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UNIVERSITY OF CALIFORNIA,
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An Investigation of College Students' Facebook Use
in Their Personal Learning Environments

DISSERTATION

submitted in partial satisfaction of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

in Information and Computer Science

by

Yiran Wang

Dissertation Committee:
Professor Gloria Mark, Chair
Professor Bonnie Nardi
Professor Judith Olson

2017

DEDICATION

To my partner,
who gifted me the unconditional love and support
that made this dissertation possible.

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ABSTRACT OF THE DISSERTATION

An Investigation of College Students' Facebook Use
in Their Personal Learning Environments

By

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Doctor of Philosophy in Information and Computer Science

University of California, Irvine, 2017

Professor Gloria Mark, Chair

Young people today grow up alongside the rapidly developing information and communication technologies, which have transformed their informational habits and have allowed for a culture of autonomous exploration and learning. Widely adopted by college students, Facebook serves multi-faceted purposes in college life. While some research claims that Facebook is detrimental to learning by distracting students (from formal learning), others see great potential in online social networking platforms to support (informal) learning opportunities. This dissertation responds to these contrasting views on the uses and effects of Facebook, particularly with respect to learning. Learning, here, is conceptualized as learners constructing knowledge using various methods and pathways in a social and cultural context.

This dissertation investigated: 1) when and under what conditions college students actually use Facebook, and how; 2) whether and in what ways college students' informal learning activities on Facebook are consistent with elements of connected learning—

personal interest, peer support, and academic orientation; and 3) how college students perceive the benefits and shortcomings associated with news engagement on Facebook. To answer these questions, I studied in situ Facebook use of undergraduate college students using mixed methods, including automatic logging, experience sampling surveys, diaries, and semi-structured interviews.

Students exhibited two contrasting Facebook use patterns after schoolwork and after leisure activities. Results suggest that a student's attentional state might carry over from their previous activity into a Facebook use session. Focusing on students' self-directed learning activities, findings show that connected learning can take place in spaces that are not designed for educational purposes, like Facebook. Specifically, the networking environment provides a foundation to support personal interests, which allow for interest-driven academic activities on Facebook, bridging the formal and informal learning divide. We need to caution, however, that learning can also be hindered by 1) students' lack of critical information skills, 2) information filtering, personalization, and the overall quality of information on Facebook, and 3) the challenges surrounding self-presentation due to context collapse on Facebook. Considering both the opportunities and pitfalls, I provide directions for students and educators on how to effectively incorporate Facebook into meaningful college learning experience.

CHAPTER 1

INTRODUCTION

Young people today grow up alongside the rapid development of information and communication technologies (ICTs). Labels such as "digital natives" (Prensky, 2001) or the "Google generation" (Rowlands et al., 2008) have been used to characterize this generation of youth and their lives augmented by search engines, online social networks, and pervasive mobile devices. Easy access to information sources together with technology-mediated communication networks have shaped young people's informational habits (for better or worse) and have allowed for a culture of autonomous exploration and learning. While information technology is rapidly advancing, critics and scholars have speculated that our institutions of learning have changed far more slowly than the emerging learning opportunities facilitated by the Internet (Davidson & Goldberg, 2010; Prensky, 2001).

1.1 Technology Narratives

The uses and effects of ICTs in young people's lives have been the center of public and scholarly attention for the past decade. Some critics (Carr, 2008; Wallis, 2006) fear that we have developed the habits of scattered attention and perpetual scanning because of search engines, instant messaging, or social networking sites. Losing our capacity for sustained attention is particularly worrisome for the youth in the context of learning, given that the decreased focus capability undermines the ways young people learn, reason, or do creative work (Wallis, 2006). Others lament the loss of old values; time spent in front of a screen is

no comparison to reading a book that actually engenders educational progress (Bauerlein, 2008) and technology mediated communication is no substitute for face-to-face interactions (Turkle, 2012). Technological deterministic rhetoric often fuels fears and anxieties around technology; it offers little help, if not creating obstacles, to further our understanding of youth and technology (boyd, 2014).

Howard Rheingold (2012) has also criticized the narratives of technological determinism by emphasizing that humans have agency. In order to better exercise our agency and consequently better harness the power of technology, both Rheingold and boyd have proposed that we move away from *what technology is doing to us* to *how we can better train ourselves and educate others—especially the so-called digital natives—on technology and media literacy*. Shifting the narrative is crucial because new forms of leisure-based, community-oriented, interactive media could provide youth with unprecedented opportunities for self-directed and interest-driven learning (e.g., Gee, 2005; Ito, Baumer, et al., 2009; Ito, Horst, et al., 2009; Ito et al., 2013; Peppler & Kafai, 2007; Steinkuehler, 2012). For instance, playing online games increases the reading skills of students who struggle with reading in schools (Steinkuehler, 2012); online social networks, such as MySpace and Facebook, provide teens with an outlet to practice content production and engage in creative work (Greenhow & Robelia, 2009; Lin & Farnham, 2013). Some scholars have even claimed that these Internet-based technologies can radically reshape future learning environments (Davidson & Goldberg, 2010). Specifically, they change how individuals learn, play, and engage in civic life. They also transform how peer groups socialize and how schools teach.

Considering these contrasting views, it is important to recognize that the effects of technology on the younger generations, and the younger generations' appropriation of technology, influence one another simultaneously and iteratively. Any technology can both expand and constrain cognitive competencies (Rogoff, 2003, cited in Vass, 2008, p.5), by offering certain opportunities for learning and hindering learning in other ways (Sefton-Green, 2012).

1.2 The Controversy of Facebook

Gaming and social media are often at the center of this controversy. I will focus on social media from hereon because the investigation of social media in the context of learning is arguably in an early stage. Facebook in particular is important to examine for multiple reasons. First, Facebook is the most commonly used social media site among young adults between the ages of 18 and 29; 88% of sampled Internet users in this age group used Facebook in 2016 (Greenwood, Perrin, & Duggan, 2016). Second, recent studies have repeatedly shown that Facebook serves important functions in college life. For example, it facilitates social interaction and satisfies young adults' psychosocial needs (Ellison, Steinfield, & Lampe, 2007; Manago, Taylor, & Greenfield, 2012; Pempek, Yermolayeva, & Calvert, 2009); it is also often used as a quick break from study or as short-term stress relief (Pempek et al., 2009; Mark, Wang, & Niiya, 2014; Wang, Niiya, Reich, & Warschauer, 2015). Third, Facebook and its relation to learning is a growing area of interest. A number of recent studies have sought to uncover the relationship between Facebook use and students' performance in school (e.g., Kirschner & Karpinski, 2010; Junco, 2012; Junco & Cotten, 2012; Michikyan, Subrahmanyam, & Dennis, 2015). Fourth, the functions and

norms of Facebook have evolved over time (Barthel, Shearer, Gottfried, & Mitchell, 2015; Schoenebeck, Ellison, Blackwell, Bayer, & Falk, 2016). Users' behavior has trended away from broadcasting their personal whereabouts toward reading news and engaging with current events (Barthel et al., 2015; Gottfried & Shearer, 2016). I have therefore chosen to focus on Facebook given its popularity, multi-faceted purposes in college, its relevance to contemporary learning, and its changing function in students' lives.

Existing research on Facebook and learning typically falls into a binary. Facebook hinders learning because it distracts students from doing schoolwork and hurts their academic performance (e.g., Junco & Cotten, 2012; Judd, 2014). Some studies even label problematic Facebook use as a behavioral addiction (see reviews in Kuss & Griffiths, 2011; Andreassen, 2015). Others are optimistic that social media such as Facebook can support students in engaging in autonomous learning (see a review in Dabbagh & Kitsantas, 2012). One underlying reason that drives this controversy is the lack of common ground with regards to the type of learning that different studies address. Specifically, the studies that criticize Facebook examine the use of Facebook in relation to formal learning in school, for instance, measured by students' overall Grade Point Averages (GPAs). The studies that praise Facebook primarily focus on self-directed learning that is outside of, or complementary to, school curricula. As a result, this binary conversation implicitly reinforces the divide between formal and informal learning. The contrasting implications from these two strands of research in turn broaden the gap in our understanding of Facebook's role in learning.

1.3 Research Objectives

The objective of this dissertation is to identify both the positive and negative impacts of Facebook on learning that occurs outside of the classroom. I aim to distill constructive guidelines for the general public to engage with Facebook in ways that maximize the benefits across different learning contexts. To do so, it is imperative to question and dismantle the binaries mentioned above by examining young people's learning environments as a holistic ecology (see Figure 1). The reasons are: 1) any technology can support learning in some ways and hinder learning in other ways (Sefton-Green, 2012); 2) learning takes place across space and time; it transitions across formal and informal settings (Lemke, 2000; Kumpulainen & Sefton-Green, 2014).
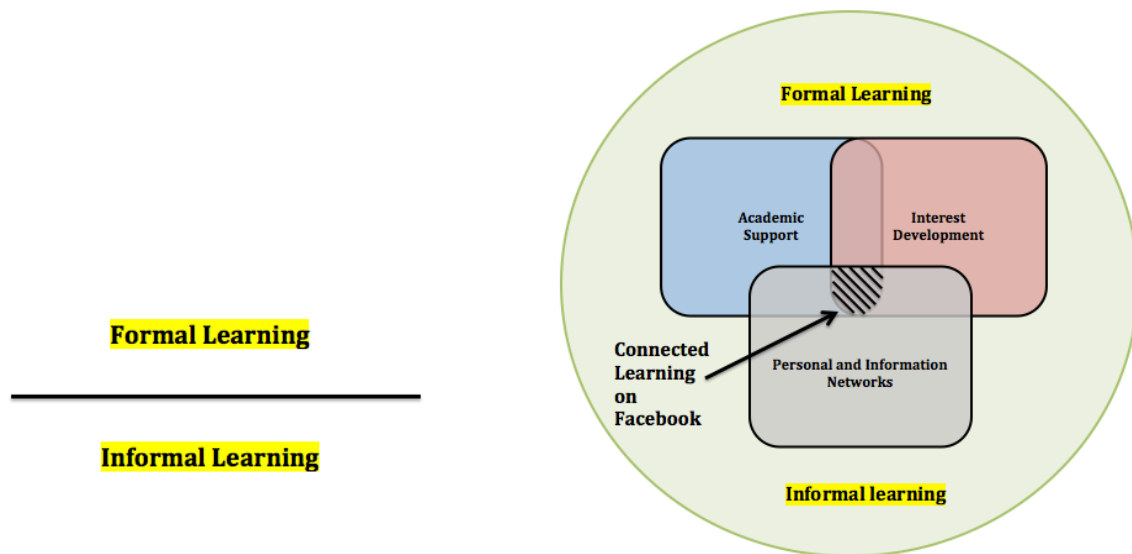
Figure 1. Conceptual framework.
The figure on the left conceptualizes a dichotomy between formal and informal learning. The figure on the right illustrates a holistic learning ecology.

Therefore, the overall guiding questions this dissertation addresses are: how does Facebook fit into college students' personal learning environments (Dabbagh & Kitsantas, 2012)? What do college students learn informally from Facebook, and how? In what ways is Facebook conducive to learning, and in what ways is it limiting? Answers to these questions have important implications for advising students on how their social media use should be encouraged or discouraged under various circumstances. They can also help make visible and (hopefully) legitimize more diverse types and pathways of learning. Implications of this line of inquiry will provide further guidelines for researchers, educators, and policy makers so they may more effectively incorporate new media tools into students' learning environments.

1.4 Dissertation Overview

In order to unpack these questions, we need to know 1) the context of Facebook use and the detailed use patterns, and 2) the process, values, and challenges of learning with Facebook. Collecting this data empirically requires a mixed-method approach. I conducted weeklong studies of 50 undergraduate students in the spring of 2016 using both quantitative and qualitative methods, including automatic logging, experience sampling surveys, diaries, and semi-structured interviews. Because college students often use their computers as their primary tools for studying, this dissertation will focus on the desktop version of Facebook.

The body of results is presented in three studies. Study 1 challenges the notion that Facebook only distracts students from studying by investigating students' activities and

characteristics of attention associated with Facebook use. Specifically, I examine students'

activity prior to Facebook, the quality of their attention right before Facebook use, and the

quality of their attention at the time of learning on Facebook. Results reveal a contrast

between students' use patterns when they visit Facebook after doing schoolwork versus

after a leisure activity. Study 1 implies that Facebook might not distract students; it could

sustain and even increase a student's engagement when they encounter learning content

on Facebook.

Study 2 describes how college students learn on Facebook. In this dissertation, learning is

conceptualized as learners constructing knowledge using various methods and pathways in

a social and cultural context (Lave, 1991; Lave & Wenger, 1991). Rooted in this

constructivist perspective, Ito and colleagues (2013) coined the term *connected learning* as

a theoretic framework and a pedagogical design guideline to bridge learning that

transitions across formal and informal contexts (e.g., classrooms, local centers, and online

communities). Connected learning emphasizes the co-occurrence of personal interest,

academic orientation, and peer networks. I discovered instances of connected learning in

college students' interaction with Facebook, demonstrating that this type of learning can

take place in spaces that are not designed for educational purposes or engineered to follow

guidelines of connected learning.

Study 3 focuses on a subset of learning activities—learning about political and social issues

because 1) college students are in a critical period for exploring their worldviews (Arnett,

2000) and political identities (Schwartz, Zamboanga, Luyckx, Meca, & Ritchie, 2013) and 2)

civic topics are the most prevalent subject in the diaries and interviews. Exploring how

college students perceive the benefits and shortcomings associated with news engagement on Facebook can help identify opportunities for designing better technological solutions for facilitating civic engagement on social media.

The rest of the dissertation is organized as follows: Chapter 2 presents a review of relevant literature; Chapter 3 describes the study overview and data collection; Chapter 4 presents the results for study 1 that concern distraction, attention, and Facebook use; Chapter 5 presents the results for study 2 that depicts college students' learning activities on Facebook; Chapter 6 presents the results for study 3 that examines students' perceived benefits and challenges of engaging with politics and social issues on Facebook; Chapter 7 offers a general discussion of these findings; and Chapter 8 concludes this dissertation by summarizing takeaway messages and future work with regard to meaningful engagement with Facebook in students' learning environments.

CHAPTER 2

LITERATURE REVIEW

In this chapter, I will review related work in three research areas: distractions and attention, informal learning, and political engagement and impression management on social media. Prior work on distractions and attention lays a foundation for understanding when and under what circumstances students use Facebook, which can inform the investigation into how students embed Facebook use in their learning environments. Learning literature, particularly that which concerns learning in informal contexts, provides guidelines for researchers to observe instances of learning on Facebook and their characteristics. Research on political engagement and social norms on social media provides directions to explore the benefits and drawbacks of learning about and participating in civic issues on Facebook.

2.1 Facebook Use, Distractions, and Attention

2.1.1 Overview of Facebook research

According to a Pew Research Report (Greenwood et al., 2016), in just over a decade, Facebook has been adopted by 68% of all U.S. adults. The user bases of other social media site are also on the rise (28% U.S. adults use Instagram, 26% use Pinterest, 25% use LinkedIn, and 21% use Twitter), but Facebook continues to be the most popular site by a

significant margin. In addition to a steady increase of overall users, the number of active daily Facebook users has also been on the rise.

Numerous prior studies have examined the uses and effects of Facebook. Noticeable trends of topics in prior research include the uses and gratifications (see a review in Ryan, Chester, Reece, & Xenos, 2014); the formation and maintenance of social relationships (e.g., Burke, Kraut, & Marlow, 2011; Burke & Kraut, 2014; Ellison et al., 2007; Vitak, 2014); Facebook as an informational and instrumental resource (e.g., Burke & Kraut, 2013; Gray, Ellison, Vitak, & Lampe, 2013; Lampe, Vitak, Gray, & Ellison, 2012); the construction, negotiation, and reinvention of personal identities (e.g., DiMicco & Millen, 2007; Haimson, Bowser, Melcer, & Churchill, 2015; Schoenebeck et al., 2016; Zhao et al., 2013); disclosure and privacy (e.g., Johnson, Egelman, & Bellovin, 2012; Vitak, 2012; Vitak, Blasiola, Patil, & Litt, 2015; Young & Quan-Haase, 2009); problematic and addictive use (see reviews in Andreassen, 2015; Ryan et al., 2014); and lastly, reflecting, regulating, limiting, and quitting (Baumer et al., 2013; Stieger, Burger, Bohn, & Voracek, 2013; Wang et al., 2011). These areas of interest identify both the benefits of engaging with Facebook (e.g., strengthening social relationships, accessing information and social support) and users' resistance to Facebook as a result of problematic use (e.g., excessive use) and social concerns (e.g., privacy).

According to a review of uses and gratifications studies before 2014, Ryan et al. reported that the most popular motivations for Facebook use are relationship maintenance, passing time, entertainment, companionship, and escaping worries and problems. They also

posited that Facebook use could become habitual, excessive, and addictive; the link between gratifications of use and addiction merits future research.

The growing body of research on users' resistance to Facebook and the potential problematic uses has propelled a conversation about intentional, mindful use of social media (Islam & Patil, 2015; Pang, 2013; Rheingold, 2012). Existing studies are the most concerned about young people, particularly the student population. A number of studies have claimed that Facebook makes students multitask, fragmenting their attention and taking time away from studying, and thus, Facebook is detrimental to learning (e.g., Judd, 2014; Junco & Cotten, 2012). In the following, I will focus on the college student population and the topic of attention with regards to Facebook use.

