)	"My internet too slow :(" (When responding to, "Please describe how the technology failed.")
Money or Resources	Subject 088 (Excerpt 1564-1682)	"No internet" (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Money or Resources	Subject 206 (Excerpt 2145-2403)	"The only reason that I would not take an online course would be if I did not have a laptop or computer to access the internet, which is very unlikely." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Personal Environment	Subject 173 (Excerpt 1565-1713)	"dont have the privacy for online lectures" (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Personal Environment	Subject 218 (Excerpt 1566-1846)	"I feel more confortable [sic] being in a classroom setting rather than sitting in front of my computer. This way I am able to concentrate on the material without any distractions." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Personal Environment	Subject 217 (Excerpt 2489-2683)	"It'll be easier to manage time and it's better for people who work/concentrate better alone." (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")
Requirements for Graduation	Subject 004 (Excerpt 1808-2078)	"The main reason for not taking an online course at [this university] in the future would simply be if I have no reason to take a class. If there are no units or graduation requirements I need that can be satisfied by an online course, than I won't take an online course." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Requirements for Graduation	Subject 160 (Excerpt 2401-2631)	"I would only register for an online course if I absolutely needed to to enroll in said course to fulfill academic requirements." (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")

Table I20 Continued
Examples of student survey excerpts coded with *Sub-codes for Student External Characteristics* in Study 2

External Characteristic	Excerpt Location	Example Excerpt
Requirements for Graduation	Subject 151 (Excerpt 2452-2608)	"It was a required class that was only offered online." (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")
Time Conflicts	Subject 011 (Excerpt 1820-2254)	"It allows me to freely allocate my time and learn the lectures in my own personal time. Whereas, in an in person course, I am forced to attend a lecture at a certain time period at which I may not be fully attentive due to external factors such as lack of sleep, or worrying about tests after the class, etc." (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")
Time Conflicts	Subject 145 (Excerpt 2388-2525)	"Fits in with any college schedule." (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")
Time Conflicts	Subject 159 (Excerpt 1801-1994)	"I work full time so I will choose online over in-person just because of scheduling issues." (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")

Table I21
Examples of student survey excerpts coded with *Sub-codes for Student Participation Decisions* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Participation Decision in Component-Activity	Subject 001 (7329-7625)	"I would appreciate some sort of reminder system for assignments and what not that is e-mail centric and automatically set in place, but can be turned off by students dependent on preference - I didn't log in to the website for a couple days at a time and almost missed some important information."
Participation Decision in Component-Activity	Subject 093 (6557-7001)	"I sometimes preferred the readings over watching lectures. It may have been because he was talking too fast in the videos for me to take notes and most of it was similar wording to what it said in the book."
Participation Decision in Component-Activity	Subject 095 (6399-6597)	"I didn't use piazza unless it was required to communicate with other students"
Participation Decision in Component-Activity	Subject 098 (5868-5914)	"online discussions frequently slipped my mind."
Participation Decision in Course	Subject 220 (6533-6977)	"Overall, I will not be taking another online course. It was too much busywork and required too much energy and effort to make sure that I was connected to Adobe connect at the right times, in the right place."
Participation Decision in Course	Subject 218 (1884-2188)	"If I wanted to take a specific course, but did not have the time to take the class or if the class did not fit in my schedule, an online course would be the best opportunity [the university] can offer." (When responding to, "What would be the main reason for taking an online course at [this university] in the future?")
Towards In-Person	Subject 130 (2150-2409)	"It is all dependent on the material. I would never take an Engineering course for my major online, but for college requirements it is a different story."
Towards In-Person	Subject 229 (2146-2340)	"Needing to be somewhere with wifi, outside of a classroom and not being able to focus." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Towards In-Person	Subject 010 (1813-1946)	"i prefer in-class learning" (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Towards In-Person	Subject 227 (1566-1873)	"The lack of face-to-face interaction with an online course is a big turnoff. It is important to my learning to have the back and forth discussion that you can really only have in and in-person course." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Towards In-Person	Subject 222 (1566-1723)	"online courses give too much room for distractions" (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")

Table I21 Continued
Examples of student survey excerpts coded with *Sub-codes for Student Participation Decisions* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Towards In-Person	Subject 220 (1566-1803)	"There was a lot more busy work involved just to prove that I watched the internet lectures. Very time consuming and not necessary." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Towards In-Person	Subject 160 (2401-2631)	"I would only register for an online course if I absolutely needed to to enroll in said course to fulfill academic requirements." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Towards In-Person	Subject 145 (Excerpt 2170-2350)	"Time management would be the biggest reason to not take an online course."
Towards In-Person	Subject 125 (1565-1723)	"It's harder to ask questions if it's not in person."
Towards In-Person	Subject 100 (1565-1829)	"Lack of communication from my past TA. HAd to send three emails before I got a response in a 2 week span. e-mailed me other stuff while avoiding my question." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Towards In-Person	Subject 097 (1564-1818)	"The main reason for not taking an online course in the future is technical difficulties that interfere with the time allotted for instruction time."
Towards In-Person	Subject 052 (1901-1950)	"I hate works that are due at midnight on Fridays!" (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Towards In-Person	Subject 049 (1564-1726)	"not many this kind of classes" (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Towards In-Person	Subject 025 (1798-1974)	"It is not accepted to fulfill requirements." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Towards In-Person	Subject 018 (1814-1929)	"I think the quality of a course is better in-person, especially when the professor is passionate about the subject." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Towards In-Person	Subject 011 (1563-1808)	"Not having the sufficient technology to attend discussions, or not having easy available access to the internet." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")

Table I21 Continued
Examples of student survey excerpts coded with *Sub-codes for Student Participation Decisions* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Towards In-Person	Subject 006 (1803-2083)	"Extensive collaborative efforts with classmates would encourage me to not take the online course. It's difficult to create and foster new friendships (that will carry a group better than academic acquaintances with a common goal) through forum posts or limited 1-hour discussions. (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Towards In-Person	Subject 003 (1807-2074)	"Our instructor is probably one of the better professors I've had at [this university]. The nature of this class minimizes the time we spend with him and I don't feel like I'm getting my money's worth by taking this course even though it's well thought out in general." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Towards Online	Subject 099 (1955-2079)	"don't have to travel" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Towards Online	Subject 220 (1841-1981)	"Could access it whenever I wanted to." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Towards Online	Subject 166 (1954-2221)	"The only reason why I would choose to take an online course in the future would be if taking it in person wasn't an option and it was a required class for my major." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Towards Online	Subject 141 (2370-2513)	"In order to overcome scheduling conflict" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Towards Online	Subject 107 (1740-1984)	"If I was a student at [this university] in the future again, it gives me the flexibility to study the material on my own time at my own pace." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Towards Online	Subject 136 (2357-2528)	"It allowed me to study at my own pace and work it around my schedule" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Towards Online	Subject 229 (2377-2587)	"Don't have to leave your room. Good if you had a far away place that took a long time to get to class from." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Towards Online	Subject 228 (2397-2601)	"Being able to watch the lectures online when I miss class (a common occurrence for a varsity athlete)." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")

Table I21 Continued
Examples of student survey excerpts coded with *Sub-codes for Student Participation Decisions* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Towards Online	Subject 215 (1911-2103)	"If it was a course I wasn't very interested in and it would be easier for me to get an A." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Towards Online	Subject 210 (2498-2690)	"I could self-pace and study when I had to, while juggling a huge courseload [sic] on the side." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Towards Online	Subject 209 (1942-2244)	"It's good for people with a long commute. It allows better time management, and the material is always available for review. For this class in particular, the online lectures were well put together." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Towards Online	Subject 205 (2384-2562)	"The ability to watch online lectures at any time, as many times as I want." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Towards Online	Subject 196 (2336-2576)	"less time needs to be put in, plus the website allowed to contact the peers through piazza if any problems on assignments were encountered" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Towards Online	Subject 182 (1778-1941)	"its easier and less time consuming." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")

Table I22
Examples of student survey excerpts coded with *Sub-codes of Efficiency Evaluation* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Access	Subject 220 (1841-1981)	"Could access it whenever I wanted to." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Access	Subject 156 (2149-2318)	"Difficulties with computers and contacting TA's or professors." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Satisfaction	Subject 215 (Excerpt 1565-1766)	"Doesnt feel like a class. I enjoy the experience of going to a classroom and being involved. Taking a course online, you can learn the same material, but it is not enjoyable. Not necessary. Why online?"
Satisfaction	Subject 032 (6590-6991)	"I really enjoyed the essay assignments. Normally, I don't like writing homework--me being a science major. But I felt like I got a better grasp on the impact of [the subject area] by writing essays."
Satisfaction	Subject 030 (3501-3906)	"I emailed my TA and instructor about the problems that I was having with my laptop and using the website and they did not have a solution for me. Granted, it was most likely something wrong with my computer and not anything to do with them- it was still frustrating completing the end of this course all on my friend's computer."
Content Learning	Subject 141 (2141-2333)	"I would think the material would be better taught in a person to person interaction."
Content Learning	Subject 177 (5798-6111)	"I felt that overall, the online videos were more relevant to the materials tested than the topics discussed during discussion because the online video questions were more closely related and more detailed."
Contribution to Goals / Interests	Subject 166 (1954-2221)	"The only reason why I would choose to take an online course in the future would be if taking it in person wasn't an option and it was a required class for my major." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Contribution to Goals / Interests	Subject 030 (2047-2391)	"It is nice to schedule studying and seeing lectures on my own time. It allowed me to focus on this class when I needed to but I could also ignore it at times if my other classes were being very demanding during a certain time in the quarter." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Contribution to Goals / Interests	Subject 033 (1926-2100)	"good for adding along G.E.'s to the unit pool" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")

Table I22 Continued
Examples of student survey excerpts coded with *Sub-codes of Efficiency Evaluation* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Contribution to Goals / Interests	Subject	"Being able to watch the lectures online when I miss class (a common occurrence for a varsity athlete)" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Process Performance	Subject 205 (Excerpt 2106-2198)	"I heard the online course was having technical difficulties." (When asked, "Why did you choose to take the in-person course rather than the online version of the course?")
Process Performance	Subject	"discussion sections were very slow moving and I felt that they were somewhat of a waste of time." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Process Performance	Subject 213 (1565-1743)	"The main reason for not taking an online course would be that the website may lose data, or restrict access. It's happened a couple times and I was unable to start an assignment.
Time / Effort	Subject 220 (6533-6977)	"Overall, I will not be taking another online course. It was too much busywork and required too much energy and effort to make sure that I was connected to Adobe connect at the right times, in the right place"
Time / Effort	Subject 200 (2149-2350)	"I would have to rely on my own willpower to finish the course work if I take an online class." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Time / Effort	Subject 196 (2336-2576)	"less time needs to be put in, plus the website allowed to contact the peers through piazza if any problems on assignments were encountered" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Time / Effort	Subject 159 (1565-1763)	"They generally are harder than their in-person counterparts and generally assign more work." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Money / Resources	Subject 086 (1563-1717)	"Access to internet is at times hard to come by." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Money / Resources	Subject 206 (2145-2403)	"The only reason that I would not take an online course would be if I did not have a laptop or computer to access the internet, which is very unlikely."
Money / Resources	Subject 210 (1565-1735)	"Having to buy the headphones in order to take the online class." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")

Table I23
Examples of student survey excerpts coded with *Sub-codes of Access* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Course Format	Subject 226 (6461-6773)	"The textbook was not easily accessible at all. Please fix that and also make it a little more affordable please."
Course Format	Subject 208 (1710-1870)	"Easy access, everything is available at all times online." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Course Format	Subject 209 (1942-2244)	"It's good for people with a long commute. It allows better time management, and the material is always available for review. For this class in particular, the online lectures were well put together." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Course Format	Subject 184 (2349-2487)	"Accessibility to material on the go" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Course Format	Subject 175 (1795-2009)	"I liked that I could watch lectures when it was convenient for me and was able to rewind if i missed something." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Course Format	Subject 148 (2323-2467)	"don't have to sit in a huge lecture hall" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Course Format	Subject 137 (2520-2602)	"I can use ctrl-F to find key words I needed more information about in transcripts."
Course Format	Subject 089 (1564-1804)	"The course was kinda disorganized. It was also very difficult to learn from your mistakes as little feedback was given, just a score." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Course Offering	Subject 166 (1954-2221)	"The only reason why I would choose to take an online course in the future would be if taking it in person wasn't an option and it was a required class for my major." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Course Offering	Subject 002 (651-703)	"Had 4 classes and this filled my last GE requirement"
Course Offering	Subject 003 (2256-2396)	"I've noticed it's getting harder to get a reasonable schedule going after the recurring budget cuts and an online class solves this problem."
Fit with Schedule	Subject 141 (2370-2513)	"In order to overcome scheduling conflict" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")

Table I23 Continued
Examples of student survey excerpts coded with *Sub-codes of Access* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Fit with Schedule	Subject 030 (2047-2391)	"It is nice to schedule studying and seeing lectures on my own time. It allowed me to focus on this class when I needed to but I could also ignore it at times if my other classes were being very demanding during a certain time in the quarter." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Fit with Schedule	Subject 226 (1813-2040)	"If it was a class I am interested in, but are during hours of the day that I am unable/unwilling to leave my place of study." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Fit with Schedule	Subject 223 (1825-1975)	"So that I can fit in more units in my schedule." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Fit with Schedule	Subject 155 (1795-2009)	"Allows for greater flexibility and, at least for me, it would allow me to not be so dependent on bus schedules." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Fit with Schedule	Subject 034 (6367-6852)	"Really want to emphasize that the flexibility of the course helped out because I have a curve of tons of homework at a certain point of the week and nothing to do on the other days so the ability to choose whenever to do the work was extremely helpful."
Fit with Schedule	Subject 011 (1820-2254)	"It allows me to freely allocate my time and learn the lectures in my own personal time. Whereas, in an in person course, I am forced to attend a lecture at a certain time period at which I may not be fully attentive due to external factors such as lack of sleep, or worrying about tests after the class, etc" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Interaction / Communication	Subject 196 (Excerpt 2336-2576)	"less time needs to be put in, plus the website allowed to contact the peers through piazza if any problems on assignments were encountered" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Interaction / Communication	Subject 227 (1566-1873)	"The lack of face-to-face interaction with an online course is a big turnoff. It is important to my learning to have the back and forth discussion that you can really only have in and in-person course" (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Interaction / Communication	Subject 155 (1566-1757)	"It is harder to make friends or interact with other people when the course is online." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")

Table I23 Continued
Examples of student survey excerpts coded with *Sub-codes of Access* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Interaction / Communication	Subject 023 (1564-1791)	"Interactions are difficult if either the speaker or listener are having technical difficulties." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Place Access	Subject 136 (Excerpt 2145-2319)	"The spotty internet connection in my dorm would be the only reason." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Place Access	Subject 195 (Excerpt 2145-2426)	"Weak internet can prohibit me from truning [sic] in assignments in time. Internet can drop so all online work could be deleted. Computer could have problems. Online site could be down." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Place Access	Subject 195 (Excerpt 2464-2604)	"Don't have to get up and get to class" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Place Access	Subject 026 (Excerpt 2129-2439)	"Easy scheduling. Time organization/management for this class is easier because a student can be anywhere and as long as the student has internet access, the student can go to class." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Other External Possibilities	Subject 228 (2397-2601)	"Being able to watch the lectures online when I miss class (a common occurrence for a varsity athlete)"

Table I24
Examples of student survey excerpts coded with *Sub-codes of Participation Decision* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Positive Online	Subject 206 (2440-2633)	"I would take an online course in the future because it would be flexible with my schedule."
Positive Online	Subject 197 (2391-2604)	"Online courses would be students who do not have very flexible schedules or prefer learning at their own pace."
Positive Online	Subject 183 (1814-2027)	"Online courses make it easier to manage my time, especially if I am taking hard core classes towards my major."
Positive Online	Subject 123 (1720-1912)	"You can go back to the lectures and play the videos repeatedly until you understood them."
Negative Online	Subject 227 (1566-1873)	"The lack of face-to-face interaction with an online course is a big turnoff. It is important to my learning to have the back and forth discussion that you can really only have in and in-person course."
Negative Online	Subject 222 (6396-6468)	"online work is really hard because it is very tempting to get distracted"
Negative Online	Subject 220 (6533-6977)	"Overall, I will not be taking another online course. It was too much busywork and required too much energy and effort to make sure that I was connected to Adobe connect at the right times, in the right place."
Negative Online	Subject 213 (1565-1743)	"The main reason for not taking an online course would be that the website may lose data, or restrict access. It's happened a couple times and I was unable to start an assignment."
Positive In-Person	Subject 141 (2141-2333)	"I would think the material would be better taught in a person to person interaction."
Positive In-Person	Subject 221 (2142-2353)	"I prefer in-person because questions are answered better and the interaction is often much more helpful."
Positive In-Person	Subject 218 (1566-1846)	"I feel more confortable being in a classroom setting rather than sitting in front of my computer. This way I am able to concentrate on the material without any distractions."
Positive In-Person	Subject 095 (1810-2037)	"Attending lectures keeps me on pace with the class, and reminders make more of a difference to me if they are in person."
Negative In-Person	Subject 185 (2375-2503)	"Not having to go to class" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Negative In-Person	Subject 148 (2323-2467)	"don't have to sit in a huge lecture hall" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Negative In-Person	Subject 094 (1837-2008)	"For convenience and not having to drive to school to go to lectures." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")

Table I24 Continued
Examples of student survey excerpts coded with *Sub-codes of Participation Decision* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Negative In-Person	Subject 034 (1789-2008)	"If I do not have the time to physically sit in class for a certain period of time everyday." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Positive Component Activity	Subject 093 (6557-7001)	"I sometimes preferred the readings over watching lectures. It may have been because he was talking too fast in the videos for me to take notes and most of it was similar wording to what it said in the book."
Positive Component Activity	Subject 032 (6590-6991)	"I really enjoyed the essay assignments. Normally, I don't like writing homework--me being a science major. But I felt like I got a better grasp on the impact of [the subject area] by writing essays."
Negative Component Activity	Subject 142 (6834-7214)	"the course did not teach any useful larger concepts or really test our understanding but instead tested how many useless details about random stuff we remembered from the readings"
Negative Component Activity	Subject 007 (6630-6831)	"Quizzes and tests focused on inane bits of information straight from the book. Students were rewarded for memorizing tidbits of trivia from the text rather than understanding the concepts of the class."
Positive In-Person Component Activity	Subject 091 (1814-1958)	"I learn better when I attend lectures"
Positive In-Person Component Activity	Subject 094 (1564-1800)	"It's too difficult to pace myself with the material. I like having in person lectures taught by the professor in a lecture hall."
Positive Online Component Activity	Subject 222 (6529-6584)	"videos were often better than going to class sometimes."
Positive Online Component Activity	Subject 206 (6549-6739)	"It was very helpful because most questions I had were already answered on Piazza by other students."
Positive Online Component Activity	Subject 197 (5614-5770)	"I found Adobe Connect very helpful when taking this course."
Negative Online Component-Activity	Subject 209 (2583-2661)	"almost every quiz was bugged, requiring constant re-evaluating of the scores."
Negative Online Component-Activity	Subject 030 (2613-2881)	"A setting on my computer must have been reset somehow, but I could not use the online course website for the later half of the quarter. This was very frustrating, buttons would not work and some pages would be blank.
Negative Online Component-Activity	Subject 104 (1621-1689)	"Lectures are tedious, not as productive or informative as in-person."
Negative Online Component-Activity	Subject 098 (2585-2618)	"audio never worked in discussions"

Table I24 Continued
Examples of student survey excerpts coded with *Sub-codes of Participation Decision* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Negative In-Person Component-Activity	Subject 220 (5414-5708)	"T.A. and students did not want to talk to each other. Felt like we (students) were just sitting and listening and once a question came up, everyone coward until someone else answered it." (When responding to the question, "Is there anything else you would like to say about your experiences attending discussion sections?")
Negative In-Person Component-Activity	Subject 201 (5373-5589)	"There were too much presentations and not enough time to go through the powerpoint and learn the materials." (When responding to the question, "Is there anything else you would like to say about your experiences attending discussion sections?")