2.1.2 Facebook use and attention

Facebook use in college has been studied extensively. Prior studies have characterized college students' Facebook use as frequent but brief. The frequency of visiting the site differs across studies, perhaps as a result of different user samples, data collection methods, and years. For example, one study found that students check Facebook on average seven times a day using self-reported survey questions (Junco, 2013). Wang et al. (2015) found college students checking Facebook as often as 52 times on an average day based on computer logging. While college students check Facebook frequently overall, each visit to Facebook is brief. Based on automatic logging data, which is more accurate than self-reports, the median time for a Facebook visit is 46 seconds in Judd's study (2014) and 65 seconds in Wang et al.' study (2015).

Studies that focus on the student population often claim that Facebook is a source of distraction considering students' frequent usage. These studies have mainly relied on 1) self-reported Facebook use time, 2) self-reported multitasking in surveys—e.g., "I very frequently do schoolwork at the same time that I am using Facebook." (Junco & Cotten, 2012)—or 3) computer logging (Judd, 2013; Judd, 2014). Each of these measures introduces significant limitations: self-reports of use and perception of shared media time can be skewed; even with relatively accurate computer logs, the lack of contextual information about how activities in a series relate to one another makes it impossible to know whether Facebook use has led to consequent multitasking by causing students to shift attention from their main tasks. Similarly, studies that found a negative correlation between students' academic performance and Facebook use often claimed that Facebook consumed students' limited cognitive resources reserved for studying (Junco & Cotten, 2012; Rosen et al., 2013), even though no actual observations on students' engagement with Facebook or schoolwork were made.

I am not disputing the possibility that Facebook use interrupts a student's study and interferes with their focus on schoolwork. I am simply proposing an alternative possibility—a student might go on Facebook when they are already unfocused or tired, and the use of Facebook might serve as a break to allow students to rejuvenate. My reasoning for this conjecture is two-fold. First, social media use is associated with stress relief for college students (Mark, Wang, et al., 2014). Office workers have also described short social media use as a routine "micro-break" used to relax without losing concentration (Skatova et al., 2016). Second, information workers' states of attention (e.g., focused, bored) are

often associated with the type of digital activity in which they are engaged (Mark, Iqbal, Czerwinski, & Johns, 2014). It is suggested that people are already in an "unfocused" state prior to Facebook and thus prone to going on Facebook (Mark, Iqbal, Czerwinski, & Johns, 2015). The activity and the associated attention prior to Facebook can influence why a student wants to check Facebook, which might further impact the quality of their Facebook use (e.g., to discover and learn something meaningful).

I chose to use student engagement, a construct measured in the dimensions of concentration, interest, and enjoyment, as a proxy for students' attention associated with an activity (Shernoff, Csikszentmihalyi, Shneider, & Shernoff, 2003; Shernoff & Csikszentmihalyi, 2009). As summarized by Shernoff and Csikszentmihalyi (2009), concentration is the selective allocation of cognitive resources, which reflects the "depth of cognitive processing" (p.133); enjoyment indicates "competencies and creative accomplishment" (p.133); and interest demonstrates a learner's intrinsic motivation and can direct their attention. High levels of engagement, both in the aggregate of the three dimensions and in each individual dimension, were correlated with high levels of challenge and skill, an indication for the flow experience (Shernoff et al., 2003).

Therefore, the first set of research questions the dissertation addresses are:

RQ1: What are the activities and the associated engagement levels immediately before a student starts to use Facebook?

RQ2: How do the activity and engagement levels prior to Facebook use affect a student's Facebook use?

Answers to these questions create an account of when and under what attentional conditions a student uses Facebook, with insights grounded in empirical observations. These findings can also provide valuable extension to existing research that claims Facebook's distracting effect without explicitly measuring students' engagement with Facebook or schoolwork.

Characteristics of attention can greatly affect how a student learns in an informal context. Research in second language acquisition has explored delivering learning cues during what users perceive as wasted time, such as waiting for a chat message reply (Cai, Guo, Glass, & Miller, 2015) or waiting for emails to load (Ren, 2015). Users are receptive to learning opportunities during under-utilized time embedded in break-activities (e.g., instant messaging (IM)) (Cai et al., 2015). Since Facebook use can be a break-time activity similar to IM, college students' attention associated with Facebook use could impact how they encounter, recognize, and utilize learning opportunities from Facebook.

In this context, a relevant research area is accidental information encountering (IE), which examines the act of accidentally "bumping" into useful or interesting information without intentionally looking for it (Erdelez, 1997, 1999, 2000; Lu, 2012). A typical IE episode comprises the following stages: noticing (the encountered information), stopping (the initial information seeking activity), examining (the usefulness of the encountered information), capturing (the encountered information for future use), and returning (to the

initial information seeking task) (Erdelez, 2000). Specifically, the first three stages describe a process that is closely tied to a user's attention to information stimuli: an information stimulus catches a user's attention; the user temporarily pauses the task at hand and diverts their attention to the new information; and the user sustains their attention to engage with the new information. In other words, a user engaging in accidental information encountering takes a "detour," so to speak, from their original information-seeking task (i.e., an information need in the foreground). The detour is triggered by new information stimuli along with the user's information needs in the background—needs that are not intended to be addressed at the time (Erdelez, 2004). Erdelez also suggested that whether a user engages in accidental information encountering and to what extent (e.g., passing the first stage) depends on a user's available attention resources and the shifting of attention, though attention was not explicitly examined in her studies.

Based on this framework, Stewart and Basic (2014) found that most undergraduate students in their study reported having frequently encountered unexpected, useful information online. With 45 graduate-level students, Lu (2012) further reported that information encountered via social media tools could be used professionally (e.g., job seeking and career building), academically (e.g., information related to learning interests and schoolwork), and in daily life (e.g., hobbies). These studies imply a potential connection between accidental information encountering and learning activities in online spaces that are not designed to be educational. Given the key role attention plays in IE and the potential relationship between IE and learning, I set out to investigate:

RQ3.1: Whether or not students engage in learning activities on Facebook?

RQ3.2: (If they do engage in learning activities,) how are students' characteristics of attention associated with learning on Facebook?

In the next section, I will elaborate on why learning on Facebook is an important topic to examine.

2.2 Learning Informally

2.2.1 Learning—a social and cultural perspective

"Constructivism" and "situated learning" have largely influenced how we think about education and educational research (Anderson, Reder, & Simon, 1996). The core of a constructivist approach emphasizes that knowledge is not a ready-made good to be acquired through direct absorption; rather, learners use various methods and pathways of inquiries to construct knowledge through active participation. The nature of constructing knowledge has been approached from the perspective of individual cognition as well as from the social and political processes (see a review by Phillips, 1995). For the scope of this dissertation, I view individuals' learning activities through a social lens, as learning in an online social networking space is inherently social.

Lave and Wenger's theory of situated learning put the focus on communities (1991). Learning, which takes place through peripheral participation, relies heavily on the learners' motivation to develop an identity to be a knowledgeable member of the community (Lave, 1991; Lave & Wenger, 1991). As a result, knowledge is always socially mediated and open-ended. Efforts to commoditize knowledge diminish the goal of learning (Lave, 1991). This

holistic view instantiates learning in various social situations, such as exchanges in Alcoholic Anonymous meetings or learning to be become a midwife through family practice. Consequently, it does not consider learning as a single institutionalized tradition (i.e., learning in school).

Subsequent research has extended situated learning to the workplace and organizational context, such as Engestrom's work in expansive learning (Engestrom, 2001; Engestrom & Sannino, 2010). Brown, Collins, and Duguid (1989) made similar arguments to Lave and Wenger that enculturation into a community of practice is what drives people to learn. Brown (1999) extended such a perspective to the digital world and observed that what kids were doing online—lurking and watching how other people do things, and then trying to imitate them—were not unlike what people had done in pre-Internet communities.

Also influenced by the social and cultural perspective that is essential to Lave and Wenger's work, Ito and colleagues have created elaborate accounts of how youth learn with new digital media. Ito and colleagues identified and examined learning through the lens of participation that is embodied or mediated by new technologies, and in students' shared cultural and social spaces that are oftentimes outside of school (Ito, Horst, et al., 2009). Through extensive fieldwork, Ito et al. have shown that meaningful learning happens when the subject of learning is relevant to the learner, the format of learning is interactive, and the process of learning is socially supported by various networks (e.g., peers, family, online community). They argue that effective learning is motivated by young people's interests and facilitated by everyday social communication (Ito, Horst, et al., 2009). Since students from different social and economic backgrounds have unequal access to learning resources

from their daily social contexts, a growing learning divide exists. In an effort to address the learning divide, Ito et al. proposed to diversify the pathways to learning opportunities by leveraging the potential of digital media, through an approach they coined *connected learning* (Ito et al., 2013).

In the following sections, I will first review the larger academic conversation about informal learning. I will then discuss how the connected learning framework is situated in and different from the debate of informal vs. formal learning.

2.2.2 Informal learning (versus formal learning)

Examining socially embedded and interest-driven learning inevitably brings to the fore the juxtaposition between learning in a school versus in a non-school environment. Learning at school is often attached to the following characteristics: standardization of curricula, evaluation through grading (Lave, 1991), authority-based, and lecture-oriented (Brown, 1999). Learning in a non-school environment, by contrast, is often labeled as genuine participation (Lave, 1991) or authentic practice (Brown et al., 1989). Such "authenticity" is considered to be conducive for learners to construct meanings in everyday life. Anderson et al. (1996), however, contend that what is considered "authentic" is ill defined and superficial. The real goal of education, they argue, is to motivate students to engage in cognitive processes that will transfer from textbook to real-world scenarios.

Along the dimension of "formal" vs. "informal," a wide range of definitions exist to conceptualize the practice of "informal learning," all of which are loosely defined. The

"informality" can refer to the location of learning (i.e., not in school), the purpose of learning (i.e., for leisure), and the subject of learning (i.e., outside of the school curriculum) (Sefton-Green, 2004). Research on informal learning in the field of education often approaches the concept from what it is not rather than what it is (Sefton-Green, 2012; Weigel, James, & Gardner, 2009). For instance, "a strictly formal learning experience is characterized by classroom-based instruction featuring an explicit curriculum and traditional pedagogical goals, and scaffolding implemented by a single educator; a pure informal learning experience lacks all of these characteristics" (Weigel et al., 2009). In the human-computer interaction (HCI) context, the definition is even less clear-cut: researchers tend to emphasize certain aspects of the informality as a general guideline to collect empirical instances of informal learning. For instance, in studying how teenagers use social media sites for extracurricular activities, Lin and Farnham (2013) defined informal learning as the personal practices and social interactions that support the development of interests and continued engagement in an activity.

The lack of a unified definition of informal learning reflects a bigger issue. We often do not recognize or legitimize certain content or procedures as learning until they can be categorized with reference to certain academic disciplines or tied to traditional credentials issued by an institution (e.g., university) (Grant, 2014; Moss 2001; Sefton-Green, 2004). In other words, learning and assessment are "part and parcel of each other" (Gee, 2010). Efforts to evaluate learning outcomes or characterize learning qualities in informal settings have been inconsistent, un-unified, and controversial (National Research Council, 2009; Sefton-Green, 2012; Schwartz & Arena, 2013), perhaps as a result of fragmented definitions

of the key concept. The 2009 National Research Council report showed that researchers and practitioners have often adopted the same measures used in school settings to assess learning in informal settings (National Research Council, 2009). These tests of general knowledge, such as reading or science, often decontextualize human actions and practices of specific domains, thus failing to show whether learners have internalized or can actually apply their knowledge (Gee, 2010).

As a result, over the past few years, a growing trend of research initiatives has suggested approaching the assessment of informal learning from new directions. These new directions include assessment based on personal interests, choices, and motivation; affinity towards science; and the development of a personal identity. Gee (2010) advocated to fuse learning context into the assessment rather than distilling the specific skills or knowledge out of learners' practices and community norms. An example of an assessment rooted in practice is gaming communities (e.g., World of Warcraft) where refined metrics such as gauges, points, game levels, and ratings by peers can be used as an assessment of players (Schwartz & Arena, 2013). Schwartz and Arena proposed to use students' personal choice as an analytical construct to assess learning outcomes because choice reflects what learners take interest in, identify themselves with, and might pursue in the future. The emphasis on "choice" is in line with the new directions the 2009 National Research Council report added to their list of evaluation: to pay special attention to students' excitement, interest, motivation, and their tendency to personally identify with science.

In addition to the theoretical work on defining and assessing informal learning, researchers have also empirically examined various online platforms as sites for learning. These

platforms include online gaming, e.g., World of Warcraft (Gee, 2005; Steinkuehler, 2012), creative media production, e.g., Scratch (Peppler & Kafai, 2007; Kafai & Peppler, 2011; Ito, Baumer, et al., 2009), and social media sites, e.g., Facebook (Cain & Policastri, 2011; Ebner, Lienhardt, Rohs, & Meyer, 2010; Greenhow & Robelia, 2009; Lin & Farnham, 2013). Studies in online games suggest that good games, even those that are not designed for educational purposes, can stimulate intellectual practices through problem solving. These practices include reasoning, exercising leadership, reading, doing math, and so forth, which can further result in core competencies and other transferrable skills (Gee, 2005; Steinkuehler, 2012). Empirical research on social media, however, has primarily focused on how Facebook or Twitter assists formal curricula in forms of coordinating communication in projects or sharing study materials (Cain & Policastri, 2011; Ebner et al., 2010). Few studies have investigated extracurricular learning activities driven by learner's own interests on social media sites (for exceptions, see Greenhow & Robelia, 2009; Lin & Farnham, 2013). The dearth of research perhaps results from the following reasons: first, the primary research focus has been to establish the (negative) association between academic learning and the use of social media, since social media is generally perceived as a distractor; and second, the content and norms on social media are not sustained through a set of knowledge or skills, unlike gaming or creative communities, and therefore, there are no obvious learning objectives associated with the interactions on social media.

While it was once a social networking platform where users broadcast personal whereabouts and engage in socializing (e.g., writing on friends' walls, leaving messages), now 44% of the general population gets news from Facebook (Gottfried & Shearer, 2016).

With the increasing amount of media content circulating in the platform, even mainstream media outlets have debated about whether Facebook should declare itself a *media* company rather than a *technology* platform ("Facebook: Media company or technology platform," 2016; Alba, 2017). As a result, college students are exposed to a wide range of information that potentially caters to their personal and academic interests, because of the abundance of information as well as the promotion by personal networks. Further, the nature of interaction on Facebook constantly puts personal identity and social affinity on display, which potentially provides motivation for a student to gauge the popular and relevant subjects to learn.

Taken together, the concept of informal learning has yet to be defined consistently across different research settings and disciplines. Yet, in order to facilitate the study design, it was necessary to identify the scope of informal learning in this dissertation. The key defining features shared by most informal learning research are interest, self-direction, and the absence of required curricula. Based on Sefton-Green's (2004) review that informality manifests in the subject, purpose, and location of learning, the term "informal learning" in this dissertation refers to the kind of informational and social practices that are not explicitly required by a school curriculum, but are motivated and sustained by students' own interests, while they engage in activities outside of the classroom. Considering the challenge and the new trend in assessing informal learning, I used students' subjective assessment of their experience—their interests, reflections, and rationales—instead of imposing a pre-defined set of formal metrics to gauge whether or not an activity should be considered informal learning. This operationalization of the concept provides a general

guide in data collection and could elicit the emerging practices of college students' Facebook use in the context of learning.

2.2.3 Connected learning

The connected learning framework is situated in this larger debate about what informal learning entails, how to evaluate learning quality and outcome in meaningful ways, and what roles digital technologies play. In contrast to the dialogue that is based on the demarcation between informal and formal learning, connected learning attempts to bridge learning that transitions across formal and informal contexts (e.g., classrooms, local centers, and online communities) in order for learners to achieve optimal learning (Ito et al., 2013; Kumpulainen & Sefton-Green, 2014).

As guiding principles to configure modern learning ecosystem, the connected learning framework integrates three key components that are often disconnected: personal interest, peer support, and academic orientation (see Figure 2). The framework gives equal weight to these three components, rather than focusing heavily on academic subjects, as school-like education often does. More specifically, Ito and colleagues propose that a learner learns through the exchanges with peers and in social networks, about a subject that is personally interesting and relevant; this form of learning can be most effective when it is connected with academic studies, civic engagement, and career opportunity. Digital media enhances connected learning by making 1) learning resources and 2) opportunities for interaction and participation in a community, abundant, accessible, and visible.
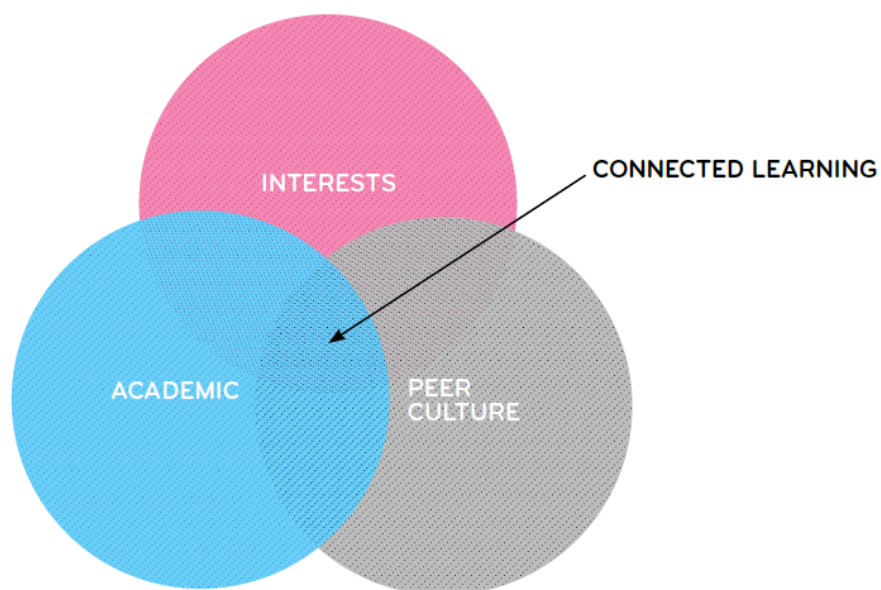
Figure 2. The connected learning framework (Ito et al., 2013)

Ito et al. set the trend of reform in learning assessment. They propose to evaluate connected learning outcomes by examining whether, and to what extent, youth acquire 21st century skills through deepening and broadening personal interests; receiving support from and providing support to peers; and developing a positive orientation to academic subjects (Ito et al., 2013). Twenty-first century skills include, but are not limited to, information literacy (research using evidence and recognize bias in sources, National Research Council, 2012), adaptability, global awareness, and self-regulation.

Empirical work on connected learning has primarily covered two themes. Researchers have examined the existence of connected learning in well-established educational sites, such as in after school programs (Davis & Fullerton, 2016). Researchers have also adopted a top-down, planned curriculum to implement connected learning into a specific site (e.g.,

organized Minecraft play in summer camps) (Ames & Burrell, 2017; Bilandzic, 2016). Can interest-driven, academic-oriented activities occur in an online social network platform without deliberate educational interventions? The following example is a preview of findings of the empirical study in this dissertation, which I will detail in later chapters.

A student learned about the concept of inflation in an introductory economics class. A quarter later, she took an interest in an article about minimum wage and inflation that showed up on her Facebook News Feed because 1) it reminded her of the class she took and 2) the news article came out in the election year and she felt the need to stay aware of current issues for offline conversations. After reading the article from Facebook, she went to Wikipedia, Forbes, and the Economist to find out more information on this topic. Consequently, she agreed and disagreed with certain aspects of the original article she saw on Facebook and then shared her opinion along with that article to her friends.

Learning takes place across space, time, and setting (Lemke, 2000). Being a multifaceted process, learning is challenging to capture and describe (Kumpulainen & Sefton-Green, 2014). The example demonstrates that learning transitions across contexts. A non-educational leisure platform such as Facebook might encapsulate an intermediate phase of dynamic cross-platform learning. Using Facebook as an anchor and tracing other activities involved in a specific instance of Facebook use can potentially uncover connected learning that occurs in the wild. Therefore, the next research question the dissertation address is:

RQ4: Whether, and in what ways, are college students' informal learning activities on Facebook consistent with elements of connected learning?

Investigating this question allows us to see whether connected learning can take place in spaces that are not designed for educational purposes or engineered to follow guidelines of connected learning. If that is the case, then the newly developed, growing research agenda in connected learning should expand its current scope. Specifically, the connected learning research community can benefit by examining the unique opportunities and challenges leisure spaces might offer, as many teenagers and young adult spend a substantial amount of time on relationship-based social networking platforms.

2.3 Politics and Social Issues on Social Media

Young adults (ages 18-25) are in a life stage of "emerging adulthood," a critical period of time for exploring worldviews (Arnett, 2000) and political identities (Schwartz et al., 2013). The college experience introduces diverse perspectives to young adults who are often open and willing to change their worldviews (Perry, 1998). The ever-growing social connectivity afforded by networked technology can further shape youth's civic engagement and political identity development (Ito et al., 2015).

Extending the connected learning framework with participatory politics, Ito et al. (2015) argued that civic and political practices that are motivated by deep personal interests and supported by social affinity networks are a form of learning. This type of learning is distinct from adult-led, fact-based curriculum (e.g., knowing who controls the judiciary), which is by default how civic education is conceptualized and assessed (Ito et al., 2015). Instead, Ito et al. (2015) advocated for paying attention to participation in civic issues that emerged from young people's everyday social and cultural activities, such as organizing hashtag

campaigns on social media or fan activism in the Harry Potter Alliance (Ito et al., 2015; Jenkins, 2015). Zuckerman (2014) made similar observations about this generation of youth. That is, they might perform poorly on standardized civics exams (Dillon, 2011, cited in Zuckerman, 2014, p.154), but their growing participation in volunteering and providing civic service (Fournier, 2013, cited in Zuckerman, 2014, p.155), and even actions as trivial as changing their Facebook profiles to signal support for same-sex marriage, indicates different forms of civic engagement compared to those of previously generations. Given the prevalence of political content in online spaces, it is important to examine how college students engage in political and civic issues on social media.

2.3.1 Political engagement on social media

A number of recent empirical studies showed a positive relationship between social media and political outcomes. Specifically, social media use can facilitate serendipitous exposure to political differences (Semaan, Faucett, Robertson, Maruyama, & Douglas, 2015), promote both online and offline political participation (Gil de Zúñiga, Jung, & Valenzuela, 2012), and facilitate youth participatory politics (Kahne, Hodgin, & Eidman-Aadahl, 2016; Rundle, Weinstein, Gardner, & James, 2015). Comparing different types of news participation, Oeldorf-Hirsch and Sundar (2015) found that asking opinions in one's network, tagging specific friends, and commenting on news signaled a greater perceived involvement in the news content.

A competing line of studies claimed that despite the growth in accessing news through social media, young people's political knowledge and civic participation (e.g., voting) have

not improved compared to those who used traditional means for reading news (Baumgartner & Morris, 2010; Bowyer, Kahne, & Middaugh, 2015; Kushin & Yamamoto, 2010). In addition, political contention on Facebook is more likely to cause friction in friendship than to encourage conversations between different sides, resulting in more polarized views among politically engaged users (Grevet, Terveen, & Gilbert, 2014). Furthermore, people have the tendency to connect with like-minded peers and pay attention to information that aligns with their values (Hsieh, Chen, Mahmud, & Nichols, 2014; Munson & Resnick, 2010). The selective exposure and echo chamber effects prevent diverse viewpoints circulating in public spaces (Flaxman, Goel, & Rao, 2016; Garret, 2009). In sum, whether social media promotes or curtails young people's political engagement is unclear.

2.3.2 Self-presentation and impression management

To unpack the complex relationship between social media use and its effect on political engagement, this section focuses on one relevant and yet under-researched area—disclosure and impression management in relation to political content on social media (see exceptions in Semaan et al., 2015, Marder, Slade, Houghton, & Archer-Brown, 2016). A person's viewpoints on political issues reflect their values and moral judgment, which are critical aspects of their identity. College students, in particular, are in a life period when they typically explore and develop their political identities (Schwartz et al., 2013). Social media can easily put a student's newly formed or changing political identity on a public display, impacting how they engage with civic content. Therefore, it is important to investigate college students' political engagement through the lens of self-presentation.

Plenty of research has investigated how people manage their self-presentation with online media (Kramer & Winter, 2008; Schoenebeck et al., 2016; Vitak & Kim, 2014; Zhao et al., 2013). The appropriateness and relevance of the content to the context is a key factor that motivates users' curating decisions. On Facebook, people manage their presentations of self by curating their overall image and friend list, as well as removing content that has become irrelevant to a context (Zhao et al., 2013). Schoenebeck et al. (2016) has highlighted the importance of temporality in studying impression management by showing that young adults went to great lengths to retrospectively manage their past appearances.

Disclosure and self-presentation are intertwined. People adopt various self-disclosure strategies that are essential for managing self-presentation goals, such as social approval, identity clarification, and social control (Vitak & Kim, 2014). These strategies (Vitak & Kim, 2014) include granting or limiting friend access, disclosing to a targeted audience, self-censorship, and disguising content (by using other communication channels or giving code names for the content). A great challenge that can render these disclosure strategies ineffective or costly is the concept of context collapse—"the flattening out of multiple distinct audiences in one's social network" (Vitak, 2012, p.451). Because each audience group can value different sets of appropriate behaviors and social norms, tensions arise when individuals interact with multiple audiences in one single platform (Vitak, 2012). Different audience groups in previous studies were often implicitly categorized according to offline social structures, such as family, co-workers, and classmates (Vitak & Kim, 2014; Vitak et al., 2015). Stances on political issues often reflect individuals' conflicting beliefs

and values, suggesting that political content can also lead to distinct audience groups, thus creating disclosure and self-presentation challenges for the users.

Taken together, this dissertation adopts the view that engagement with civic issues is a form of learning, embedded in social and cultural activities. Previous research has found inconsistent results regarding whether Facebook supports or hinders young people's political engagement. My guess is that it is both, depending on the outcome measures researchers evaluated. A recent study (Pentina & Tarafdar, 2014) takes a more nuanced approach to the role of social media in online news consumption by identifying the benefits (e.g., facilitating social sense-making) as well as the drawbacks (e.g., lack of objectivity, depth, or focus). With a range of factors affecting political engagement on social media, such as serendipitous exposure to news, the echo chamber effect, algorithmic influence, and social norms, it is imperative to examine how college students perceive and reflect on their own engagement with political issues on Facebook. Their attitudes and rationales can help identify opportunities for designing technological solutions for facilitating better civic engagement on social media. The overall guiding question in this section is:

RQ5: How do college students perceive the benefits and shortcomings associated with news engagement on Facebook?

I approach this question by taking a specific interest in impression management, an under-researched factor, because Facebook might both encourage and prohibit students' news behavior as a result of the visibility of personal identity on the platform.

CHAPTER 3

STUDY OVERVIEW AND DATA COLLECTION

To refresh readers' memories, the research questions addressed in this dissertation are:

RQ1: What are the activities and the associated engagement levels (concentration, interest, enjoyment) immediately before a student starts to use Facebook?

RQ2: How do the activity and engagement levels (concentration, interest, enjoyment) prior to Facebook use affect a student's actual Facebook use?

RQ3.1: Does informal learning occur when college students interact with Facebook?

RQ3.2: How are students' characteristics of attention associated with learning on Facebook?

RQ4: Whether, and in what ways, are college students' informal learning activities on Facebook consistent with elements of connected learning?

RQ5: How do college students perceive the benefits and shortcomings associated with news engagement on Facebook?

This chapter will present the empirical study conducted in 2016 to answer these research questions, including the procedure of data collection, data preprocessing, and data analysis.

3.1 Study Design Overview
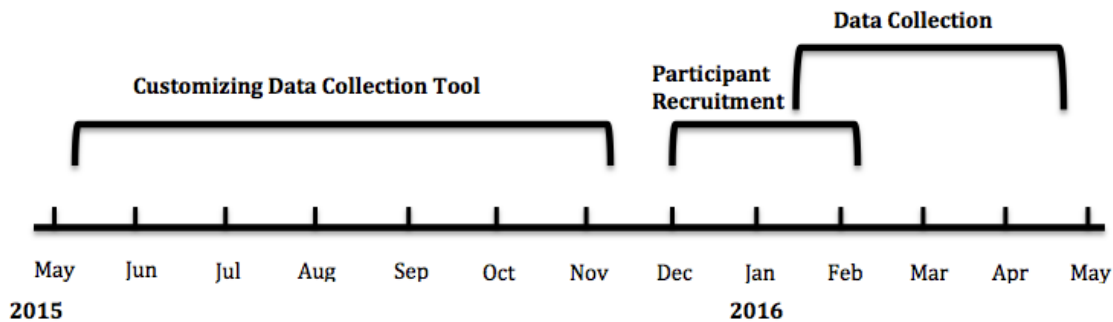
Figure 3. Data collection timeline overview

3.1.1 Customizing the data collection tool—ROSE

An open-source browser extension—Research tool for Online Social Environments (ROSE[1]) (Epp et al., 2016; Poller et al., 2014)—was customized for data collection. From a computer browser, ROSE automatically collects user activities (e.g., making a comment) and usage statistics (e.g., mouse movement, page scrolling) on sites like Facebook, YouTube, and Reddit. It also supports surveys and diary functions inside the interface of these websites.

From May to November 2015, I collaborated with the developers and researchers of ROSE to modify the code so that it could 1) monitor all site-specific activities (e.g., posting a Facebook status; join an event invitation on Facebook); 2) display the survey and diary questions for the study; and 3) trigger the surveys with the right timing. Multiple iterations of code modification and pilot testing were conducted to ensure that ROSE was able to

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[1] https://github.com/secure-software-engineering/rose

accurately log all user activities, administer surveys, and host diaries. Two versions of ROSE, a Chrome version and a Safari version, were used for data collection.

Once installed, the icon of ROSE appears on the browser bar (Figure 4). Participants could view their own usage summary at any time during the study by clicking on the ROSE icon.
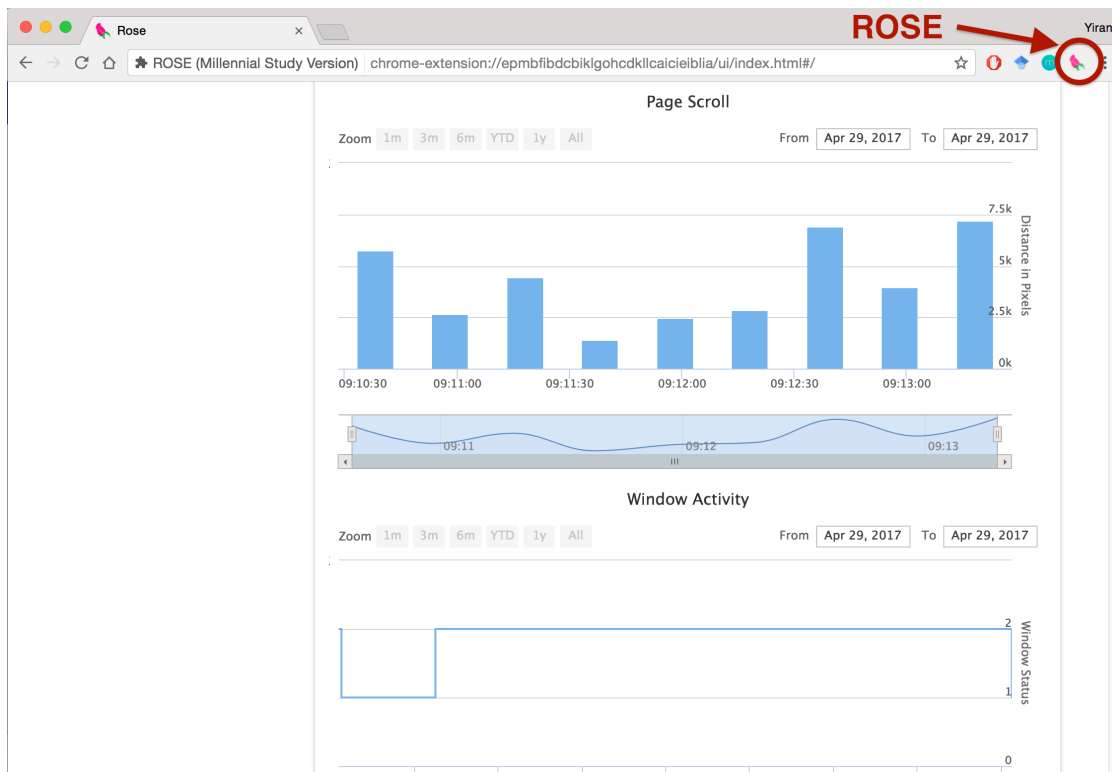
Figure 4. ROSE dashboard

3.1.2 Recruitment

Participants were recruited from a major public university on the U.S. West Coast from December 2015 to February 2016. I made announcements in large undergraduate classes and posted subject recruitment advertisements on the official university Facebook groups

for the classes of 2016–2019, as a large number of current students were affiliated with these groups. All research questions require that participants use Facebook on a regular basis. Furthermore, the scope of this dissertation is on the desktop version of Facebook. Therefore, after the initial recruitment, I used a screening survey to select students who self-reported to use Facebook at least three times a day on the computer.

From a pool of 126 eligible candidates, I further selected students to represent different genders, years in school, and majors. In total, 50 undergraduate students participated in a weeklong study. The sample of participants comprised a relatively balanced representation of gender (female=29) and class standing (freshman=11, sophomore=12, junior=13, senior=14). Ages ranged from 18-25, with a median age of 20. In addition, participants came from 24 distinct majors, covering a variety of STEM and non-STEM fields.

3.1.3 Procedure

The study spanned from Monday to the end of Sunday of a given week. I hosted four to nine participants in each week. Data collection took place from January to April 2016 for all 50 participants.

On day one of the study (Monday), participants came to a set-up meeting where I explained the procedure and the types of data to be collected. They consented and installed ROSE on the browser of their personal laptops. Participants were instructed to use Facebook normally and to fill out experience sampling (ES) surveys the moment they showed up on the computer screen for the next seven days. They were also instructed to keep diaries

using the diary function of ROSE. I will describe the details of the ES survey and the diary in the following section.