Table I25
Examples of student survey excerpts coded with *Sub-codes of Course and Component-Activity Features* in Study 2

Course Assembly Input Type	Excerpt Location	Example Excerpt
Accuracy of Information or Assessment	Subject 209 (Excerpt 1565-1904)	"Technical Difficulties. Particulary with Canvas, the site is very messy, difficult to navigate, and quizes are glitchy/prone to errors. The last part is especially aggravating, as oftentimes, the ability to review answers is locked." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Accuracy of Information or Assessment	Subject 165 (Excerpt 2665-2746)	"The answers to the quiz questions would be wrong sometimes or it was graded wrong" (When responding to, "Please describe how the technology failed.")
Alignment	Subject 142 (Excerpt 6834-7214)	"the course did not teach any useful larger concepts or really test our understanding but instead tested how many useless details about random stuff we remembered from the readings" (When responding to, "Is there anything else you would like to share with us about this course that we haven't already asked")
Alignment	Subject 144 (Excerpt 5853-6027)	"make the discussions more relevant to the material we are learning. We're being asked about how we can help polar bears but in reality that is not what we are being tested on" (When responding to, "Is there anything else you would like to say about your experiences attending discussion sections?")
Alignment	Subject 172 (Excerpt 6317-6366)	"Tests reflected online videos not inclass lecture" (When responding to, "Is there anything else you would like to share with us about this course that we haven't already asked")
Alignment	Subject 171 (Excerpt 6529-6683)	"Work on the midterm to match it with the rest of the class. You can't grade everything reasonably and then grade the midterm really hard. That isn't fair." (When responding to, "Is there anything else you would like to share with us about this course that we haven't already asked")
Amount of Work	Subject 038 (Excerpt 1564-1786)	"Online classes often has a more demanding workload to compensate for a lack of class time." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Amount of Work	Subject 159 (Excerpt 1565-1783)	"They generally are harder than their in-person counterparts and generally assign more work." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Amount of Work	Subject 224 (Excerpt 6803-7067)	"This class required way to much work for a typical 3 unit class." (When responding to, "Is there anything else you would like to share with us about this course that we haven't already asked")

Table I25 Continued
Examples of student survey excerpts coded with *Sub-codes of Course and Component-Activity Features* in Study 2

Course Assembly Input Type	Excerpt Location	Example Excerpt
Amount of Work	Subject 220 (Excerpt 1566-1803)	"There was a lot more busy work involved just to prove that I watched the internet lectures. Very time consuming and not necessary." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Amount of Work	Subject 201 (Excerpt 6449-6795)	"I think this course has a lot of work for a 3 units class. I think it should be a 4 units class instead. There were a lot of exercises and essays." (When responding to, "Is there anything else you would like to share with us about this course that we haven't already asked")
Amount of Work	Subject 171 (Excerpt 5461-5541)	"They assigned extra assignments when we already had assignments due that friday." (When responding to, "Is there anything else you would like to say about your experiences attending discussion sections?")
Amount of Work	Subject 171 (Excerpt 1565-1693)	"Too many assignments" (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Complex or Difficult	Subject 026 (Excerpt 1802-2119)	"It is very hard and is graded like a 4 unit class. The professor does not assume that we may not have a background in the field of study and teaches as if we were all science majors." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Complex or Difficult	Subject 102 (Excerpt 3288-3339)	"The interactive lectures cover too much information" (When responding to, Do you have any suggestions for improving the course website?")
Complex or Difficult	Subject 102 (Excerpt 1837-2000)	"I felt that the material was too much, and some were really dense with information, didn't really allowed me to finish all or completely understand the right material. I honestly thought it was all important." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Navigation or Organization	Subject 095 (Excerpt 3167-3362)	"I thought the online course website was fairly well laid out, I would have a difficult time offering any improvements." (When responding to, Do you have any suggestions for improving the course website?")
Navigation or Organization	Subject 097 (Excerpt 6204-6392)	"I found it difficult to navigate through, because of the way in which it is organized and sorted." (When responding to, "Is there anything else you would like to say about your experiences using Piazza?")
Navigation or Organization	Subject 140 (Excerpt 3804-3850)	"Organize it so that things are easier to find." (When responding to, Do you have any suggestions for improving the course website?")

Table I25 Continued
Examples of student survey excerpts coded with *Sub-codes of Course and Component-Activity Features* in Study 2

Course Assembly Input Type	Excerpt Location	Example Excerpt
Navigation or Organization	Subject 176 (Excerpt 6560-6757)	"It's too cluttered for a forum, and not spaced well. The main content is in a thin column in the center." (When responding to, "Is there anything else you would like to say about your experiences using Piazza?")
Navigation or Organization	Subject 209 (Excerpt 6484-6623)	"Piazza is messy, unorganized, and a pain to use." (When responding to, "Is there anything else you would like to say about your experiences using Piazza?")
Navigation or Organization	Subject 209 (Excerpt 1565-1904)	"Technical Difficulties. Particulary with Canvas, the site is very messy, difficult to navigate, and quizes are glitchy/prone to errors. The last part is especially aggravating, as oftentimes, the ability to review answers is locked." (When responding to, "What would be the main reason for not taking an online course at [this university] in the future?")
Other Course and Component-Activity Features	Subject 126 (3929-4169)	"I think that the quizzes were the biggest issue with this course. The quizzes should offer two tries each week and there should be ability for regrades. The answers found directly from videos were considered wrong after the quiz was graded"
Other Course and Component-Activity Features	Subject 222 (6470-6527)	"not being to see the answers for the quizzes was annoying"
Other Course and Component-Activity Features	Subject 210 (2240-2353)	"Apart from your TA (the one I saw in person for discussion sections), the rest of the course was very disjointed."
Other Course and Component-Activity Features	Subject 199 (2718-2931)	"Someone dropped the database.Not really, but you get the picture. Uptime definitely needs to be higher.In addition, the transfer to Canvas was extremely messy. Quiz questions definitely need to be looked at again."

Table I26
Examples of student survey excerpts coded with *Sub-codes of Characteristics of Online Courses* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Distance	Subject 034 (Excerpt 1789-2008)	"If I do not have the time to physically sit in class for a certain period of time everyday." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Communication	Subject 001 (Excerpt	"The lag time during discussion." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Communication	Subject 130 (Excerpt 7111-7398)	"I think Piazza is a good way for students to initiate communication with other students and instructor/TA. I DO NOT think piazza is a good way for instructors/TA to initiate contact with students."
Communication	Subject 227 (Excerpt 1566-1873)	"The lack of face-to-face interaction with an online course is a big turnoff. It is important to my learning to have the back and forth discussion that you can really only have in and in-person course."
Communication	Subject 196 (Excerpt 2336-2576)	"less time needs to be put in, plus the website allowed to contact the peers through piazza if any problems on assignments were encountered"
Communication	Subject 196 (Excerpt 2336-2576)	"It is harder to make friends or interact with other people when the course is online."
Communication	Subject 105 (Excerpt 5556-5859)	Many students in my discussion section, myself included, had issues getting our webcams and mics working. Issues persisted throughout the quarter as the site had trouble recognizing the hardware.
Communication	Subject 047 (Excerpt 1795-2010)	"It is very convenient and a lot of ways to become more interactive during the lecture." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Organization and Distribution of Content	Subject 041 (Excerpt 6320-6440)	"The course was interesting; however, I feel that having it online depletes the amount of information we as students get." (When asked, "Is there anything else you would like to share with us about this course that we haven't already asked?")
Content Interaction	Subject 177 (Excerpt 6972-7097)	Overall, I felt that the online resources that were provided were very helpful, especially the videos and the video questions
Content Interaction	Subject 175 (Excerpt 1565-1757)	"I found that it was difficult to get excited about the material when doing it online."
Assessment	Subject 222 (Excerpt 2102-2151)	"i was taking a quiz and the website kicked me out."

Table I27
Examples of student survey excerpts coded with *Sub-codes of Communication* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Communication Breakdown	Subject 105 (5556-5859)	"Many students in my discussion section, myself included, had issues getting our webcams and mics working. Issues persisted throughout the quarter as the site had trouble recognizing the hardware." (When responding to the question, "Is there anything else you would like to say about your experiences attending discussion sections?")
Communication Breakdown	Subject 130 (3721-4043)	"Twice I did not get notification from my TA about a last minute task he wanted us to do before discussion. I feel there should be a better way for TA's to get in touch with their discussion groups through the site."
Communication Breakdown	Subject 220 (5414-5708)	"T.A. and students did not want to talk to each other. Felt like we (students) were just sitting and listening and once a question came up, everyone coward until someone else answered it." (When responding to the question, "Is there anything else you would like to say about your experiences attending discussion sections?")
Communication Breakdown	Subject 204 (2141-2305)	"You don't get to ask questions directly to an instructor." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Communication Breakdown	Subject 100 (1565-1829)	"Lack of communication from my past TA. HAd to send three emails before I got a response in a 2 week span. e-mailed me other stuff while avoiding my question." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Communication Breakdown	Subject 095 (2416-2543)	"On campus connections were often not strong enough to support adobe connect" (When responding to the question," Please describe how the technology failed")
Communication Breakdown	Subject 006 (7867-8094)	"Piazza is a great way to post non-immediate announcements, but not the best place to make time-sensitive requests from other classmates. Piazza performance is only as good as the frequency of those who actively log and read it."
Interaction or Presence	Subject 047 (Excerpt 1795-2010)	"It is very convenient and a lot of ways to become more interactive during the lecture." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Interaction or Presence	Subject 141 (2141-2333)	"I would think the material would be better taught in a person to person interaction." (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")

Table I27 Continued
Examples of student survey excerpts coded with *Sub-codes of Communication* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Interaction or Presence	Subject 186 (5819-6054)	"There was not a lot of interaction during discussion section but I think that was primarily due to our TA's lack of leadership." (When responding to the question, "Is there anything else you would like to say about your experiences attending discussion sections?")
Interaction or Presence	Subject 196 (Excerpt 2336-2576)	"It is harder to make friends or interact with other people when the course is online."
Interaction or Presence	Subject 118 (5543-5720)	"I really liked my TA and how helpful he was and interactive as well." (When responding to the question, "Is there anything else you would like to say about your experiences attending discussion sections?")
Interaction or Presence	Subject 021 (1564-1747)	"Interactive human discourse and being present at a lecture, being able to ask questions at the end of class are important factors in a class that I wasn't able to do in online course"
Interaction or Presence	Subject 006 (1803-2083)	"Extensive collaborative efforts with classmates would encourage me to not take the online course. It's difficult to create and foster new friendships (that will carry a group better than academic acquaintances with a common goal) through forum posts or limited 1-hour discussions."