At the end of the 7-day study, I downloaded the ROSE data files from participants' laptops, which included Facebook use logs, surveys, and diaries. A general survey was used at the end of the study to collect demographic information. On the Tuesday or Wednesday immediately following the weeklong study, I conducted semi-structured interviews using diaries participants submitted the week before as memory aids. Each participant was provided $50 compensation upon the completion of the study.

3.2 Data Collection

3.2.1 Facebook usage logging

ROSE stores various types of usage data when a student uses their computer to go on facebook.com. To protect participant privacy, all content information (e.g., posts, pictures, user names) were hashed and stored as unique identification numbers instead of the actual content. I collected and analyzed three types of usage data: window active status, active user interaction, and browsing statistics (Table 1). Window active status captures when a student visits Facebook and for how long, representing an overall degree of use. Active user interaction records specific social interactions for participation, broadcasting, and direct communication (e.g., commenting, updating status, chatting). Browsing represents the amount of content a student views (or at least scrolls past), providing a supplementary measure of content consumption that active interaction might not capture. For instance, a

student might browse through a large number of posts without using any Facebook functions to connect with their friends. Altogether, these metrics provide a multi-faceted record of a student's Facebook use pattern.

Table 1. Summary of Facebook usage logging

Facebook Usage Type	Value
Window active status	True / False
Active user interaction	Occurrence of chatting, liking, commenting, sharing, friending, events, or curating
Browsing	Page scrolling (in pixels)

Window active status: When a Facebook webpage was open and currently in focus, window active status was marked True; when the page was currently not in use (i.e., user switched to another webpage or closed the Facebook page), window active status was marked False. All records were time stamped. Using window active status, I could calculate the length of time a student spent on Facebook.

Active user interaction: Social networking and direct communication using a Facebook function, including chat (sending a chat message), like (a post, a comment, or a page), comment (on a post or other comments), share (in a status update or in a private chat), friend (adding, confirming, or rejecting a friend request), event (responding to an event invitation), and curate (deleting a status update, un-friending, or un-liking content or pages previously liked). All records of user interactions were matched with timestamps of their occurrences.

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Browsing statistics: When a student was on Facebook, ROSE recorded a summary statistic of page scrolling, measured in pixels. Page scrolling indicated the amount of new content moving in and out of the user view from scrolling down the webpage.

3.2.2 Experience sampling

To sample conditions prior to Facebook use, ROSE sent pre-FB surveys triggered by the activation of a Facebook webpage (Figure 5). When a user opened a Facebook webpage, a pre-FB survey slid in on the left side of the screen automatically.
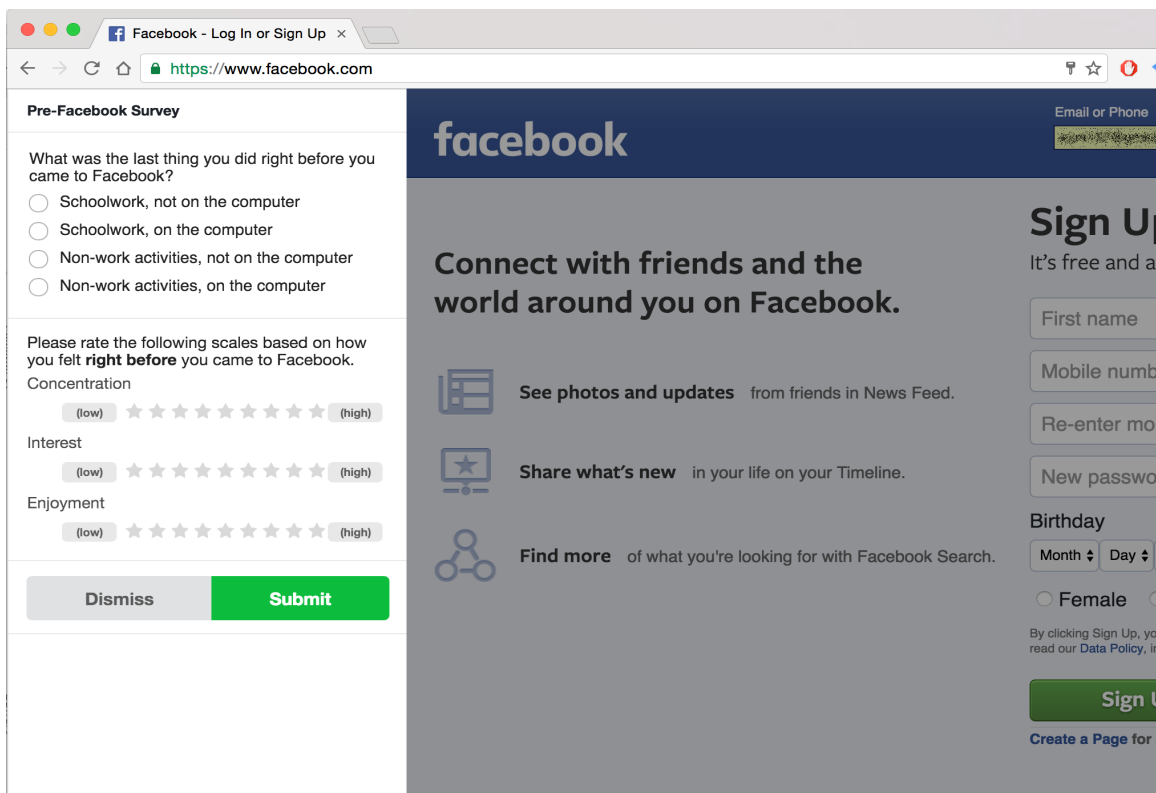
Figure 5. Pre-FB survey

The pre-FB survey asked participants to self-report the last activity they did right before they came onto Facebook. To reduce participants' burden, four categories were provided: schoolwork not on the computer, schoolwork on the computer, non-work not on the computer, non-work on the computer. The pre-FB survey also asked participants to rate their engagement level associated with the last activity they just reported. Engagement is measured in three 9-item Likert scales: concentration, interest, and enjoyment (Shernoff et al., 2003; Shernoff & Csikszentmihalyi, 2009).

Though a survey takes a few seconds to complete, too many surveys could have interrupted participants' normal use or discouraged them from going on Facebook as often as they usually would. To avoid that scenario, a delay trigger was implemented such that once a survey was submitted, no survey would be triggered in the following 30 minutes.

3.2.3 Diary

Participants were instructed to keep a diary when they encountered any content on Facebook that they considered to be interesting, meaningful, or of value to them, from which they felt they could learn something. I gave examples of informal learning to participants, including but not limited to content related to science, literacy, technology, news, and personal development. I also clarified to the participants that content such as entertainment or social events would not typically count as informal learning, unless the information inspires deep reflections (e.g., celebrity news prompting one to reflect on how women are portrayed in popular culture).

ROSE provides a diary function that is directly integrated in the Facebook user interface (Figure 6). After installation of the extension, a red ribbon called a *study note* appears at the top of every post. Clicking on the study note launches a diary template on the left side of the screen where participants can input relevant information about the corresponding post.
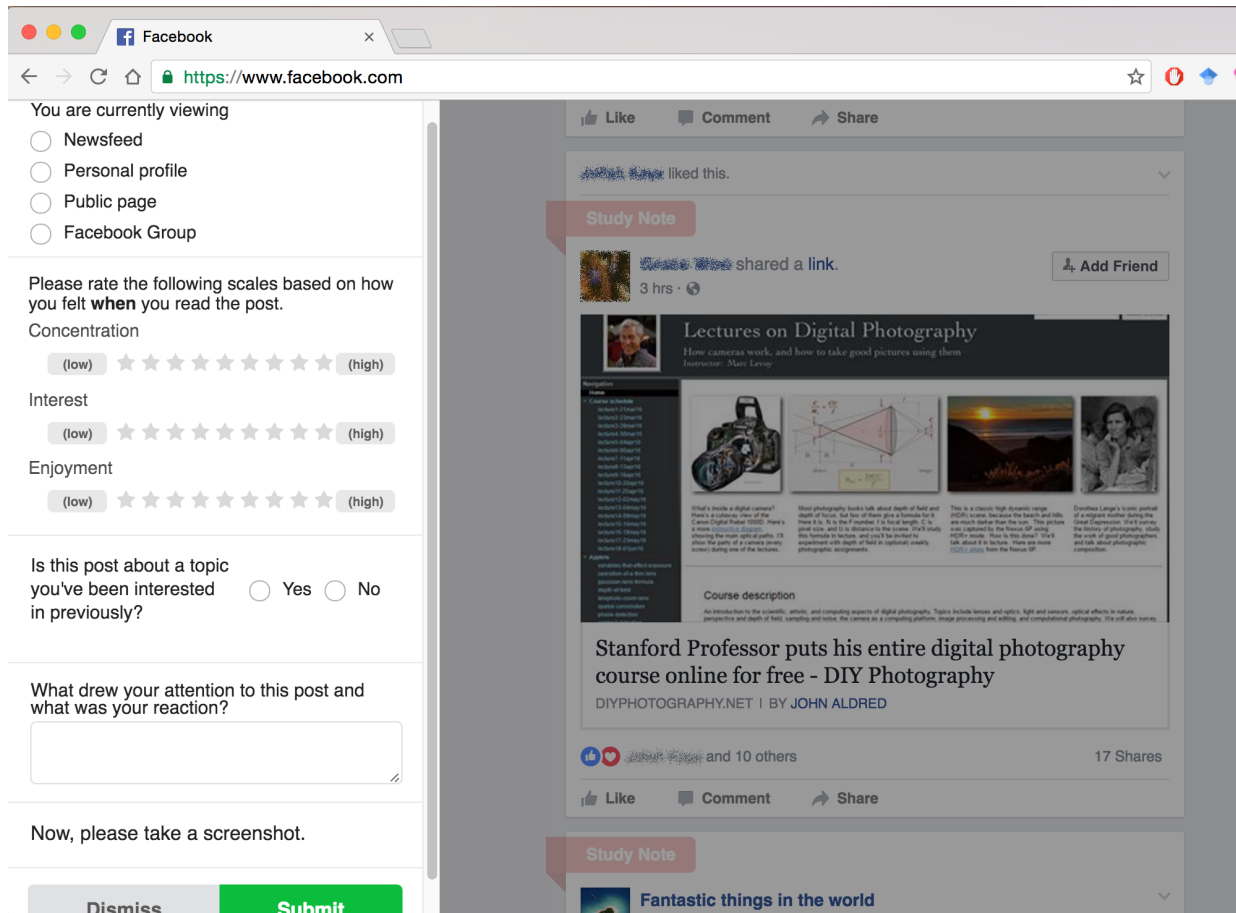
Figure 6. Diary template

The diary prompt asked four questions: 1) the location of the post (newsfeed, personal profile, public page, group page); 2) engagement level in the dimensions of concentration, interest, enjoyment when the participant read the post, the same question as that used in

the pre-FB survey; 3) whether the participant was previously interested in the topic; and 4) an open-ended question about what aspects of the post drew the participant's attention.

After filling out a diary, participants were asked to take a screenshot of the post alongside the diary, since ROSE does not record content from Facebook. I refer to the diary note and screenshot as a diary entry. In order to minimize disruption, I instructed the participants that they did not need to make diary entries for repeating topics. For instance, if a participant was interested in learning about public health issues and encountered a large number of posts on this topic, they were only expected to make diary entries on selective posts of higher significance to them. Therefore, the informal learning instances I collected represent stories of more significance selected by the participants in the period of a week.

3.2.4 Semi-structured interviews

I conducted semi-structured interviews immediately after the weeklong study, using diaries as prompts and memory aids for the participants. I started each interview by asking what participants' primary reasons for using Facebook were; what type of content they generally found interesting, meaningful, or of personal value on Facebook; and how they used Facebook currently compared to how they used it when they first started. I also asked participants whether they considered Facebook a place to learn something, and why or why not; if yes, I asked for one or two examples of something they learned from Facebook that had lasting impact on them.

Afterwards, participants were shown all the diaries they submitted from the weeklong study. They selected three diary entries that they found the most interesting or important to discuss extensively. If their diaries covered multiple topics (e.g., science, technology, and politics), I encouraged the participant to pick the most interesting example(s) for each topic. If the participant submitted less than three diaries, they discussed all diaries submitted.

For each diary note, participants discussed the content of the post, the values of the information to them and why, how they encountered the information, what aspects of the post drew their attention, and what they did after reading the information and why. Refer to Appendix A for a full list of interview prompts.

Because the data collection took place in 2016, a U.S. presidential election year, I took a special interest in students' engagement with news and politics. If a participant mentioned information about current events, politics, or social issues, they were encouraged to further discuss where they typically got this type of content on Facebook and outside of Facebook, why they paid attention to such content, how they evaluated its quality, whether and how they interacted with such content, and why or why not. If the participant did not mention any topics relevant to news, politics, or social issues, I asked them at the end of the interview whether they read information on those topics, and if not, what were the reasons.

All interviews were audio recorded and fully transcribed. The interview lengths ranged from 25 to 96 minutes, with an average of 45 minutes.

3.3 Data Analysis Overview

The results of the study will be presented in three foci, subsequently called study 1, study 2, and study 3. Study 1 uses the quantitative data from Facebook logging, ES surveys, and diaries to investigate students' characteristics of attention before and during Facebook use. Study 2 relies on diaries and interviews to answer whether and to what extent college students' Facebook use resembles connected learning. Also with diaries and interviews, study 3 zooms in on students' political engagement on Facebook and the associated benefits and drawbacks of civic learning on Facebook. In the following sections, I will explain the measures, the granularity, and the coding schemes used for data analysis.

3.3.1 Data preprocessing—study 1

In total, 50 participants submitted 1350 pre-FB surveys, averaging approximately three to four pre-FB surveys per participant per day. Twenty pre-FB surveys were incomplete, consequently excluded from data analysis. Facebook usage data, surveys, and diaries were organized in a chronological timeline for each participant. Each line of data contains the data type (i.e., window status, type of interaction, page scrolling, ES survey, and diary), its corresponding value, and its timestamp.

The duration of one *individual Facebook visit* is the time span between when a Facebook window became active and later went inactive, referred to as *per visit duration*. The duration between the start of the current Facebook visit and the end of the last visit is referred to as *break duration*. Sometimes, a user left Facebook temporarily and came back

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immediately afterwards. For instance, when a user clicked on media content on Facebook, they were re-directed to a new browser tab to view the media content on its original site (e.g., CNN, YouTube); they then returned to Facebook immediately afterwards and continued to use Facebook. I therefore considered a series of individual visits with brief break durations in between as one *Facebook session*.

To determine which individual visits belonged to one Facebook session, I first calculated all per visit durations and break durations. The median break duration of all participants was 40 seconds, suggesting that the gap between two consecutive Facebook visits can be rather brief. This further demonstrated the need to interpret Facebook checking from a coarser granularity instead of treating each visit as independent and separate from each other. Prior work found that college students spend an average of 47.9 seconds on a computer window before switching to the next (Mark, Wang, et al., 2014). I inferred that, if a student left Facebook to attend to another window (e.g., viewing the media content found on Facebook from its original site), they would need approximately 47.9 seconds. If the gap between two consecutive Facebook visits was over 47.9 seconds, it was likely that they continued to attend to other activities on the computer, thus making the next occurrence of Facebook visit more likely to be the start of a new session. If the gap was less than 47.9 seconds, it was likely that they had a rather brief engagement with the non-Facebook window and resumed their attention on Facebook. Therefore, a conservative threshold of 40 seconds was used to create Facebook sessions. That is, if the time span between two consecutive Facebook visits (break duration) was less than 40 seconds, then these multiple visits were considered to be in one Facebook session.

A pre-FB survey sampled a student's attentional states right before Facebook use, whereas a diary submitted during Facebook use gave us information about a student at the time of informal learning. In sum, for each Facebook session, I calculated the following metrics for data analyses:

- Duration of FB use: the sum of all per visit durations in this session (in seconds).
- Browsing: the sum of all page scrolling that occurred in this session (in pixels).
- Active interactions: the total number of active interactions a student engaged in that were not chats (e.g., comment, like).
- Chats: the total number of chat messages sent in this session.
- Pre-FB last activity: activities right before Facebook use in four categories.
- Pre-FB attention: ratings of concentration, interest, and enjoyment levels (1-9) associated with the activity right before Facebook.
- Diary attention: ratings of concentration, interest, and enjoyment levels (1-9) at the time of reading a post of learning value
- Diary location: where on Facebook a student viewed a post of learning value
- Diary new interest: whether a student was interested in the topic previously

Participants did not receive a pre-FB survey every time they logged on Facebook. They also did not encounter learning content every time they visited Facebook. Additionally, participants were allowed to dismiss the survey if they could not fill them out, though I discouraged it. As a result, only a proportion of Facebook sessions had a matching pre-FB survey, diary, or both.

The repeated sampling of each individual with pre-FB surveys created a nested dataset that required the use of linear mixed effects models (LMM). To investigate pre-FB experience and its relation to Facebook use (RQ1, RQ2), I conducted data analysis using LMM and data of all Facebook sessions with matching pre-FB surveys.

3.3.2 Coding scheme—study 2

I used an inductive approach to analyze the interview data (Corbin & Strauss, 2008; Locke, Feldman, & Golden-Biddle, 2015). In *stage 1*, based on the first 16 interviews, I conducted open coding and let early themes emerge from the data. After open coding, axial coding was used to identify sub-categories in each theme. These early themes include: activities on Facebook that are directly or indirectly related to formal education; activities on Facebook that are relevant to the development of personal interests; network effects in accessing and participating in learning content; and skills developed as a byproduct of engaging with Facebook.

After the initial opening coding and axial coding, I discussed the coding scheme with a second coder, a fellow Ph.D. student, based on the first 16 interviews in *stage 2*. Through this iteration, we identified a few new sub-categories in the existing themes. We also identified one new theme: actions after alleged learning on Facebook. After finalizing the coding scheme, we picked another 8 interview transcripts and independently coded them with the updated coding scheme. The coding was not done on the unit of participant, but rather on the unit of instance. Afterwards, we compared and discussed our codes on the 8 interviews, gave our rationale, and resolved differences.

After calibration, we divided the remaining interviews and coded them independently in *stage 3*. After all coding was finished, we each marked quote-code pairs that we were uncertain about and discussed them. In total, 124 quote-code pairs were discussed in this stage, which resulted in the exclusion and update of a number of quote-code pairs. Throughout stage 2 and stage 3 of coding, the second coder and I documented the surprises we saw in the data and noted down our reflections in memos.

3.3.3 Coding scheme—study 3

In the open coding stage described above, I noticed a set of early themes that centered on the topic of political news and social issues, such as values of engaging with news on Facebook and tactics of interacting with Facebook news. This set of themes stood out for its subject matter in a particular time (the 2016 U.S. presidential election year), thus, study 3 will focus on diaries and interview discussions about political and social issues. Specifically, *political* referred to topics relating to the government and public affairs of a country; *social issues* was operationalized using a criterion of the most popular social issues of 2016[2] and additionally included stigmatized topics, such as mental illness, as they are of increasing societal concern. Some of the political or social topics were in the format of personal reflections, photo journals, or video commentaries—they were not all in the form of a news article. Nevertheless, these topics were directly connected to current news events or social issues. Therefore, I use the term "news" and "social and political issues" interchangeably from hereon.

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[2] https://www.isidewith.com/polls/social

In the general comments in the interviews, participants mainly discussed topics of the 2016 U.S. presidential election, national and international affairs, LGBT rights, and climate change. In discussing the diaries, participants also covered topics related to the election, other political topics, gender and race, stigmatized topics, and the economy. Similar to study 2, I used an inductive approach to analyze the interview data (Corbin & Strauss, 2008; Locke et al., 2015). Four early themes emerged from open coding: news sources, values of engaging with news on Facebook, tactics of interacting with Facebook news, and self-presentation around news on Facebook. I used axial coding to identify sub-categories in each theme. Through constant comparison and memoing, two main themes will be reported. One centers around why college students like to learn about news on Facebook; the other focuses on the issues of self-presentation and impression management, and their primarily negative effects on college students' civic engagement on Facebook. These two themes are the most salient because they 1) highlight the specific needs students have for learning civics in the digital age and how Facebook is helping students meet those needs; and 2) uncover drawbacks of engaging in political and civic issues on Facebook, which could lead to opportunities for future design interventions.

CHAPTER 4

Study 1: DISTRACTIONS, ATTENTION, AND FACEBOOK USE

This chapter will present results on students' activities and characteristics of attention associated with Facebook use to investigate how Facebook is embedded in students' daily routines. The guiding questions are: what are the activities and the associated engagement levels immediately before a student starts to use Facebook (RQ1)? How do the activities and engagement levels prior to Facebook use affect a student's actual Facebook use (RQ2)? Does informal learning occur when college students interact with Facebook (RQ3.1), and if yes, how are students' characteristics of attention associated with learning on Facebook (RQ3.2)? To answer these questions, I analyzed experience sampling surveys submitted at the start of Facebook use sessions, Facebook usage statistics, and the quantitative measures in diaries.

4.1 Overview of Facebook Use and Topics of Interest on Facebook

The sampled college students, who self-reported to have used Facebook regularly, spent an average of four and half hours on Facebook in a week (see a summary in Table 2). Despite the substantial total of time on Facebook, the duration of each visit was short: an individual visit averaged 71.2 seconds and a Facebook use session averaged 139.5 seconds. To remind the readers, a Facebook use session comprises a series of individual Facebook visits with breaks of less than 40 seconds in between. Not only were Facebook sessions short in duration, 38% of sessions had no browsing (page scrolling), suggesting that it is not

uncommon for students to go on Facebook for "a peek" without moving past the initial screen.

Table 2. Summary of Facebook usage in the weeklong study. [1]Weekly total Facebook duration is calculated by summing up all active Facebook window durations.

	Min.	Max.	Mean	SD	Median
Weekly Total FB duration[1] in sec. (h:mm:ss)	1157 (0:19:17)	77237 (21:27:17)	16607.7 (4:36:48)	12577.7 (3:29:38)	14270 (3:57:50)
Weekly Total FB visits	9	1057	233.1	214.5	174
Weekly Total FB sessions	7	493	119	99.6	92
Per visit duration in sec.	0.04	3208.5	71.2	147.4	19.2
FB session duration in sec.	0.2	4643.8	139.5	253.1	48.4

Regarding active interactions (i.e., social networking and direct communication using a Facebook function, see Table 3), most students sent chat messages, liked and commented on posts, and viewed profiles relatively frequently. Only a subset of students sparsely engaged in sharing content, updating statuses, friending, events, or curating their data history or friend list. Most of the time (62%) when a student visited Facebook, they did not engage in any social networking activities or direct communication; only 24.9% of Facebook use sessions involved chatting and 17.2% of sessions had one or more social networking activities (e.g., liking, sharing).

In sum, students spent a substantial amount of total time on Facebook, yet each use was often brief and absent of active interactions, sometimes without scrolling past the initial screen. I speculate that students often logged onto Facebook to check if they had received

notifications (e.g., pending chat messages, comments or likes from friends), thus they did

not need to go past the first screen or engage in any active interactions.

Table 3. Summary of active interactions on Facebook in the weeklong study. [2] The number of occurrences for chat represents the number of sent chat messages.

Interaction category	# unique students out of 50 who engaged in the interaction	# Occurrence in a week (for students who engaged in the interaction)				
		Min.	Max.	Mean	SD	Median
Chat[2]	41	1	1253	172	281	38
Like	45	1	132	31.2	31.4	20
Comment	36	1	83	12.2	16.5	8.5
View profile	38	1	53	8.6	10.8	4
Share	17	1	22	4.8	5.9	2
Update status	16	1	17	3.3	4.1	1.5
Friend	21	1	7	2	1.7	1
Event	13	1	10	2.5	2.5	2
Curate	20	1	6	1.9	1.6	1

4.2 Activities and Engagement Before Facebook Use

RQ1 begins to unpack the context in which college students use Facebook by investigating

the activities and the corresponding engagement levels prior to a college student's

Facebook use. Based on all pre-FB surveys submitted at the start of a Facebook session, two

thirds of activities immediately preceding Facebook use (all self-reported through

experience sampling) were leisure activities (non-work), either on the computer (29.2%)

or offline (37.5%). Schoolwork on the computer occurred 25.6% of the time before Facebook use and schoolwork offline was the least common (7.7%).

Next, I examined whether engagement levels differed based on what students were doing right before visiting Facebook. Since each participant was repeatedly sampled through pre-FB surveys, linear mixed effects models (LMM) were used to account for the nested nature of the data. Specifically, Facebook sessions with pre-FB surveys were used to test the relationship between pre-FB activity and the associated engagement levels. In three separate LMMs, I used 1) concentration, interest, and enjoyment as the dependent variable (DV), respectively; 2) pre-FB activity (four categorical levels: schoolwork not on the computer, schoolwork on the computer, non-work not on the computer, non-work on the computer) as the independent variable (IV) fixed factor in each model; and 3) participant as the random factor in each model. Given that there were four categories in pre-FB activity, Bonferroni post-hoc tests were used to do pairwise comparisons.

Students' engagement levels before Facebook use differed according to the type of activity they were doing (Table 4, Figure 7). If a student was doing schoolwork on the computer, their concentration level was significantly higher than that of leisure activity on the computer, which was higher than that of leisure activity offline. Conversely, a student's interest and enjoyment levels were both the lowest when the student was doing schoolwork on the computer right before logging into Facebook. They were both the highest when the student was doing leisure activities on the computer right before logging into Facebook.

Table 4. RQ1 Comparing engagement levels (concentration, interest, enjoyment) associated with pre-FB activities. ***p<.001, **p<.01. [3]Non-work on the computer (group 4) is the reference category.

DV	IV: Pre-FB activity				F statistics	p	Coefficient of Pre-FB activity[3] (SE)	Post-hoc pairwise comparisons
	1:School work Offline	2:School work Computer	3: Non-work Offline	4: Non-work Computer				
Concentration (m, sd)	5.83 (2.35)	5.94 (2.56)	5.00 (2.44)	5.45 (2.26)	F(3,1326) =11.11	***	1: 0.39 (.27) 2: 0.49 (.18) 3: -0.44 (.16) 4: 0	***: 2&3 **: 1&3 *: 2&4, 3&4
Interest (m, sd)	4.75 (1.96)	4.13 (2.26)	5.23 (2.34)	6.23 (2.09)	F(3,1326) =55.47	***	1: -1.47 (.25) 2: -2.10 (.16) 3: -0.99 (.15) 4: 0	***: 1&4, 2&4, 3&4, 2&3, 2&4
Enjoyment (m, sd)	4.33 (2.11)	3.39 (2.11)	5.28 (2.44)	6.12 (2.19)	F(3,1326) =94.38	***	1: -1.79 (.25) 2: -2.72 (.17) 3: -0.84 (.15) 4: 0	***: 1&4, 2&3, 2&4, 3&4 **: 1&2, 1&3
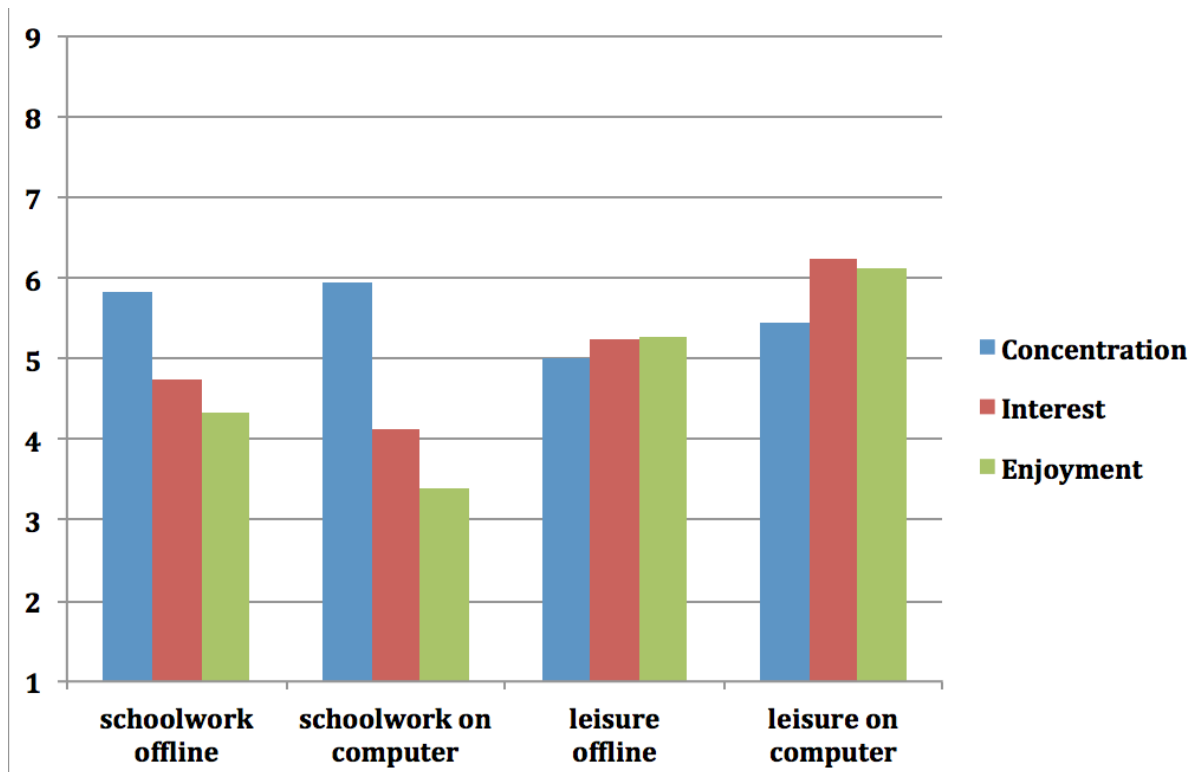
Figure 7. Engagement levels associated with pre-FB activities

In sum, at the start of Facebook use sessions, concentration levels tended to be higher immediately following schoolwork and lower immediately following leisure activities; whereas enjoyment and interest levels tended to be lower immediately following schoolwork and higher immediately following leisure activities.

4.3 Facebook Use Patterns in Relation to Pre-Facebook Conditions

The next research question concerns whether students' activity and engagement levels at the start of Facebook use affected the way they actually used Facebook, and if so, how. I reduced the 4-level pre-FB activity to a 2-level grouping. That is, considering the similar

trend (see Figure 7), I grouped the schoolwork online and offline into one schoolwork category and non-work online and offline into one leisure category.

Similar to the analysis of RQ1, due to the nested nature of the data, RQ2 also required linear mixed effects models (LMM) based on Facebook sessions with pre-FB surveys. For Facebook usage patterns, I chose to focus on the duration of time a student spent on Facebook. The reason for modeling duration is that previous studies have suggested the negative relationship between the time spent on Facebook and academic performance using one-time general survey measures (Junco, 2012; Michikyan et al., 2015), though the direction of the effect is uncertain. If my data, which is measured at the level of each Facebook use, also shows that Facebook use is heavy when paired up with schoolwork, then the result can speak to the distracting effect of Facebook. Therefore, in a LMM, Facebook session duration was the DV; IVs were pre-FB activity, engagement (concentration, interest, and enjoyment), GPA, along with the two-way interactions between pre-FB activity and GPA, and pre-FB activity and engagement; individual participant was the random factor. Note that, in this analysis, I excluded Facebook sessions in which a student submitted a diary because writing a diary within the Facebook interface would artificially increase observed Facebook use duration.

Students spent less time on Facebook if the Facebook session followed schoolwork (Table 5). While interest level had no significant main effect on Facebook duration, a significant interaction between pre-FB activity and interest affected the time a student spent on Facebook. Lower interest in the leisure activity before Facebook was related to longer time spent on Facebook; interest in schoolwork did not appear to have a clear relationship with

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duration of the Facebook use session (Figure 8). For students who had lower GPAs, there is

also a trend that their Facebook duration tended to be longer if it followed a leisure activity

(Figure 9).

Table 5. RQ2 LMMs models of pre-FB conditions on Facebook duration. Significant results and trends are bolded.

DV: FB use metrics	IV(s): Pre-FB conditions	F statistics	p	Coefficient (SE)
Duration	**pre-FB activity**	**F(1, 1179)=4.496**	**.014**	**373.87 (152.01)**
	Concentration	F(1, 1129)=.855	.855	-2.26 (7.31)
	Interest	F(1, 1178)=.173	.678	18.90 (11.88)
	Enjoyment	F(1, 1165)=2.344	.126	-16.60 (11.80)
	GPA	F(1,45)=1.617	.210	-6.87 (48.19)
	pre-FB activity x GPA	**F(1,1178)=3.297**	**.07**	**-83.13 (45.78)**
	pre-FB activity x Concentration	F(1, 1153)=.407	.524	9.08 (10.10)
	pre-FB activity x Interest	**F(1, 1177)=4.452**	**.035**	**-31.60 (14.98)**
	pre-FB activity x Enjoyment	F(1, 1179)=.645	.422	11.30 (14.07)
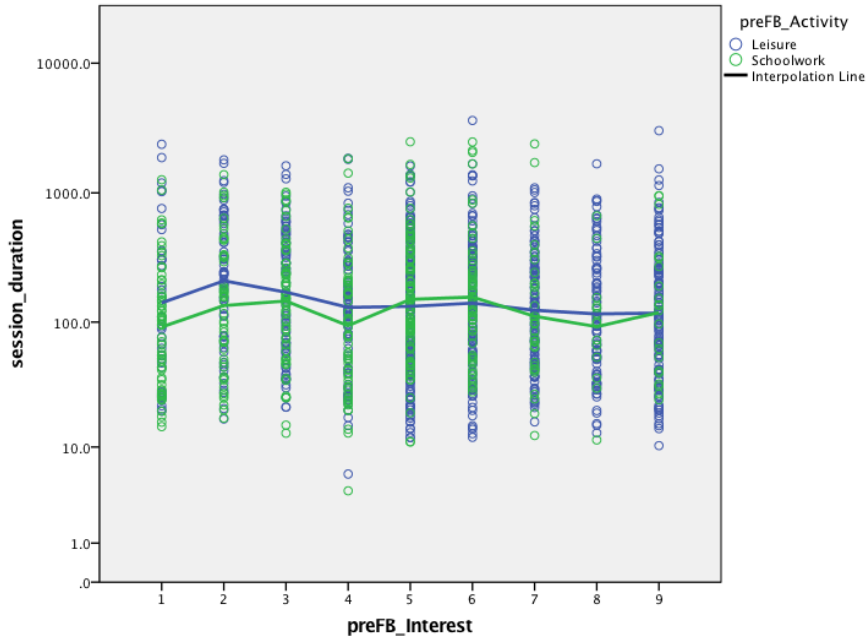
Figure 8. Interaction between pre-FB interest and pre-FB activity on duration. Session duration (y-axis) was transformed using logarithmic (base 10) in the figure.
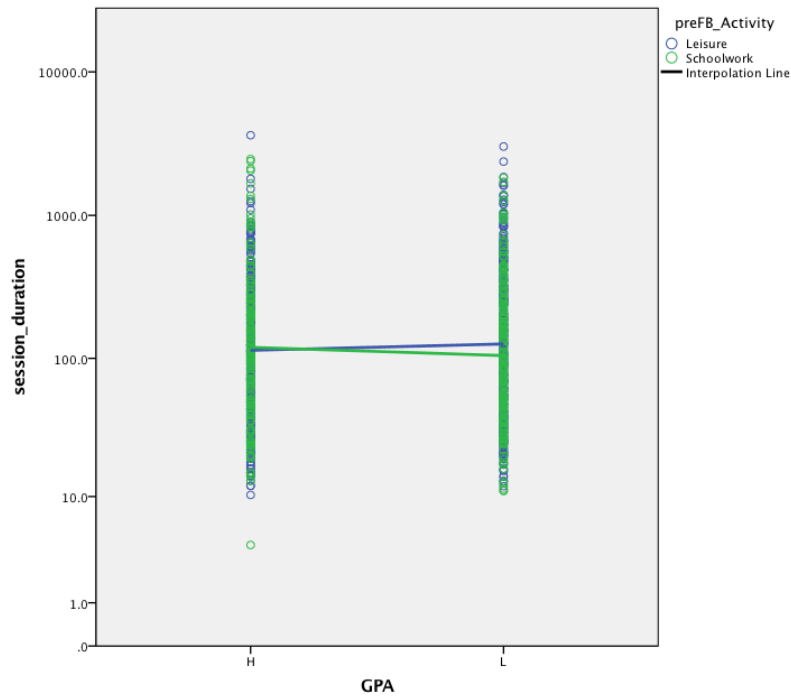
Figure 9. Interaction between GPA and pre-FB activity on duration. In the LMM, GPA was entered as a continuous variable. For visualization purpose, the top one third of GPA was grouped in H, and the bottom one third of GPA was grouped in L. Session duration (y-axis) was transformed using logarithmic (base 10) in the figure.