Table I28
Examples of student survey excerpts coded with *Sub-codes of Media Features* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Media Form	Subject 093 (Excerpt 6557-7001)	I sometimes preferred the readings over watching lectures. It may have been because he was talking too fast in the videos for me to take notes and most of it was similar wording to what it said in the book.
Synchronicity	Subject 006 (Excerpt 7867-8094)	"Piazza is a great way to post non-immediate announcements, but not the best place to make time-sensitive requests from other classmates. Piazza performance is only as good as the frequency of those who actively log and read it."
Synchronicity	Subject 015 (Excerpt 6300-6499)	[Piazza is] "Not always quick enough or efficient enough to solve problems by deadlines."
Symmetry	Subject 006 (Excerpt 8570-8794)	"The almost one-way learning (through videos and reading) with a lag time of at least a day for human interaction (via online discussion and online office hours) made me question whether my efforts were too little or too much."
Anytime or Anywhere	Subject 030 (Excerpt 2047-2391)	It is nice to schedule studying and seeing lectures on my own time. It allowed me to focus on this class when I needed to but I could also ignore it at times if my other classes were being very demanding during a certain time in the quarter.
Multiplicity	Subject 093 (Excerpt 6557-7001)	"I sometimes preferred the readings over watching lectures. It may have been because he was talking too fast in the videos for me to take notes and most of it was similar wording to what it said in the book." (When responding to the question, "Is there anything else you would like to share with us about this course that we haven't already asked?")
Multiplicity	Subject 094 (Excerpt 6385-6521)	"Students that were enrolled in the in person lectures had an unfair advantage over those that were enrolled in the online only sections." (When responding to the question, "Is there anything else you would like to share with us about this course that we haven't already asked?")
Multiplicity	Subject 126 (Excerpt 2481-2691)	"I enjoyed having several options regarding how to learn the presented material. I could choose to go to lecture or just watch the videos online to obtain the material. The professor held both in person office h…" (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Multiplicity	Subject 140 (Excerpt 7357-7595)	"The content covered in the live lectures did not adequately cover the content tested. The tested content came straight from the online videos so your experiment to see who performed better, those who attended in class or online is rigged" (When responding to the question, "Is there anything else you would like to share with us about this course that we haven't already asked?")

Table I28 Continued

Examples of student survey excerpts coded with *Sub-codes of Media Features* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Multiplicity	Subject 186 (Excerpt 6879-7095)	"I think the online course almost perfectly matched the in person course. I attended every in person lecture but also watched every online lecture. The in-person lectures often fell slightly behind the online lectures" (When responding to the question, "Is there anything else you would like to share with us about this course that we haven't already asked?")
Non-linearity	Subject 137 (Excerpt 2454-2508)	"ability to see lecture again and again if its recorded"
Non-linearity	Subject 137 (Excerpt 2520-2602)	"I can use ctrl-F to find key words I needed more information about in transcripts"

Table I29
Examples of student survey excerpts coded with *Sub-codes of Component-Activities* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Practice Problems	Subject 125 (2819-2919)	"More practice problems." (When responding to the question, "Do you have any suggestions for improving the online course website?")
Chat Room	Subject 054 (2613-2771)	"The students and I did not know how to work the online chat room but after we did it was all working fine."
Grade Postings - Grading	Subject 099 (2976-3175)	"grading needs to be faster. didn't get most of my grades (and still not 4/5 of the essays) till the day before finals week"
Grade Postings - Grading	Subject 126 (2142-2302)	"I feel that the website used was always having technical errors that resulted in problems with grading. The online quizzes did not seem to be graded accurately."
Grade Postings - Grading	Subject 089 (1564-1804)	"The course was kinda disorganized. It was also very difficult to learn from your mistakes as little feedback was given, just a score."
Email	Subject 156 (3561-3701)	"Make mailtool and access to contact information for TA's better"
Email	Subject 098 (5915-6025)	"sometimes wasn't able to make up assignments given in missed discussions due to lack of email response from TA"
Email	Subject 009 (2232-2424)	"Either my Internet or the teaching assistant's Internet went out occasionally leaving some discussion sections discontinuous. However, she did provide feedback after the discussion via e-mail."
Transcripts	Subject 178 (2611-2726)	"Some of the transcripts in the videos are not the correct ones."
In-Person Lecture	Subject 222 (6529-6584)	"videos were often better than going to class sometimes."
In-Person Lecture	Subject 186 (6879-7095)	"I think the online course almost perfectly matched the in person course. I attended every in person lecture but also watched every online lecture. The in-person lectures often fell slightly behind the online lectures"
In-Person Lecture	Subject 140 (7357-7595)	"The content covered in the live lectures did not adequately cover the content tested. The tested content came straight from the online videos so your experiment to see who performed better, those who attended in class or online is rigged"
In-Person Lecture	Subject 140 (2137-2367)	"It is possible to transfer information through online videos and quiz's but the interactive and focused environment of a live lecture is better for fully understanding and gaining the knowledge needed to apply the course concepts."
In-Person Lecture	Subject 091 (1814-1958	"I learn better when I attend lectures"
In-Person Lecture	Subject 125 (2105-2199)	"Projector would not work in class one day."
Office Hours	Subject 001 (5441-5554)	"My TA wasn't on Adobe Connect during office hours, though if I e-mailed in advance I'm sure it would have worked."

Table I29 Continued
Examples of student survey excerpts coded with *Sub-codes of Component-Activities* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Assignment	Subject 130 (2802-3097)	"Twice I submitted assignments late because I would click on the file but neglect to hit the "Submit Assignment" button to finalize it. This has happened to me in other classes before so now I've learned to double check the submission."
Assignment	Subject 032 (6590-6991)	"I really enjoyed the essay assignments. Normally, I don't like writing homework--me being a science major. But I felt like I got a better grasp on the impact of [the subject area] by writing essays."
Assignment	Subject 196 (6939-7214)	"there were too many assignments assigned other than that the course was fun"
Course Website	Subject 218 (2409-2570)	"The class course website would not be working at times which impacted my homework and essays I had to write."
Course Website	Subject 183 (2977-3139)	"I thought the website was constructed very well and cannot think of any suggestions."
Course Website	Subject 176 (3375-3605)	"The layout is overly complicated for it's use. Minimal designs with more compartmentalized options. Plus,the forum tool looks too cluttered and close. (When responding to the question, "Do you have any suggestions for improving the online course website?")
Course Website	Subject 131 (3558-3708)	"Iron out the technical problems, they ended up affecting people's grades." (When responding to the question, "Do you have any suggestions for improving the online course website?")
External Website	Subject 221 (2846-3164)	"The [one external] website crashed the one week out of the quarter we needed it and the [other external] site was not at all user friendly. The course website crashed twice. We were unable to access the site and it really made working on homework on those weekends"
External Website	Subject 158 (2727-2864)	"We weren't able to access the sites we needed to research in order to do our homework"
Discussion Section	Subject 130 (6429-6649)	"This [discussion section] and the weekly assignments were what helped me learn the material more than any other aspect of this course.
Discussion Section	Subject 010 (5603-5772)	"They [discussions] were boring and not helpful. Definitely a waste of time."
Discussion Section	Subject 225 (5814-6027)	"Discussions were probably the most helpful aspect to this entire course! I learned from each one of them."
Discussion Section	Subject 218 (5925-6162)	"If the TAs could talk more about the material [during discussion] we were going to cover in the next lecture to prepare us, it would be more helpful."
Discussion Section	Subject 199 (6302-6473)	"Discussion was a mess. The blame rests solely on my TA, though."
Adobe Connect	Subject 220 (2202-2319)	"Connection to the Adobe connect dropped out or produced no sound."
Adobe Connect	Subject 197 (5614-5770)	"I found Adobe Connect very helpful when taking this course."

Table I29 Continued
Examples of student survey excerpts coded with *Sub-codes of Component-Activities* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Piazza	Subject 213 (3280-3430)	"Sometimes Piazza chat messages did not receive a reply until much later."
Piazza	Subject 209 (3336-3384)	"Piazza is a mess. Links lead to illogical places."
Piazza	Subject 130 (7111-7398)	"I think Piazza is a good way for students to initiate communication with other students and instructor/TA. I DO NOT think piazza is a good way for instructors/TA to initiate contact with students."
Piazza	Subject 206 (6549-6739)	"It was very helpful because most questions I had were already answered on Piazza by other students."
Piazza	Subject 199 (6934-7102)	"I've used Piazza before for another class. I barely needed to for this class."
Piazza	Subject 095 (6399-6567)	"I didn't use piazza unless it was required to communicate with other students"
Piazza	Subject 027 (6037-6225)	"Just not enough interest in the student body for it [Piazza] to work. If everybody used it, it would be fine, but it wasn't promoted enough. Maybe incentives... extra credit? Participation grade?"
Midterm / Final	Subject 099 (6606-6886)	"lecture wasn't really reflective of the tests though. the test were much harder."
Midterm / Final	Subject 142 (6834-7214)	"the course did not teach any useful larger concepts or really test our understanding but instead tested how many useless details about random stuff we remembered from the readings"
Midterm / Final	Subject 013 (6720-7032)	"I will be taking a Final next week, and I imagine the material on it will reflect what I learned in the course."
Quizzes	Subject 228 (2846-2879)	"The quizzes had the wrong answers"
Quizzes	Subject 209 (2583-2661)	"almost every quiz was bugged, requiring constant re-evaluating of the scores."
Quizzes	Subject 126 (3929-4169)	"I think that the quizzes were the biggest issue with this course. The quizzes should offer two tries each week and there should be ability for regrades. The answers found directly from videos were considered wrong after the quiz was graded."
Quizzes	Subject 215 (6763-7002)	"The quiz questions were the mostly horribly written questions i have ever encountered. Often times didn't make sense grammatically. They asked about random facts that seems to have no relevance to anything. Stuff that nobody needs to know.
Quizzes	Subject 168 (2277-2351)	"the quizzes never let me take them twice even though they were supposed to"
Quizzes	Subject 142 (6771-6832)	"the quizzes were based on random facts buried in the readings"
Quizzes	Subject 146 (2789-2958)	"fix the quizes. i.e. sometimes you would get an answer right but then it would mark it wrong"

Table I29 Continued
Examples of student survey excerpts coded with *Sub-codes of Component-Activities* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Replayable Videos	Subject 030 (2047-2391)	"It is nice to schedule studying and seeing lectures on my own time. It allowed me to focus on this class when I needed to but I could also ignore it at times if my other classes were being very demanding during a certain time in the quarter."
Replayable Videos	Subject 177 (6972-7097)	"Overall, I felt that the online resources that were provided were very helpful, especially the videos and the video questions"
Replayable Videos	Subject 102 (3288-3606)	"The interactive lectures cover too much information, and to be honest, it is hard to know what is really important, sometimes you guys throw some words or concepts that to me and other students really had no much importance with the subject."
Replayable Videos	Subject 093 (6557-7001)	"I sometimes preferred the readings over watching lectures. It may have been because he was talking too fast in the videos for me to take notes and most of it was similar wording to what it said in the book."
Replayable Videos	Subject 006 (8570-8794)	"The almost one-way learning (through videos and reading) with a lag time of at least a day for human interaction (via online discussion and online office hours) made me question whether my efforts were too little or too much"
Textbook / Readings	Subject	"the course did not teach any useful larger concepts or really test our understanding but instead tested how many useless details about random stuff we remembered from the readings"
Textbook / Readings	Subject 093 (6557-7001)	"I sometimes preferred the readings over watching lectures. It may have been because he was talking too fast in the videos for me to take notes and most of it was similar wording to what it said in the book."
Textbook / Readings	Subject 006 (8570-8794)	"The almost one-way learning (through videos and reading) with a lag time of at least a day for human interaction (via online discussion and online office hours) made me question whether my efforts were too little or too much"

Table I30
Examples of student survey excerpts coded with *Sub-codes of Control* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Control	Subject 013 (Excerpt 3183-3259)	"Perhaps separating the Lectures into weeks as a suggestion not a requirement"
Control	Subject 28 (Excerpt 6576-6738)	"I liked that I could review the notes over and over again until I understood all the subject matter, rather than not being able to 'rewind' an in-person lecture"
Location	Subject 026 (Excerpt 2129-2439)	"Easy scheduling. Time organization/management for this class is easier because a student can be anywhere and as long as the student has internet access, the student can go to class." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Location	Subject 229 (Excerpt 2146-2179)	"Needing to be somewhere with wifi, outside of a classroom and not being able to focus. " (When responding to the question, "What would be the main reason for not taking an online course at [this university] in the future?")
Location	Subject 229 (Excerpt 2377-2484)	"Don't have to leave your room. Good if you had a far away place that took a long time to get to class from." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Timing & Location	Subject 220 (Excerpt 6533-6777)	"Overall, I will not be taking another online course. It was too much busywork and required too much energy and effort to make sure that I was connected to Adobe connect at the right times, in the right place."
Timing	Subject 159 (Excerpt 1801-1994)	"I work full time so I will choose online over in-person just because of scheduling issues."
Timing	Subject 220 (Excerpt 1841-1981)	"Could access it whenever I wanted to." (When responding to the question, "What would be the main reason for taking an online course at [this university] in the future?")
Timing	Subject 032 (Excerpt 1806-1994)	"A lot of work got put off until a later time for me. It is easy to procrastinate."
Timing	Subject 101 (Excerpt 1565-1784)	"I may be lazy and not attend lecture and slack off on learning the material resulting in cramming for the exams."
Timing	Subject 030 (Excerpt 2047-2391)	"It is nice to schedule studying and seeing lectures on my own time. It allowed me to focus on this class when I needed to but I could also ignore it at times if my other classes were being very demanding during a certain time in the quarter."
Pacing	Subject 005 (Excerpt 1706-1881)	"Allows more effective use of my time, and are usually given the opportunity to get ahead in the course instead of having to go at the pace the in person courses usually require"
Pacing	Subject 094 (Excerpt 1564-1800)	"It's too difficult to pace myself with the material. I like having in person lectures taught by the professor in a lecture hall."

Table I30 Continued
Examples of student survey excerpts coded with *Sub-codes of Control* in Study 2

Framework Area	Excerpt Location	Example Excerpt
Sequencing	Subject 001 (Excerpt 7329-7625)	"I would appreciate some sort of reminder system for assignments and what not that is e-mail centric and automatically set in place, but can be turned off by students dependent on preference - I didn't log in to the website for a couple days at a time and almost missed some important information."
Sequencing	Subject 006 (Excerpt 8795-9138)	"At the very least, the chronological and orderly listing of required viewing modules and readings, the sequential importance of Exercises leading up to Essays, and the visibly undeniable due dates of any and all activities spell out the academic expectations of the student (in terms of materials to learn and homework/assignments to turn in)."
Content	Subject 218 (Excerpt 5407-5606)	"It would be great if it let me fastforward the sessions so I do not have to watch the whole recording."
Component-Activity	Subject 095 (Excerpt 6399-6567)	"I didn't use piazza unless it was required to communicate with other students"
Component-Activity	Subject 199 (Excerpt 6934-7011)	"I've used Piazza before for another class. I barely needed to for this class."
Component-Activity	Subject 93 (Excerpt 6557-7001)	"I sometimes preferred the readings over watching lectures. It may have been because he was talking too fast in the videos for me to take notes and most of it was similar wording to what it said in the book." (When responding to, "Is there anything else you would like to share with us about this course that we haven't already asked?")

Appendix J: Detailed Week/Lesson Sequencing Cycle for Student Interviewees

Table J1

Student 1 week/lesson sequencing cycle

Weekend	
Monday	
Tuesday	• * Attend lecture • Start writing essay or assignment (sometimes started this as late as Thursday) • On weeks without essays, would watch a couple of videos and take the quiz on Tuesday or Wednesday
Wednesday	
Thursday	• Attend discussion section • * Attend lecture
Friday	• * Watch videos • Submitted assignment or essay • Completed quiz
Time spent on course	• 7-8 hours per week
Primary source for content information	• Replayable lecture videos • In-person lecture
Midterm and Final Preparation Activity Spike	• Did as many practice problems from the study guide as possible • He felt that doing the practice problems over and over prepared him well for the midterm and final, however, he would have liked to have known more about the expectations of what students needed to know for the midterm and final.
Notes about participation	• * He stated that the lectures did not help him but he went to them because he was interested. He went to 90% of them. • * He would not watch all of the videos. But he would watch them right before the quizzes to help prepare him.

Table J2

Student 2 week/lesson sequencing cycle

Weekend	• Read the textbook • Start writing essay or assignment (sometimes started this as late as Tuesday or Wednesday)
Monday	
Tuesday	• Attend lecture
Wednesday	
Thursday	• Attend lecture • Attend discussion section
Friday	• Submitted assignment or essay* • Completed quiz
Time spent on course	• 6-7 hours per week
Primary source for content information	• Textbook • In-person lecture • Online lecture videos
Midterm and Final Preparation Activity Spike	• Reviewed Notes • Took the practice quiz multiple times. • Made bullet points of the material she wanted to cover during the essay portion of the test.
Notes about participation	• She would mostly finish the assignment or essay before discussion section, so if there were any last minute questions, they could be asked • "I was enrolled in 18 units, most of which were upper division. So I tried to get my work done as quickly as possible so I wasn't waiting until the last minute." • When she was unsure about the content, she would review the online lectures

Table J3

Student 3 week/lesson sequencing cycle

Weekend	• Read the textbook* • Watch videos sometimes
Monday	• Took the quiz*
Tuesday	
Wednesday	
Thursday	• Attend discussion section* • Submitted assignment or essay
Friday	
Time spent on course	• 8-12 hours per week
Primary source for content information	• Textbook • Replayable lecture videos
Midterm and Final Preparation Activity Spike	
Notes about participation	• Early quarter adjustment to week/lesson sequencing cycle: Stopped going to the in-person lecture after the first two • Sometimes would read the textbook during the preceding week. • Student would take the quiz as soon as the instructor opened it. Sometimes that was on Monday but could be as late as Thursday. • He did not actually say which day his discussion was on (either Tuesday, Wednesday, or Thursday) but he did say that he attended all of them.

Table J4

Student 4 week/lesson sequencing cycle

Weekend	
Monday	
Tuesday	• Attend Lecture
Wednesday	
Thursday	• Attend lecture • Attend discussion section • Start work on essay/ assignment (sometimes started this on Wednesday) • Completed quiz (Sometimes this was completed earlier, often on Monday or Tuesday)
Friday	• Submitted assignment or essay (early in the quarter, these were turned in on Thursday)
Time spent on course	• 6-7 hours per week
Primary source for content information	• Discussion section • In-person lecture • Video lecture transcripts • Replayable lecture video • Textbook
Midterm and Final Preparation Activity Spike	• Used the book and replayable videos for the Midterm and Final preparation • Used the ungraded quiz to study but did not know how to check for correct answers so she felt it did not help until late in the study for the final when she figured it out • Attended Midterm and Final online study sessions through Adobe Connect Found people to study with for Midterm and Final through participation in the discussion section groups
Notes about participation	• Early quarter adjustment to week/lesson sequencing cycle: Started the quarter off turning in the essay/ assignment on Thursday but as the quarter got more difficult, the essay/ assignment would be turned in on Friday • Early quarter adjustment to week/lesson sequencing cycle: Started the quarter completing the quiz on the first day it would open but later in the quarter, started completing it on Wednesday or Thursday • She read through the transcripts to the video lectures more frequently than she watched the video lectures. • She would only read the book to look up answers for the quiz,, to assist with the essay writing, midterm preparation, and final preparation • She would also watch the videos to look up answers for the quiz, to assist with the essay writing, midterm preparation, and final preparation • Attended a single one-on-one online TA office hours through Adobe Connect • She would use a chat tool to discuss problems she was having with essays • She also watched recorded online TA office hours through Adobe Connect (this was not her TA for her section running the office hours)

Table J5

Student 5 week/lesson sequencing cycle

Weekend	
Monday	
Tuesday	• Attend Lecture • Start working on Essay or assignment
Wednesday	• Attend discussion section
Thursday	• Attend Lecture • Submitted assignment or essay
Friday	• Completed quiz – would use the textbook and watch videos to look up information that he did not know
Time spent on course	• 8-9 hours per week
Primary source for content information	• In-person lecture • Replayable lecture videos • Textbook
Midterm and Final Preparation Activity Spike	• Stated that their number of study hours increased during midterm and final preparation weeks • Downloaded all of the videos and re-watched them and slowed them down during confusing parts. • Did the practice exercises • Reviewed notes • Used the book and replayable videos for the Midterm and Final preparation
Notes about participation	• She would only read the book to look up answers for the quiz, midterm preparation, and final preparation • He would also watch the videos to look up answers for the quiz, midterm preparation, and final preparation • He would watch the videos if he could not attend class. If he needed to study for another course's test or other external influences that might be considered priority over attending class.