Taken together, Facebook use patterns were affected by prior activities and engagement levels. Two contrasting use patterns emerged. When a student visited Facebook right after schoolwork, they spent less time on Facebook. When a student visited Facebook right after a leisure activity, they spent more time on Facebook. Lower interest in the leisure activity prior to Facebook was related to even more prolonged use. For students who had lower GPAs, there is also a trend that their Facebook duration tended to be longer if it followed a leisure activity.

4.4. Engagement Levels when Informal Learning Occurs

Does informal learning occur on Facebook (RQ3.1)? I approached this question by asking participants to make a diary when they encountered content they considered interesting, meaningful, and of learning value to them (referred to as *learning-content posts* in what follows). Students submitted a minimum of one diary and a maximum of 24 diaries in a week, totaling 373 diaries. The median number of diaries a student submitted was 6.5, suggesting that students on average encountered learning content on Facebook approximately once a day. This estimate is conservative because, to minimize disruption in data collection, I gave participants the option to be selective and make only one diary if they viewed multiple posts on the same topic.

The topics students learned about during the week of the study include political and social issues, science and technology, campus information and resources, personal inspirations and perspectives, do-it-yourself (DIY) tutorials and life hacks, non-political news, and others (e.g., pop culture issues, local events). See Figure 10a – Figure 10g for an example of

each category. The majority of learning-content posts were found on News Feeds (83%), followed by public pages (10%), group pages (3%), and personal profiles (3%). A little over half of these posts were about students' existing interests (54.7%) and the rest were about new interests.

In this section, I will focus on the characteristics of a student's attention at the time of reading learning-content post, that is, when they submitted a diary entry. Chapter 5 will present an in-depth qualitative examination of the content of these posts and students' interaction with them.
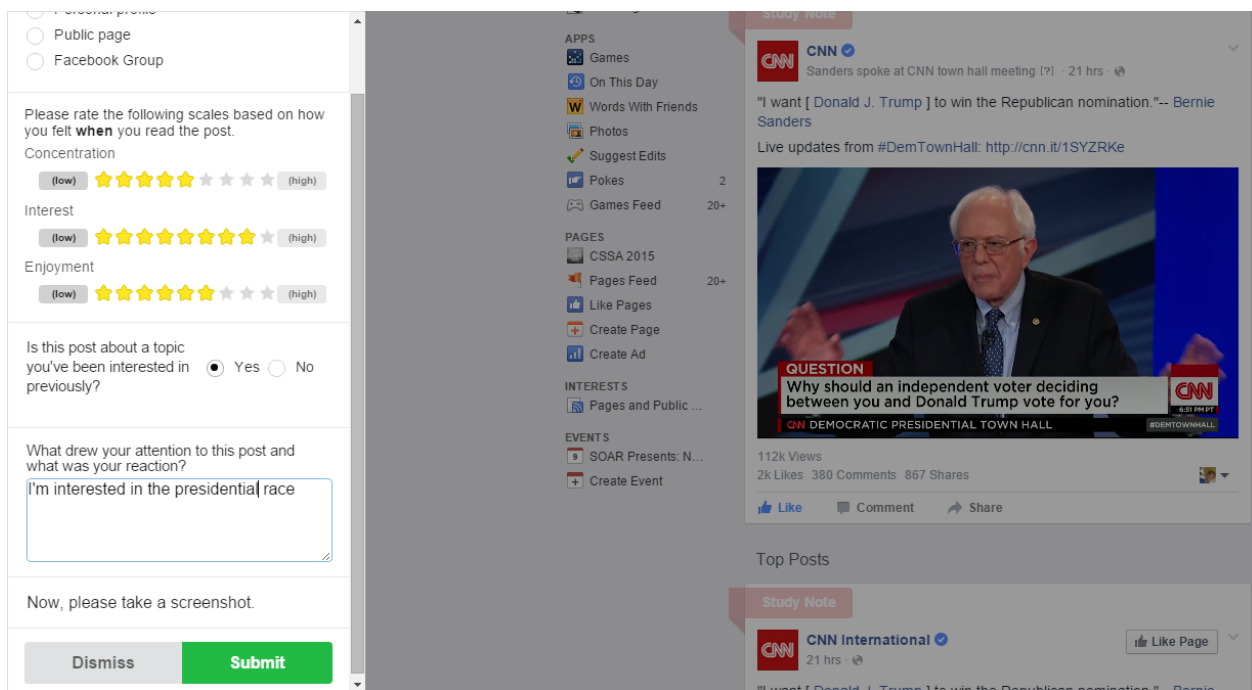

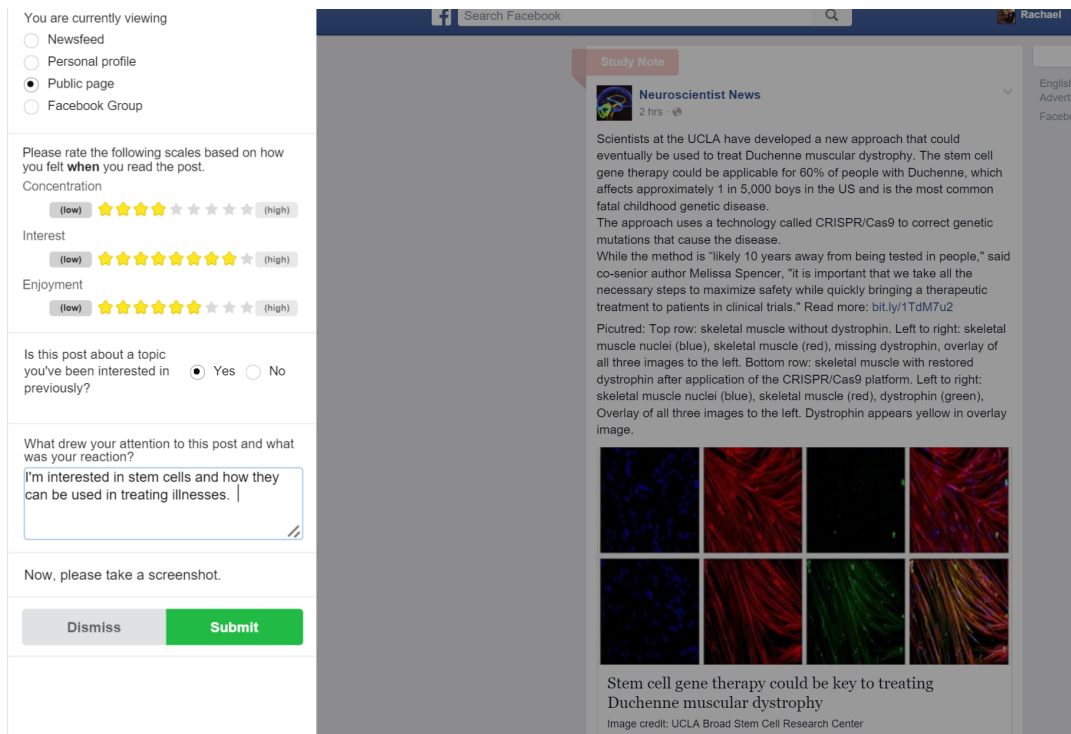**Figure 10a An example post of political and social issues**

Figure 10b An example post of science and technology
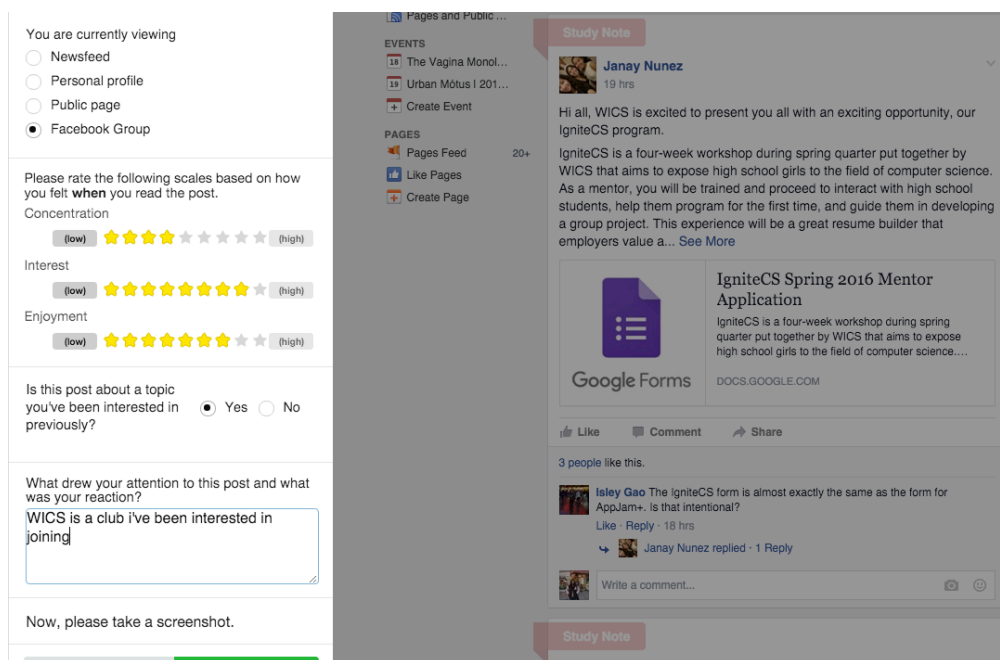
Figure 10c An example post of campus information and resources

Please rate the following scales based on how you felt **when** you read the post.

Concentration
(low) ★★★★★★☆☆☆ (high)

Interest
(low) ★★★★★★★★☆ (high)

Enjoyment
(low) ★★★★★★★★☆ (high)

Is this post about a topic you've been interested in previously? ○ Yes ● No

What drew your attention to this post and what was your reaction?

It's a Humans of New York post so I was drawn to it. It was good. I have never read a piece like this before so it was enlightening.

Now, please take a screenshot.

Dismiss   **Submit**

Humans of New York
4 hrs ·

1 hr ·

"I don't enjoy observing people as much as I used to. Everyone acts like they're on stage. People used to come to The Village sheepishly. Nobody was sure if they belonged. We didn't know if we were artists. These days everyone walks around like they're contributing something. There's no angst anymore. There's too much certainty. And that's a shame. Because all the best art comes from people who feel like they don't belong. Art is a way of proving your existence. When I was a young man, a person that I respected told me that I was an artist. It was one of the worst things that could have happened to me. I stopped walking into museums or galleries with a sense of awe. I walked in feeling like an 'artist.' My arms would be crossed. If I liked a piece, it was 'good.' If I didn't like a piece, it was 'bad.' I didn't feel vulnerable anymore. I lost my humility. And that's when growth stops."

Like Page

Figure 10d An example post of personal inspirations and perspectives

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You are currently viewing
○ Newsfeed
○ Personal profile
○ Public page
● Facebook Group

Please rate the following scales based on how you felt **when** you read the post.

Concentration
(low) ★★★★★★★★☆ (high)

Interest
(low) ★★★★★★★★★ (high)

Enjoyment
(low) ★★★★★★★★★ (high)

Is this post about a topic you've been interested in previously? ● Yes ○ No

What drew your attention to this post and what was your reaction?

the fact that it is a diy project and i love making handmade gifts for people

Now, please take a screenshot.

Study Note

Smart Hacks
11 hrs ·

Paper Mug Tutorial

2.1K Views

Like   Comment   Share

36 people like this.   Top Comments ▾

28 shares

Write a comment...

Rose A Carlson Will try this.
Like · Reply · 2 hrs

Figure 10e An example post of DIY and life hacks

60
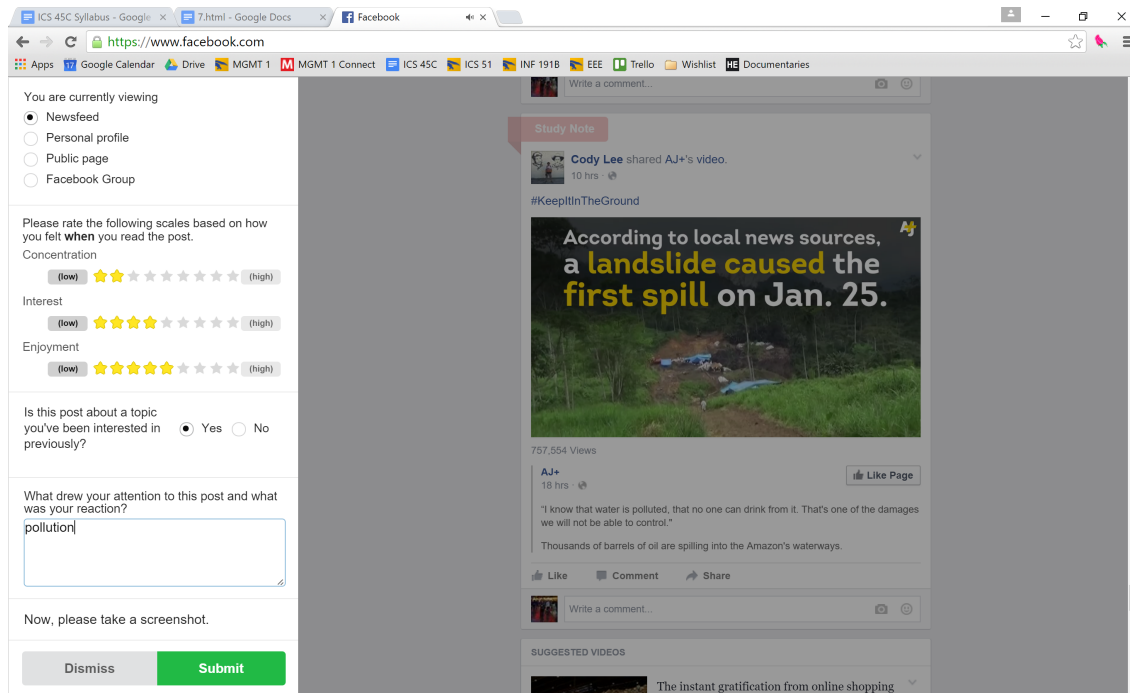
Figure 10f An example post of non-political news
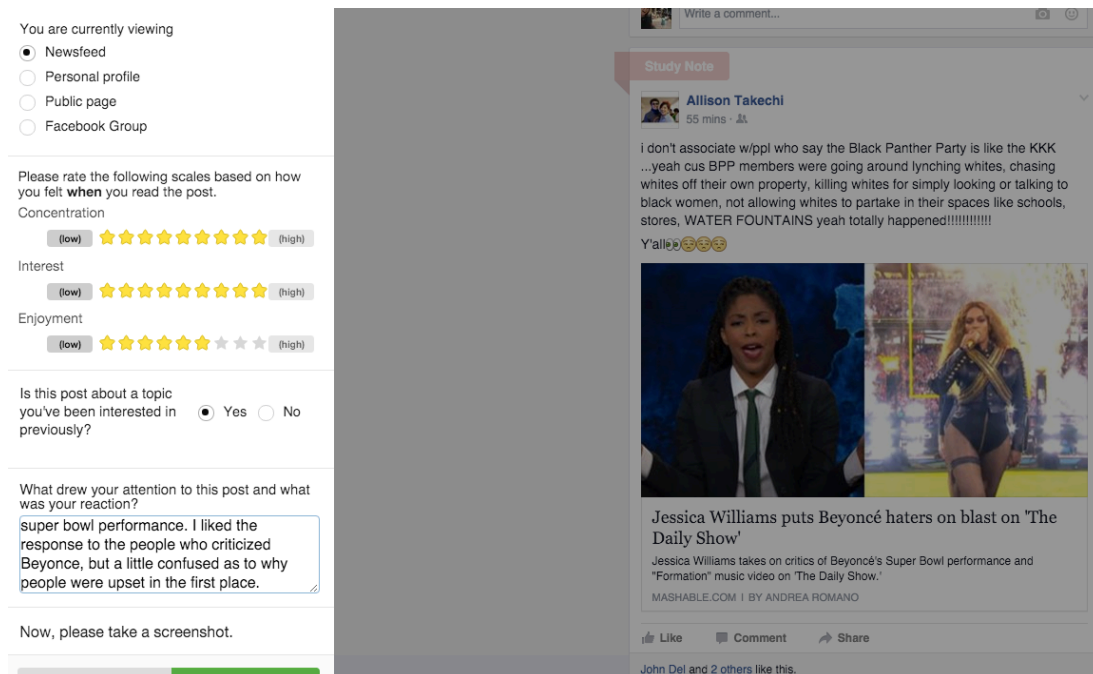
Figure 10g An example post of other content

How did the characteristics of attention change when a student engaged in learning content on Facebook (RQ3.2)? I first examined how engagement levels changed from the start of a Facebook use session to when a student viewed a learning-content post. Second, I tested whether or not this change of engagement was consistent between Facebook use after schoolwork and Facebook use after leisure.