Table J6

Student 6 week/lesson sequencing cycle

Weekend	
Monday	
Tuesday	
Wednesday	• Attended online discussion section
Thursday	
Friday	• Crammed for everything • Watched the online videos – Would watch with roommate. They would split up the videos and explain the important parts of each to eachother. • Submitted assignment or essay* • Completed quiz
Time spent on course	• 3-4 hours per week
Primary source for content information	• Replayable lecture videos (he did not read the textbook)
Midterm and Final Preparation Activity Spike	• * Because he crammed for everything Friday night, he would make sure to get the quiz done first, cause you could not complete that late. And on two occasions, he missed the deadline for the essay. But it was not enough of a point deduction to make him want to work earlier on it. • Huge increase in number of hours spent on studying for the midterm and final. • Re-watched all of the videos • "in studying for the midterm and the final, my roommate and I sat down, and we watched almost every single video, again. After we had seen it initially, just to, I know we took notes down from those videos, and took all the practice quizzes to get ready for the midterm" • "Once the midterm and the final rolled around, this number, I remember, went up very high. I, I think I pulled an all-nighter before the final and I studied two days before, so I studied a lot for the final."
Notes about participation	• Did not read the book • Felt like the ability to re-watch the videos was very important for success in course • Would sometimes pause on certain parts of the video in order to write notes about important visuals

Table J7

Student 7 week/lesson sequencing cycle*

Weekend	• Watched the online videos*
Monday	• Watched the online videos*
Tuesday	• Watched the online videos* • Attended online discussion section
Wednesday	• Watched the online videos*
Thursday	• Watched the online videos*
Friday	• Watched the online videos* • Submitted assignment or essay* • Completed quiz*
Time spent on course	• 12 hours per week
Primary source for content information	• Replayable lecture videos
Midterm and Final Preparation Activity Spike	• He did not provide much information about how he studied for the midterm or final. • He used practice quiz and he studied with his roommate for the midterm and final
Notes about participation	• * He stated that he did not have any kind of weekly structure for this course. He just completed the essay/ assignment and quiz by they due date and attend discussion section at the specified time. • Videos would be watched whenever he had time

Table J8

Student 8 week/lesson sequencing cycle*

Weekend	
Monday	• Start watching the online videos* • Start reading lecture notes*
Tuesday	
Wednesday	• Attended online discussion section
Thursday	• Completed quiz
Friday	• Submitted assignment or essay
Time spent on course	• 5-6 hours per week
Primary source for content information	• Replayable lecture videos • Lecture notes
Midterm and Final Preparation Activity Spike	
Notes about participation	• * Did not have a strict schedule on when he would watch videos or review lecture notes – but did try to start reviewing this material on Monday or Tuesday. Mainly it was done between other classes. • Attended a number of in-person and online office hours with the TA

Table J9

Student 9 week/lesson sequencing cycle

Weekend	
Monday	
Tuesday	
Wednesday	• Attended in-person discussion section*
Thursday	
Friday	• Crammed for everything • Watched the online videos • Read the book • Submitted assignment or essay • Completed quiz
Time spent on course	• ~5 hours per week (while they did not answer a specific question about how many hours were spent on the course each week, it was estimated to be approximately five hours since they stated that in addition to the discussion section, they waited until the last minute on the last day of the week to do all of the work for the course that week)
Primary source for content information	• Replayable lecture videos • Textbook
Midterm and Final Preparation Activity Spike	
Notes about participation	• Watched all of the videos for the midterm • Gave up and did not watch any of the videos for the final • It is unclear but it seems that this student did not use any other midterm or final preparation materials.

Table J10

Student 10 week/lesson sequencing cycle

Weekend	
Monday	• Attended online discussion section
Tuesday	• Read the book
Wednesday	• Read the book
Thursday	• Watched the online videos
Friday	• Watched the online videos
Time spent on course	• 10-12 hours per week
Primary source for content information	• Textbook • Replayable lecture videos
Midterm and Final Preparation Activity Spike	
Notes about participation	• * Some of the recording was lost for this student, so it was unclear when he turned in the essay/ assignments and the quizzes • Went to two in-person office hours with the TA • Discussed how during the discussion section, the instructor came in for a brief appearance and told the students how to do certain assignments – this refers to student 9 who said that they did not know what to focus on. This was also something that the instructor did in the in-person lecture. Student 9 missed both. • This student emphasized that he spread the work throughout the week so that he was not rushed at the last minute.

Table J11

Student 11 week/lesson sequencing cycle

Weekend	• Read the book
Monday	
Tuesday	• Attended online discussion section
Wednesday	• * Started the essay/ assignment
Thursday	
Friday	• * Turned in the essay/ assignment • * Completed the quiz
Time spent on course	• 3-4 hours per week
Primary source for content information	• Textbook
Midterm and Final Preparation Activity Spike	• Spent a little more time reviewing previous chapters but said that this did not increase the workload much because the essay/ assignment was pretty light that week
Notes about participation	• Early quarter adjustment to week/lesson sequencing cycle: Stopped watching the videos altogether after the first week • * Some weeks, he would start on the essay/ assignment on Wednesday but on other weeks, he would start on Thursday • * Some weeks, he would turn in the essay/ assignment on Thursday, other weeks, he would turn them in on Friday • He watched about a week's worth of video lectures and then stopped watching them and did not watch any after that because the book seemed better • Mostly just used the book for studying. He did not use ungraded quizzes. There is no mention of lecture notes or study aids

Table J12

Student 12 week/lesson sequencing cycle

Weekend	• Started reading the book – would finish the reading throughout the week
Monday	• * Started watching the videos in the evenings during the week • * Started reading through the video transcripts and would read them throughout the week in the evenings
Tuesday	
Wednesday	
Thursday	• Attended online discussion section
Friday	• * Turned in the essay/ assignment • Completed the quiz
Time spent on course	• 6-7 hours per week
Primary source for content information	• Textbook • Transcripts from replayable lecture videos • Replayable lecture videos
Midterm and Final Preparation Activity Spike	• Used the practice quizzes on the instructor's personal website.
Notes about participation	• * She would often read the transcripts for the videos rather than watch the video. • * Unclear exactly which day she turned in the essay/ assignment but hints at later in the week, like Thursday or Friday • Relates to student 9 - "We had a couple questions during the discussion sections that were brought up and we would choose our answer and then the TA would go over which is correct and which one isn't and how many got what right, and that was super helpful because I could see questions that were going to be on the midterm and final and how they were outlined and stuff."

Table J13

Student 13 week/lesson sequencing cycle

Weekend	
Monday	• * Started watching the videos • * Started reading the book • * Started reading the lecture notes on PowerPoint slides
Tuesday	
Wednesday	• Attended online discussion section
Thursday	• * Started the essay/ assignment
Friday	• Turned in the essay/ assignment • Completed the quiz
Time spent on course	• 4-10 hours per week
Primary source for content information	• Replayable lecture videos • Textbook • Instructor's lecture notes on PowerPoint
Midterm and Final Preparation Activity Spike	• Used the practice quizzes on the instructor's personal website. This added a couple of hours of work to the week. • Total study time would double from the usual 3-10 hours to about 15 hours of study during the midterm and final preparation weeks.
Notes about participation	• * In one part of the interview, she stated that she started watching the videos Mondays and Tuesdays, while in another part of the interview, she said that she started watching the videos on Wednesday either before or after the discussion. • In one part of the interview, she said that she started reading the book on the weekend but in another part of the interview, she said that she only used the textbook and lecture notes to supplement the videos as she watched them. • Sometimes started the essay/ assignment on Fridays. • Relates to student 9 - "the discussion leader was really, he was really attentive to our technical needs and you know to study material needs, so he helped us out a lot. I would say Professor [Professor's Name]'s interactive videos cause he pointed out the key points for the textbooks and it was like really clear what he expected of us to know for the exams."

Table J14

Student 14 week/lesson sequencing cycle

Weekend	
Monday	• Started watching the videos during the morning during breakfast. Would continue watching the videos during the week and spent about 20 minutes on the videos per day in the morning during breakfast.
Tuesday	
Wednesday	• Attended online discussion section
Thursday	
Friday	• Started the essay/ assignment • Turned in the essay/ assignment • Completed the quiz • Skimmed through the book while writing the essay/ assignment and working on the quiz
Time spent on course	• 7-8 hours per week
Primary source for content information	• Replayable lecture videos • Textbook
Midterm and Final Preparation Activity Spike	• Doubled the amount of time spent on the course during the week of preparation for the midterm and final.
Notes about participation	• He did not want to spend much time on the course during the week because he had other courses that were his priority. • Two weeks out of the ten week quarter, he got started on the weekend and finished the essay/ assignment and quiz on Sunday so he did not have to do that work on Friday.

Table J15

Student 15 week/lesson sequencing cycle

Weekend	
Monday	• * Started watching the videos
Tuesday	
Wednesday	
Thursday	• Started the essay/ assignment • Attended online discussion section
Friday	• * Turned in the essay/ assignment • * Completed the quiz
Time spent on course	• 5-7 hours per week
Primary source for content information	• Replayable lecture videos • Textbook
Midterm and Final Preparation Activity Spike	• She stated that she did not increase her study time during the midterm or final
Notes about participation	• * She sometimes started watching the videos on Tuesday • * Would sometimes complete the essay/ assignment and quiz on Thursday • Would only read the book as a reference when completing the quiz and the essay/ assignment.

Appendix K: Tables Showing Framework Change and Support for Each Actor

Table K1
Framework change and support for *institute actor*

Framework Area	Original Framework	Final Framework for Dissertation Studies	Final Generalizable Framework	Literature Review Support	Study 1 Support	Study 2 Support	Study 3 Support	Needs Research
Institution as an Actor – In the original framework, institution was listed as a type of context.		X		X	X	X	X	
Institutional Input		X		X	X	X	X	X
Allocation of Resources		X		X	X			X
Money		X		X	X			X
Time		X		X	X			X
Staff		X		X	X			X
Infrastructure		X		X	X			X
Pedagogical Support		C		X	X			X
Training for Instructors		C		X	X			X
Learner Support		C		X	X			X
Institutional Assembly of Course		C		X	X			X
Goals		X		X	X			X
Access					X			X
Graduation Rate and Pace					X			X
Money (Savings and Revenue for both university and students)					X			X
Quality					X			X
Reputation					X			X
Institutional Decisions		X		X	X			X
If, When, How, Where, and at What Level to play a role in various aspects of course operation (e.g. direct intervention on course operation, infrastructure, marketing, staff allocation, course approval, instructor training, technology support)		X		X				X
Resource Allocation (Efficiency Evaluation)		X		X	X			X
Institutional Operation		X		X	X	X		X
Course Registration		X				X	X	
Operation and Infrastructure		X				X	X	
Staff Support		X				X		X
Course and Program Promotion		X						X
Institutional Output		X		X	X			X
The number of courses supported		X						X
The amount of staff support for courses		X						X
Infrastructure and Technology Provided		X						X
Amount of Money Spent		X						X
Other resources and efforts such as marketing		X						X

Table K1 Continued
Framework change and support for *institute actor*

Framework Area	Original Framework	Final Framework for Dissertation Studies	Final Generalizable Framework	Literature Review Support	Study 1 Support	Study 2 Support	Study 3 Support	Needs Research
Institutional Outcomes and Impacts		X		X	X			X
Revenue		X						X
Effectiveness of courses		X						X
Student achievement and satisfaction		X						X
Instructor and staff satisfaction		X						X
Ratings (Internal and External to the Institution)		X						X

Table K2
Framework change and support for *instructor actor*

Framework Area	Original Framework	Final Framework for Dissertation Studies	Final Generalizable Framework	Literature Review Support	Study 1 Support	Study 2 Support	Study 3 Support	Needs Research
Instructor as an Actor	X	X		X	X	X	X	X
Instructor Input	X	X		X	X	X	X	
Internal Attributes	X	X		X	X			X
External Attributes	X	X		X	X			X
Instructor Decisions	X	X		X	X	X		X
Information Gathering and Theory Development		X				X		X
Gather information about past, present, and future		X				X		X
Develop a personal theory about course or aspects of course		X				X		X
Efficiency Evaluation		X		X	X	X	X	X
Internalized and Rational Cost Benefit Analysis		X				X		X
Efficiency Criteria		X				X		X
Decisions Considers Others		X				X		X
Instructor Considered in Decision		X				X		X
Institution Considered in Decision		X				X		X
Student Considered in Decision		X				X		X
Other Considered in Decision		X				X		X
Participation and Operational Decisions	C	X				X		X
Based on an evaluation of efficiency		X						X
Participation Decisions: If, When, How, Where, and at What Level the instructor will participate		X						X
Instructional Operation Decisions: If, When, How, Where, and at What Level the instructor will assemble and operate a course	X	X		X	X	X		X
Instructor Participation	C	X		X	X	X	X	X
Participation		X		X	X	X	X	X
If, When, How, Where, and at What Level the instructor participates in a course and component-activities: Actions, Interactions, Experiences		X		X	X	X	X	X
Conceptualization Assembly, and Operation of Course (*Connection to Media Input Section)	X	X		X	X	X	X	X
Instructor Output	C	X		X	X	X		X
Operation Tasks Completed: (Grading, Interacting with Students, Operation of Website, Participation in Discussions)		X		X	X	X		X
Time and Effort Spent		X		X	X	X		X
Money and Resources Spent		X		X	X	X		X

Table K2 Continued

Framework change and support for *instructor actor*

Framework Area	Original Framework	Final Framework for Dissertation Studies	Final Generalizable Framework	Literature Review Support	Study 1 Support	Study 2 Support	Study 3 Support	Needs Research
Instructor Outcomes and Impacts	C	X		X	X	X		X
Instructor Outcomes		X		X	X	X		X
Intended and Unintended		X		X	X	X		X
Initial and Long-Term Outcomes		X		X	X	X		X
Impacts and Goal Attainment		X		X	X	X		X
Impacts on the Instructor and her/his future		X		X	X	X		X
Impacts on Others		X		X	X	X		X
Attainment or non-attainment of goals (e.g. academic, career, social, family, and/or work)		X		X	X	X		X

Table K3
Framework change and support for *media actor*

Framework Area	Original Framework	Final Framework for Dissertation Studies	Final Generalizable Framework	Literature Review Support	Study 1 Support	Study 2 Support	Study 3 Support	Needs Research
Media as an Actor - In the original framework, Media was only an Artifact. In the final framework, Media was both Actor and Artifact		X	X	X	X	X	X	X
Media Input	C	X	X	X	X	X	X	
Course Content	X	X	X	X		X	X	
Subject Area	X	X	X	X		X	X	
Range	X	X	X	X				X
Depth	X	X	X	X		X	X	X
Difficulty	X	X	X	X		X	X	X
Complexity	X	X	X	X		X	X	X
Course and Component-Activities Assembly	X	X	X	X				
Structure	X	X	X	X		X		
Format	X	X	X	X		X		
Organization	X	X	X	X		X	X	
Technology-Media	X	X	X	X		X	X	
Quality	X	X	X	X				
Reliability	X		X	X		X	X	
Design	X	X	X	X		X	X	X
Usability	X	X	X	X		X	X	X
Intuitiveness	X	X	X	X		X	X	X
Media Decisions		X	X					X
Static, Programmed Logic, or Free Thinking		X	X				X	X
Reaction to User Choices		X	X				X	X
Unexpected Intervention (e.g. Technology Glitches / Failure)		X	X				X	X
Media Operation	X	X	X	X	X	X	X	
Component-Activities (e.g. Assignments, videos, readings)	X	X	X	X	X	X	X	
Characteristics of Online Courses	X	X	X	X	X	X	X	
Distance	X	X	X	X	X	X	X	
Communication and Interaction	X	X	X	X	X	X	X	
Organization and Distribution of Content	X	X	X	X	X	X	X	
Content Interaction and Assessment	X	X	X	X	X	X	X	
Control Source and Type	X	X	X	X	X	X	X	
Meta-Control		X	X			X	X	X
Control Source (Institution, Instructor, Student, Groups, Media)	X	X	X	X	X	X	X	
Control Type	X	X	X	X	X	X	X	
Location	X	X	X	X	X	X	X	
Timing	X	X	X	X	X	X	X	
Pacing	X	X	X	X	X	X	X	
Sequencing	X	X	X	X	X	X	X	
Content	X	X	X	X	X	X	X	
Component-Activity	X	X	X	X	X	X	X	
Media		X	X				X	X
Other		X	X				X	X

Table K3 Continued
Framework change and support for *media actor*

Framework Area	Original Framework	Final Framework for Dissertation Studies	Final Generalizable Framework	Literature Review Support	Study 1 Support	Study 2 Support	Study 3 Support	Needs Research
Features of Curriculum and Content	C	X	X	X		X	X	
Curriculum and Content Structure		X	X	X		X	X	
Discrete, Linear, Hierarchical, Spiral		X	X	X		X	X	
Alignment		X	X	X		X	X	
Organization	X	X	X	X		X	X	
Navigation		X	X			X	X	
Accuracy of Information		X	X			X	X	
Amount of Work for Students		X	X			X	X	
Difficulty, Complexity, Range, and Depth of Content		X	X	X		X	X	
Features of Media		X	X	X		X	X	
Form		X	X	X		X	X	
Structure		X	X	X		X	X	
Synchronicity		X	X	X		X	X	
Symmetry		X	X	X		X	X	
Anytime and Anywhere		X	X	X		X	X	
Multiplicity		X	X	X		X	X	
Non-Linearity		X	X	X		X	X	
Media Output	C	X	X	X		X	X	X
Intended and Unintended Media Output		X	X	X				X
Successful Process and Usage		X	X					X
Technology Glitches		X	X			C	C	X
Data Cache		X	X	X				X
Media Outcomes	C	X	X	X		X	X	X
Intended and Unintended Media Outcomes		X	X	X				X
Purpose of Media was Successful or Unsuccessful		X	X					X