Accordingly, Facebook sessions for which students submitted both a pre-FB survey and a diary were used for the analysis. A total of 179 sessions from 46 students in the sample met this requirement. Since I measured engagement in three dimensions—concentration, interest, and enjoyment—I had 179 x 3 pairs of individual measures. If more than one Facebook session from a student had both a pre-FB survey and a diary, I then calculated the average of these sessions. The remaining four students submitted diaries and pre-FB surveys; however, these diaries and surveys were not submitted in the same Facebook use sessions. Therefore, I conducted paired t-tests with 46 x 3 pairs of measures.

Students' concentration, interest, and enjoyment levels were all significantly higher associated with a learning-content post relative to right before Facebook use (Table 6). Students' interest levels, in particular, were more than two points higher on average (on a 9-point Likert scale). This result is expected as students were instructed to make a diary note on content that they found interesting, meaningful, and of value to them. Furthermore, a student's engagement might increase with any activity on Facebook. Since I only sampled engagement levels associated with learning-content posts during Facebook use, future research should test how a student's engagement might change when they interact with different types of content (e.g., entertainment videos, social events). Nevertheless, results

in Table 6 serve as a validation that diary entries concerning learning content were indeed of interest to students.

Table 6. RQ3.2. Paired t-test results for comparing change of engagement levels

	Right before FB (pre_FB)	Time of learning (diary)	T statistics t(df)	p
Concentration (m, sd)	5.27 (1.68)	6.32 (1.84)	t(45)=3.98	<.001
Interest (m, sd)	5.08 (1.45)	7.15 (1.45)	t(45)=8.64	<.001
Enjoyment (m, sd)	4.94 (1.60)	6.51 (1.55)	t(45)=5.12	<.001

Next, I tested whether the difference in engagement between the two times (i.e., right before Facebook and at the time of learning) was consistent or different depending on the type of activity prior to Facebook. I divided the 179 Facebook use sessions into two subgroups based on the pre-FB activity: schoolwork and leisure. Since four sessions had missing pre-FB activity data, 175 sessions with pairs of engagement levels were analyzed. Specifically, 121 Facebook use sessions (from 39 students) followed a leisure activity and 54 sessions (from 28 students) followed schoolwork. Similar to the previous test, I averaged individuals' scores if they had more than one session that met the requirement. Afterwards, I conducted paired t-tests to compare the difference in engagement levels between the two times, for each of the two subgroups.

For Facebook sessions right after leisure, students' concentration, interest, and enjoyment levels associated with a learning-content post were all significantly higher compared to right before Facebook use (Table 7). This result is consistent with the overall trend.

Students' concentration, interest, and enjoyment levels on average increased by 1.1, 1.7, and 0.8 points, respectively, on the 9-item rating scale.

For Facebook sessions right after schoolwork, the result is also consistent with the overall trend (Table 7). Students' concentration, interest, and enjoyment levels on average increased by 1.1, 3.1, and 3.1 points, respectively, on the 9-item rating scale.

Table 7. RQ3.2. Paired t-test results for comparing the difference in engagement levels between right before Facebook use and the time of learning, for the two subgroups—Facebook use after leisure vs. Facebook use after schoolwork

		Right before FB (pre_FB)	Time of learning (diary)	T statistics t(df)	p
FB use after leisure	**Concentration (m, sd)**	5.23 (1.81)	6.38 (1.76)	t(38)=3.67	.001
	Interest (m, sd)	5.66 (1.63)	7.34 (1.35)	t(38)=5.79	<.001
	Enjoyment (m, sd)	5.66 (1.74)	6.50 (1.77)	t(38)=1.97	.05
FB use after schoolwork	**Concentration (m, sd)**	5.29 (2.24)	6.41 (2.29)	t(27)=2.32	.028
	Interest (m, sd)	3.86 (1.79)	6.95 (1.99)	t(27)=6.43	<.001
	Enjoyment (m, sd)	3.54 (1.78)	6.62 (1.84)	t(27)=5.75	<.001

To test whether the magnitude of increase in engagement differ between these two subgroups, I conducted paired t-tests using data from 22 students who have both Facebook use sessions following schoolwork and use sessions following leisure (Table 8). Results show that 1) the increase in concentration between these two subgroups were not significantly different; 2) the increase in interest after schoolwork was significantly higher

than that after leisure; and 3) the increase in enjoyment after schoolwork was significantly

higher than that after leisure.

Table 8. RQ3.2. Paired t-test results for comparing the magnitude of difference in engagement levels between the two subgroups—Facebook use after leisure vs. Facebook use after schoolwork

	FB after schoolwork	FB after leisure	T statistics t(df)	p
Difference in Concentration (m, sd)	0.84 (2.49)	1.11 (2.19)	t(21)=-0.40	.691
Difference in Interest (m, sd)	3.10 (2.73)	1.53 (1.84)	t(21)=2.43	.024
Difference in Enjoyment (m, sd)	2.98 (3.04)	0.36 (2.89)	t(21)=2.95	.008

Putting it all together, Figure 11 summarizes the results for RQ1, RQ2, and RQ3.2.
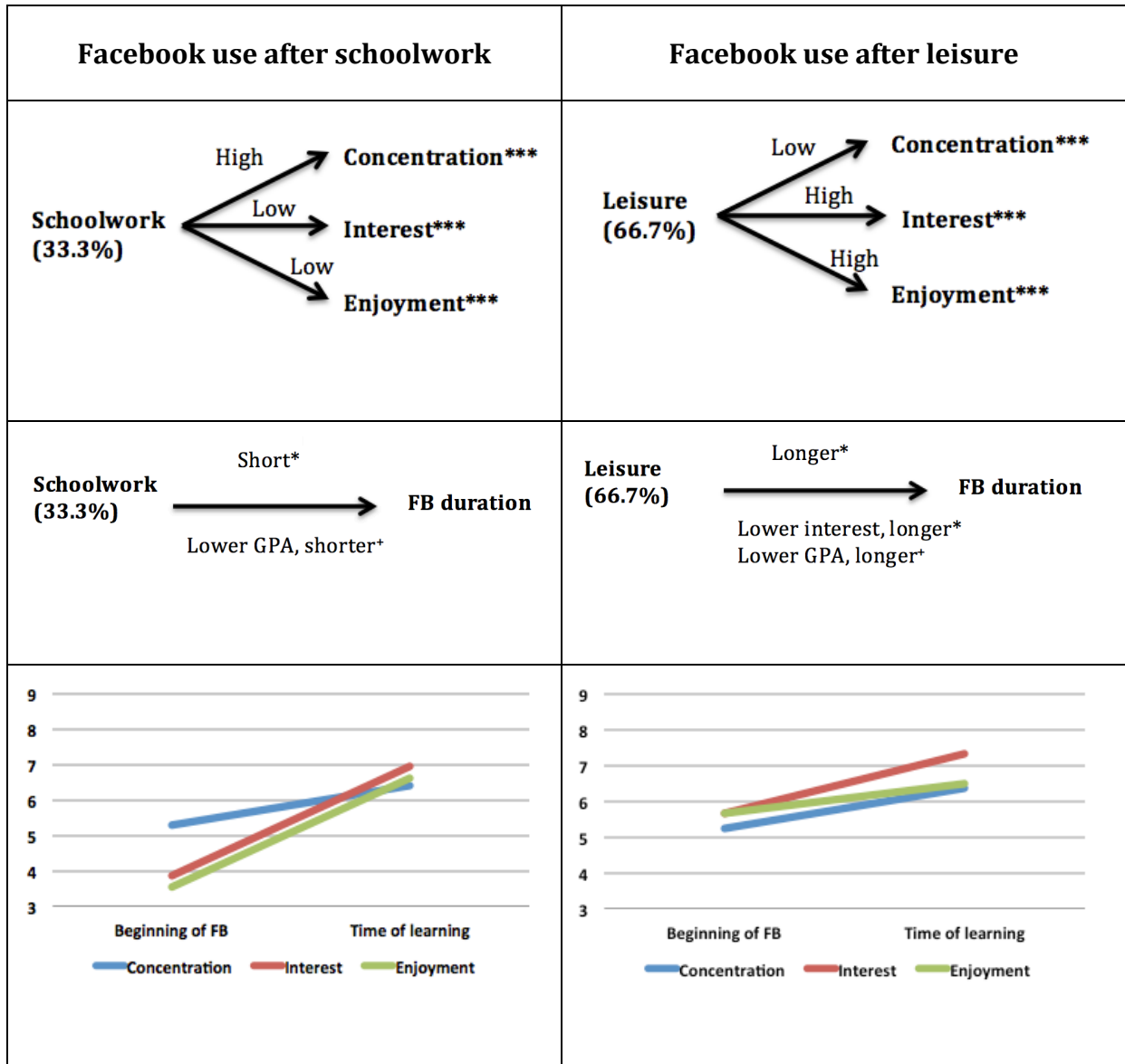
Figure 11. Summary of results for RQ1, RQ2, and RQ3.2. *: p<.05, **: p<.01, ***: p<.001, ⁺: a trend

4.5 Study 1 Discussion

In this chapter, I examined students' characteristics of attention when visiting Facebook. Previous studies (Judd, 2014; Junco & Cotten, 2012; Kirschner & Karpinski, 2010; Rosen et al., 2013) maintain that Facebook is a distractor, which brings negative impacts on

studying. However, these studies have methodological limitations and are insufficient to uncover exactly how Facebook use is embedded in students' studying activities. First, some studies speculate that Facebook distracts students from studying without explicitly measuring students' attentional states (Judd, 2013, 2014). Specifically, Judd (2013, 2014) found that Facebook use often appears in the same sequence as studying. However, with no supporting contextual information, it is impossible to determine whether Facebook actually distracts students from studying, or students choose to go on Facebook when they need a break. Second, some studies rely on self-reported survey answers to track students' Facebook use and multitasking (Junco, 2012; Junco & Cotten, 2012; Mokhtari, Delello, & Reichard, 2015). Yet, studies have shown that self-reports of computer and Facebook usage are an overestimate of the actual usage (Collopy, 1996; Junco, 2013). Third, some studies claim the distracting effect of Facebook by using a coarse correlation between one-time self-reported Facebook use and end-of-the-term GPA (Kirschner & Karpinski, 2010; Junco & Cotten, 2012).

In comparison, this dissertation is based on precision tracking that logs the duration of time per each use. To complement the Facebook log, students' activities and characteristics of attention are also sampled throughout the study. Since all participants are frequent Facebook users and each participated for seven days, the activities prior to Facebook use and associated attention states sampled through ES surveys provide a good representation of the contextual information associated with Facebook use.

Students exhibited two contrasting Facebook use patterns after schoolwork and after leisure. When a student visited Facebook after schoolwork, their interest and enjoyment

levels tended to be lower, but concentration tended to be higher, compared to when a student visited Facebook after leisure activities. Additionally, when Facebook use followed schoolwork, students spent less time on Facebook. Higher concentration and shorter visits (after schoolwork) indicate that Facebook use right after schoolwork could be more regulated: students might need to go back to their studying thus limiting the time they spent on Facebook; or they might be more alert and thus better at time management on Facebook.

In contrast, when Facebook use followed leisure activities, students exhibited potentially problematic use. Specifically, lower concentration, longer visits suggest that Facebook use right after a leisure activity could be more unrestricted. Furthermore, when a student's interest was already low in the leisure activity prior to Facebook, they spent even longer time on Facebook. For those who were struggling academically, longer Facebook use followed leisure activities, not schoolwork. These results point to a possibility that prolonged and potentially problematic Facebook use occurs when students are in the "play" mode. Since Facebook use more often followed leisure activities (67% of the time) rather than schoolwork (33% of the time), as shown in my study, I strongly urge future research to pay attention to Facebook use when a student is not studying.

Taken together, students exhibited two Facebook use profiles following schoolwork and leisure—more regulated after schoolwork and more unrestricted after leisure. Future research can extend this dissertation by further examining the activity, the associated attentional states, and productivity immediately after Facebook use. If students resume the schoolwork they were doing right before Facebook with high engagement, then these

result altogether suggest a carry-over effect of attention. The overall implication for future research is that when researching about Facebook use (or social media use and leisure activities more broadly) and its effect on students, researchers should not assume that Facebook reduces a student's attention from the prior task. It is imperative to distinguish the scenario where a student is highly engaged in the prior task and chooses to go on Facebook with a purpose and the scenario where a student goes on Facebook with low levels of focus and interest to begin with.

Students showed increasing interest and enjoyment when they encountered learning content on Facebook, especially after schoolwork. My speculation is that when students visit Facebook after schoolwork, they are more open to take an interest in and enjoy the newly found learning content. In the next chapter, I will zoom in on the interest-driven and self-directed learning activities on Facebook to unpack what and how students learn on Facebook.

CHAPTER 5

STUDY 2: LEARNING INFORMALLY WITH FACEBOOK

As reviewed in Chapter 2, connected learning is a modern learning framework that embraces students' autonomy and leverages the potential of digital media. This framework integrates and balances three key components that are often disconnected in a formal learning environment: personal interest, peer support (in a network), and academic orientation. Existing research has primarily adopted top-down, planned curricula for implementing connected learning into a specific educational site. By contrast, my investigation explores whether connected learning can take place in spaces that are not designed for educational purposes or engineered to follow the connected learning guidelines. Specifically, this chapter seeks to qualitatively investigate whether and in what ways college students exhibit qualities of connected learning when using Facebook (RQ4). Results in this chapter are based on the interviews and Facebook posts collected in diaries.

5.1 Facebook Supports Academic-oriented Activities

Facebook is not designed for educational purposes; yet, students used it in a variety of ways to support their academic activities—one key element in connected learning. Specifically, students have used Facebook 1) as a study aid for schoolwork, 2) to make sense of school subjects or to apply these subjects in a new context, 3) to explore application domains of their majors or career options, and 4) to aspire to and develop an academic identity. These varying degrees of connection to academic advancement in school

demonstrate that students and even some teachers have appropriated Facebook for non-leisure purposes.

5.1.1 Study aid for schoolwork

For many college classes, Facebook has become an extension of the classroom. This extension was either chosen by professors and teaching staff, or self-organized by students in their own out-of-class activities. Specifically, students used Facebook to share resources, exchange knowledge, and coordinate tasks.

For example, the only reason that P8, a sophomore in biological sciences, had a Facebook account was to access course related information. In three classes he had recently taken, peer tutors created Facebook groups to review important course information and answer questions from students:

> "*Last quarter, for O-Chem [organic chemistry], some of the peer tutors would post questions that we should be able to answer, and other helpful stuff to think about while you are studying for the next exam. This quarter, in O-Chem, one of the peer tutors just posted a sheet with all the chemical reactions on it. And she was like 'keep these in mind when preparing for the next exam.' They [other students] can comment on it: 'Why is this reaction doing this?' The peer tutor could answer that. I understand the reactions myself, but I can understand how this can be helpful with other people—a very direct message instead of having to email someone on the side. Even professor said: 'Please don't email us.' That's why I can see how*

Facebook can be very helpful in that regard because other people can see what they are asking and they might have the same questions but are too afraid to ask." (P8)

Exchanges like these provided a centralized space for knowledge sharing among peers. For large, public university classes, learning does not only (or even primarily) occur in lectures. When a professor's resource was limited, having a space where students could connect with each other and with fellow experts engendered learning opportunities for those who asked questions, those who answered questions, and those who spectated alike. Unlike email communication, using Facebook could create and strengthen social relationships through the process of discussing difficult materials. As P8 continued: "*Facebook is actually a really good place to form study groups. It's really easy to get notifications and comments or likes.*"

In addition to sharing resources and knowledge, students also commonly allocated project roles, sent project deadline reminders, communicated assignment requirements, and coordinated face-to-face meetings over Facebook Messenger and group functions.