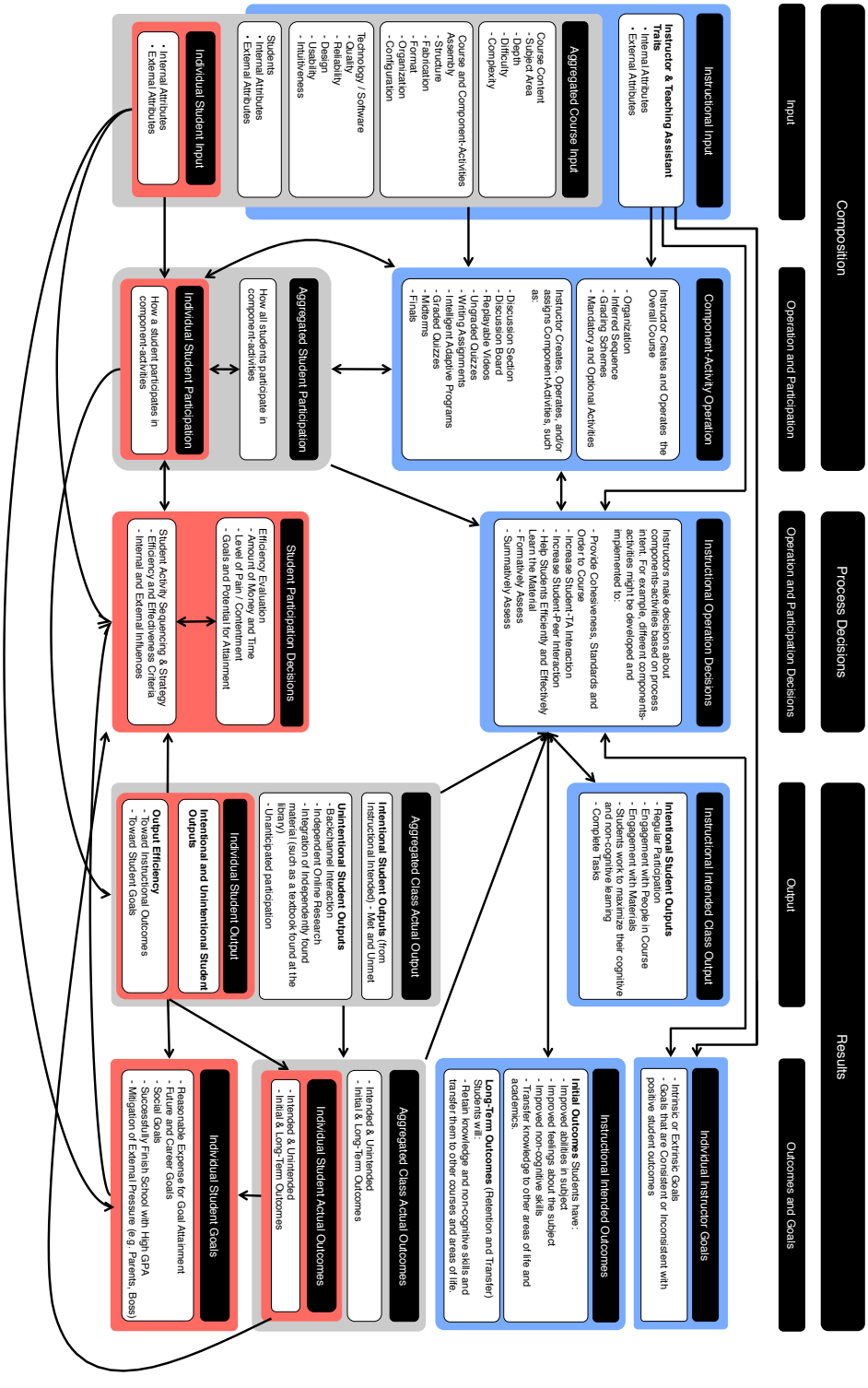
Table K4
Framework change and support for *student actor*

Framework Area	Original Framework	Final Framework for Dissertation Studies	Final Generalizable Framework	Literature Review Support	Study 1 Support	Study 2 Support	Study 3 Support	Needs Research
Student as an Actor	X	X	X	X	X	X	X	
Students Input	X	X	X	X	X	X	X	
Enrollment Qualifications	X	X	X	X				X
Prerequisite Listings	X	X	X	X				X
Student Registration Logistics	X	X	X	X				X
Student Input (Individual)	X	X	X	X	X	X	X	
Internal Attributes	X	X	X	X	X	X	X	
Background and Abilities	X	X	X	X	X	X	X	
Compatibility for Learning Environment or Instructional Practice	X	X	X	X	X	X	X	
Interest in Subject or Learning Intervention	X	X	X	X	X	X	X	
Motivation / Focus / Time Management	X	X	X	X	X	X	X	
Preference for Learning Environment	X	X	X	X	X	X	X	
Prior Experience	X	X	X	X	X	X	X	
Other Student Internal Attributes	X	X	X	X	X	X	X	X
External Attributes	X	X	X	X	X	X	X	
Distance from University	X	X	X	X	X	X	X	
Money or Resources	X	X	X	X	X	X		X
Personal Environment	X	X	X	X	X	X	X	
Requirements for Graduation	X	X	X	X	X	X	X	
Time Conflicts	X	X	X	X	X	X	X	
Other Student External Attributes	X	X	X	X	X	X	X	X
Student Decisions	X	X	X	X	X	X	X	
Information Gathering and Theory Development		X	X			X	X	
Gather information about past, present, and future		X	X			X	X	
Develop a personal theory about course or aspects of course		X	X			X	X	
Efficiency Evaluation	X	X	X	X	X	X	X	
Internalized and Rational Cost Benefit Analysis		X	X			X	X	
Efficiency Criteria	X	X	X	X	X	X	X	
Cost: Time/Effort		X	X			X	X	
Cost: Money/Resources		X	X			X	X	X
Gain: Content Learning		X	X			X	X	
Gain: Goals or Interests		X	X			X	X	
Gain: Affect Satisfaction		X	X			X	X	
Operational: Access		X	X			X	X	
Operational: Process Performance		X	X			X	X	
Participation Decisions	X	X	X	X	X	X	X	
Based on an evaluation of efficiency	X	X	X					
Participation Decisions: If, When, How, Where, and at What Level the student will participate		X	X					
Students Participation	X	X	X	X	X	X	X	

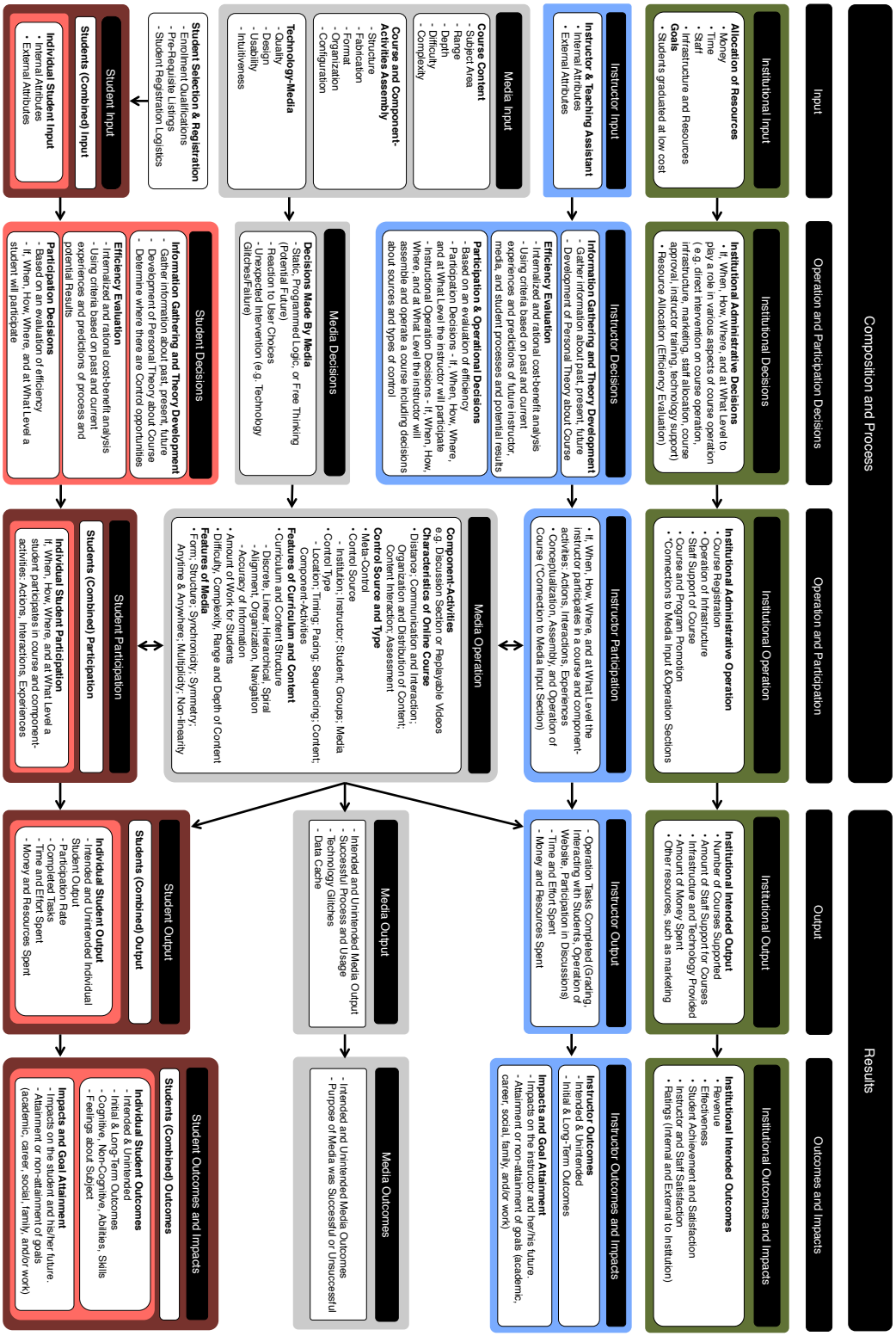
Table K4 Continued
Framework change and support for *student actor*

Framework Area	Original Framework	Final Framework for Dissertation Studies	Final Generalizable Framework	Literature Review Support	Study 1 Support	Study 2 Support	Study 3 Support	Needs Research
Student Participation	X	X	X	X	X	X	X	
Participation	X	X	X	X	X	X	X	
If, When, How, Where, and at What Level the student participates in a course and component-activities: Actions, Interactions, Experiences		X	X			X	X	
Action		X	X	X	X		X	X
Communication / Interactions		X	X	X	X		X	X
Experience		X	X	X	X		X	X
Studying Alone or with Friend		X	X	X	X		X	X
Student Output	X	X	X	X	X	X	X	
Intended and Unintended Student Output	X	X	X	X	X	X	X	
Participation Rate	X	X	X	X	X	X	X	
Completed Tasks	X	X	X	X	X	X	X	
Time and Effort Spent	X	X	X	X	X	X	X	
Money and Resources Spent	X	X	X	X	X	X	X	
Student Outcomes and Impacts	X	X	X	X	X	X	X	
Student Outcomes	X	X	X	X	X	X	X	
Intended and Unintended Student Outcomes	X	X	X	X	X	X	X	
Initial and Long-Term Outcomes	X	X	X	X	X	X	X	X
Cognitive, Non-Cognitive, Abilities, Skills	X	X	X	X	X	X	X	
Feelings about Subject	X	X	X	X	X	X	X	
Impacts and Goal Attainment	C	X	X	X	X	X	X	X
Impacts on the student and his/her future		X	X			X	X	X
Impacts the student will have on others		X	X			X	X	X
Attainment or non-attainment of goals (academic, career, social, family, and/or work)	X	X	X	X	X	X	X	X

Appendix L: Original Conceptualization of the Framework



Appendix M: Final Framework for Dissertation Case Studies



Appendix N: Final Generalizable Framework