5.1.2 Making sense of and applying school subjects

In addition to using Facebook to directly support schoolwork, twenty-three students reported instances where information encountered on Facebook triggered them to reflect on, make sense of, and apply the topics they learned in class.

P4, a senior in public health, used her academic training in immunization and epidemiology to engage with topics of public health on Facebook. She frequently witnessed her network sharing (oftentimes false) information about the 2015 Zika outbreak, and she asserted:

> "*In the science community, they've known about Zika. Zika is not a new virus. It's a new virus in the location but it's not a new virus and we know how to solve it. It's hard to implement because it's not really that moral. But everyone is like: 'We don't know what we are doing!' So then people freak out. I'm like: 'Guys! Calm down!'...It gives an idea about the public sphere on how they're taking the information, how they are feeling about the information, or they are taking it incorrectly.*" (P4)

Because P4 was passionate about educating the public, in addition to being a spectator of the public comments, she also researched information that "*doesn't sound right.*" Prompted by questionable information from Facebook, rather than a formal class requirement, she searched for relevant scientific work from PubMed and Google Scholar in order to confirm or debunk what she had read. Afterwards, she shared these science articles on Facebook with her network.

Similar to P4, P21 applied what he learned in a social justice workshop and an Asian American studies class to Facebook. Over an Internet meme about Asian students, P4 confessed that he used to find posts like this funny and share them on Facebook. He said:
"*But now learning and doing more social justice stuff for workshops and for classes, I want to be as clean as possible so that no one gets offended, because learning about people's struggles,*

I don't want to do anything to remind them of what hurts them." P21's growing sensitivity to racism-charged content was the outcome of applying theoretical concepts to his daily life.

P26, a senior in criminology law and society saw the Andrea Yates court case on Facebook in a new light. When she first learned about this case in class, she thought, "*it was just another study.*" But a year later, when she came across the same topic on Facebook, P26 was pleasantly surprised and thought: "*Oh! I know about this! People are actually talking about it!*" While she learned in class that Yates should be punished for her crime, on Facebook she developed more empathy towards Yates because the article and the comments below emphasized Yate's severe postpartum depression. She further remarked: "*Facebook gives you a whole new perspective on how to look at it. In class, it was, oh you've got to learn this because you have to. So I'm learning in class about why is it important to the class. And on Facebook I'm learning why is it important to the people.*"

These three examples demonstrate that students were able to identify and engage with information that supplemented class materials on Facebook. They used Facebook as a playground to apply knowledge learned in the abstract or extended their understanding of an academic subject with new perspectives from the public. In addition to the examples I highlighted here, students made a variety of connections between content learned in class and content exposed on Facebook. For instance, students reflected on an American politics class with the election news coverage, compared the sciences of mental illness with the social ramifications of living with mental illness, recollected a human-computer interaction class when encountering futuristic shopping ideas, and made sense of principles from an economics class with regulations about minimum wage in the news.

5.1.3 Exploring application domains and career options

In addition to making direct or indirect connections between school subjects and Facebook activities, twenty students used Facebook for career planning.

To P1, a freshman in bioengineering, seeing how foundational knowledge can be applied is crucial in choosing a specialization in his field. Facebook is an important place to branch out to different interests since he was only taking introductory courses in school. As part of his Facebook routine, P1 regularly consumed science-related articles from reputable and fun sources to which he subscribed, such as *The Skeptics' Guide to the Universe.* He discussed one of the nine science posts he encountered over the week of the study:

> "*The glove has a gyroscope in the back, it helps correct imperfect moving, and make them more stable through the use of the gyroscope. It relates to my major because that's what biomedical engineering is—using engineering to help in medical areas. I'm not taking classes directly related to areas like that right now, except for maybe physics, because there's a strong physics aspect to it [the glove]... It [this Facebook post] helps me choose my career path, because I'm very undecided so far about what I'm going to do in bioengineering. So I think it helps me to see what's going on in the world, like what's going on in my field.*" (P1)

P15, a third year computer science (CS) major, used Facebook to "*understand the bigger picture*" and explore a viable career path. Having switched majors from psychology to computer science a year ago and having just come back from studying abroad, P15 told me

about a challenge she ran into: "*I don't have many CS friends. So I don't have people telling me 'there's this, come with me.' I don't have that.*" Facebook, therefore, became a particularly important tool for P15 to find her CS peers and to stay updated with events and opportunities on campus. She followed the UCI *App Development Club* and *Women In Computer Science Club* (WICS) Facebook groups where she saw a mentorship application program:

> "*Whenever they [WICS] post something on Facebook, it's on their Facebook group. It's usually really important because they always try to have opportunities for undergrads to improve in general. This program has undergraduate students go to high schools and help women that are interested in CS decide if it's a track or career they want to follow. We teach them the basics of a certain language and I was interested in helping with that.*" (P15)

P15 emphasized that an internship experience like this could improve her resume. She later added that she was having internal conflicts about whether she wanted to pursue a CS career herself. Mentoring high school students could serve as a mirror for her to work through her own doubts.

> "*When I was sitting in that class [computer hardware], everyone I know and myself were like: 'why do I need to know this? Why is this useful to me?'... Just the bigger picture in general I think is scaring me, which is why I've been looking for more internship programs because I want to see if I can find a way to apply it into a job*

or a real internship. I want to see if that will help me figure out exactly what I will

be doing with my life in the future." (P15)

While some were "shopping" for ideas to narrow down a career direction (like P1) and some were looking for offline opportunities to make sense of their fields of study (like P15), for a few others, using Facebook for career advancement was more targeted. P41, a senior in cognitive psychology who aspired to obtain a doctoral degree and become a professor commented:

"I also follow a professor's page that posts different opportunities. For example, she sometimes posts research positions. Or grad students ask her to post that they have research positions available and there's contact information on those posts. Those are the kind of posts that I look for. And yeah, I got a research position in a doctor's office." (P41)

These examples illustrate students' pressing needs to figure out how and where they can apply what they learned in school to their future careers. While Facebook is not a replacement for resources in a university, such as professors, peers, academic counselors, or career centers, it nevertheless has become an additional outlet for students in varying stages of academic progress to explore the application domains of an academic field and to find career opportunities.

5.1.4 Developing a broader academic identity

Lastly, I observed four students—three seniors and one sophomore—showing an interest in their academics on Facebook that went beyond doing well in class or getting a good job. They were curious about developing a broad understanding of their academic fields and relating to other members in their fields. P48, a psychology and social behavior major who aspired to become a professor, commented:

> "*If I know that my psychology professors are interested in what's happening within the APA, American Psychological Association, then I know that it would benefit me to also be familiar with what's formally happening in the world of my field. (Interviewer: do you get this type of information from Facebook?) Yes. I read a lot of reviews on certain ethical guidelines, about how psychologists can be doing this better, or where psychology graduate students and professors are being employed. Things like that, it shows me what's happening with psychology as a science.*" (P48)

P9, like P41, was Facebook friends with her professor, whose personal, congratulatory messages to former students' achievements inspired her. She commented:

> "*It's interesting to see what other people in my major have done and what they're all capable of doing and kind of gauging like, oh, I can do that too probably. So it's kind of interesting to compare myself to my peers in that way, in a good way.*" (P9)

Lave and Wenger's theory of situated learning posits that learning takes place through peripheral participation, which relies heavily on the learners' motivation to develop an identity to be a knowledgeable member of a community (Lave & Wenger, 1991). The cases highlighted here, though primarily from a few upperclassmen, demonstrate students' curiosity to develop a broad understanding of their academic fields and willingness to relate to other members in their fields. In other words, these students trying on a broader academic identity through their Facebook activities exemplifies a form of situated learning.

5.2 Facebook Supports Personal Interest Development

In the last chapter, we learned that students' concentration, interest, and enjoyment levels all increased significantly when they engaged with content that they perceived to have value for learning. This finding, which is based on experience sampling surveys, is echoed in the interviews. For example, P34 commented: "*I scroll [down the News Feed] on an automatic mode. But if something catches my attention, that is something I am directly interested in. I would take a moment to look at it and like it.*" In this section, I specifically focus on students' interests and the role Facebook plays in supporting these interests.

The functions and norms of Facebook have evolved over time towards a culture of sharing information on societal issues (Barthel et al., 2015; Schoenebeck et al., 2016). Facebook use is no longer restricted to broadcasts of personal whereabouts (e.g., posting status updates) or traditional interpersonal communication (e.g., writing on friends' walls, leaving messages). Facebook is becoming "*an outlet to the whole world*" (P44) because of new features like Trending and the growing integration of news media publishers (Barthel et al.,

2015). Furthermore, users have been moving away from sharing too much information about themselves (Schoenebeck et al., 2016) to increasingly consuming and sharing news media content (Barthel et al., 2015). This trend was echoed by P36, who stated: "*It's also not just because of the trending topics and news sources, I feel like people, more so now, are starting to share [news related] posts.*"

Perhaps as a result of these changing functions and norms, students frequently encountered information on topics that interested them on Facebook. Given that personal interests reflect intrinsic motivation and direct attention, students were eager to initiate learning activities that were not prescribed by a teacher or an institution. Take P25 as an example:

> "*Not to say that you are forced to learn in school, but on Facebook, no one is forcing you to read this article or get knowledge from it. It's something that you just like to do. I'm usually on Facebook to see what's going on. And then it's like, 'Oh! This is pretty interesting. Let me see who wrote it or shared it.' Then I click on the page and get a bunch more information on stuff that I wouldn't have looked up on my own.*" (P25)

Specifically, 33 students reported their rationales for why they thought Facebook was conducive to promote personal interests. These rationales covered three categories: frequent accidental information encountering, lower barriers to entry, and low-cost, reoccurring exposure to information.

5.2.1 Frequent accidental information encountering

In the interviews, students often spoke about serendipitously encountering content that interested them. Students described moments when they were intrigued by topics they had never heard of or paid attention to before while they browsed their Facebook News Feed. Most of the time, such browsing was without any specific goals. The outcome of browsing, however, served as a "*starting point*" (P4) for students' further engagement on the topics that piqued their interests. For example, P12 described how he became interested in gravitational waves: "*It's a post quickly describing that they were able to detect the gravitational waves. They went into what is a gravitational wave, then I was like 'Oh! What is it? More!' My curiosity was piqued. (Interviewer: Were you interested in this before?) No, I didn't know about it at all!*" After that initial encounter, P12 started to pay attention to other posts on this topic on Facebook, stating: "*Everyone was reporting [gravitational waves] and they all had different opinions. So I did watch them all. Then I just looked it up on Google.*" (P12)

P40 described a similar process for learning about the 2016 U.S. presidential election: "*I'll see it first on Facebook. And if it's something of interest or importance, then I would go to a secondary site to read more about it. (Interviewer: What is a secondary site?) CNN.*"

This process of "*going from Facebook to other news, but not to other ones [information sources] to begin with*" (P12) was common among other students. When asked about why they consumed information in this order, students expressed that without a starting point, they would not know which term(s) to search or where. For instance, P39 described:

"When you're looking at other places, you might have to type in the actual keyword to find that information."

Erdelez (1997, 1999, 2000) called this process of chancing upon useful or interesting information without intentionally looking for it accidental information encountering. The fact that students would often use topics encountered on Facebook as starting points of their subsequent information routine indicates the prevalence of "super-encounters." Super-encounters is a category of users Erdelez (1997) observed to have relied on accidental information encountering as an integral part of their information behavior.

5.2.2 Lower barriers to entry

Various characteristics of media content on Facebook reduced the entry barriers for understanding otherwise challenging or serious topics (e.g., politics, scientific subjects). Some of these characteristics included colloquial terms, peer recommendations, relevance to a familiar subject, and short, entertaining media formats (e.g., one-minute videos).

P7 asserted that Facebook was a place for entertainment and that learning was a part of such entertainment. He continued with an example:

"On Facebook you are entertained, then you are actually focused on that news event that you liked, because you are actually interested in it. Compared to school, for example, I'm taking a political science class now. I think it's really boring. I'm hardly learning anything from it. (Interviewer: why is content on Facebook more interesting to you?) I think it's mostly videos and how other friends have shared it.

When your friends look at something, you want to look at it too, because you want

to be a part of it." (P7)

A post that explained chemical degrading caught P4's attention. The reasons that her interest was piqued were that 1) the post was an infographic with attractive graphics, and 2) the subject of chemical degrading was introduced by the question "*why do old books smell a certain way,*" which was easy to relate to as she was an avid reader. She commented:

"*It [a post on Facebook] tends to be more colloquial, not only in terminology, also what they tend to focus on—the things that everyone is very common with or familiar with. In school, they just try to get you the information, this is the information and this is what happens; now you need to regurgitate it. When it is presented like this [post], it becomes more relatable, and more people can understand it, and more people enjoy understanding it.*" (P4)

P7 and P4's comments highlighted two things. First, when a challenging topic was framed in a familiar context, students could easily become interested in the topic. Second, enjoyment was crucial in the learning process, an element that was often associated with leisure activities such as checking Facebook and not with school. A fun environment presented low-barrier entry into a topic, which invited opportunities for self-driven learning.

Fun media content that promotes personal interests is a double-edged sword to learning, however. Consider P28's comment: "*They [Facebook posts] also keep it up to two lines max.*

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They get to the point more quickly. It sounds more interesting so I click it. Other news outlets they go on and on. It's too long a headline." While youth-oriented media styles can easily draw students' attention and pique their interests, entertaining media content also gives students illusion that they do not need to go beyond the "*two lines max*" or do rigorous work in order to learn a topic. In section 5.3, I will discuss some of the activities that occur after students' initial contact with new information and these activities' relationship to learning.

5.2.3 Low maintenance, reoccurring exposure to the same topic

Facebook stimulated students' initial interests by supporting accidental information encountering and low entry barriers. Moreover, students found using Facebook to be an efficient way to sustain both new and existing interests. Various forms of interaction on Facebook facilitated reoccurring exposure to areas of interest at a low cost. Some of these forms included subscribing to a public page (through liking a page), being part of a Facebook group, and connecting to a network of people that might share a similar interest. These networked configurations enabled push-based information dissemination where data is sent to information consumers without them specifically requesting (i.e., "pulling") it (Franklin & Zdonik, 1998).

P17, a neurobiology senior, talked about a post on the 3D printing of functional human organs from a public page called *Medical News Today*. She praised the ease of receiving information: "*The fact that you say you are interested in this page and it'll pop up on your News Feed once in a while means that you don't have to continue to seek things out, they just*

come to you." When asked about why she subscribed to this particular page, P17 explained: *"I don't remember why I subscribed to it. I don't think I looked it up, I probably just saw someone liked a post from it, and I thought that looks like a page I should follow. Then I followed it."*

Contrasting P17, P15 intentionally went on a spree of following political pages when she returned from studying abroad. Her experience outside of the country encouraged her to take an interest in current events. Facebook facilitated this interest by providing a low-cost way for her to repeatedly receiving information of interest:

> *"I'm trying to keep up more with the [U.S. presidential] campaigns through Facebook. If you just search a tag in Facebook, all this information comes up. I did start going on a following spree to certain pages that were related to news. So if they ever posted something, it would come up on my News Feed. Recently there are a lot of videos that come up of what currently happened—what did Donald Trump say now or he just won in North Carolina. When I scroll past [my News Feed], I see a lot of important things now. And I find myself paying attention to my News Feed more than just mindlessly scrolling."* (P15)

Students perceived the push-based information dissemination as an efficient way to maintain their existing interests as well. For example, P23, who was interested in volunteering and community work, commented: *"I think I just find them. I don't actually type 'humanitarian videos' or anything. The posts are on my News Feed. People share them, and I would say the people who share them are people with similar interests. Oddly enough,*

though, they are not my closest friends."

In sum, students were able to use Facebook to easily sustain their interests. Push technology (Franklin & Zdonik, 1998) ensured low-maintenance, reoccurring exposure to a certain topic of interest. To configure Facebook into a push technology that cultivates interests, students either intentional follow information sources that directly relate to their known interests (like P15) or inadvertently follow information sources indirectly recommended by friends (like P17).

5.3 Beyond Consumption—Learning Activities, Learning Outcomes

This section will report the activities that the students engaged in after they consumed content that they perceived to have learning value, referred to as learning content.

5.3.1 No further engagement

Nearly two thirds of the sampled students (31) reported instances on Facebook where they consumed but did not otherwise engage with the learning content. "*Kept scrolling*" was the most common action. The reasons behind the lack of sustained attention fell into two categories.

First, due to the perception that Facebook was a space for leisure, students were not willing to "*make too much of an effort*" (P35) to further engage with the content. Specifically, some thought that they would not remember the materials because they did not know how to

easily keep track of them. Thus they were not inclined to spend time on following up with the content they consumed. Take P21 for example.

> "*I think I read that one article and I reflect on it. Oh, that's interesting, I just think about it. But I don't go: 'Is this true?' I don't like to Google the topic, I just read it one time. Recently I've been thinking about it, that 20 minutes you spent reading that article, it doesn't matter at all, because next week you are not going to remember it.*" (P21)

Others prioritized engaging in social activities on Facebook (e.g., responding to an incoming chat message) over following up with the learning content, an activity that would often require them to use resources outside of Facebook.

Second, some students saw no need to further engage, as they considered consumption equivalent to learning. Specifically, these students perceived Facebook as a credible and comprehensive information source. As a result, reading the information from Facebook was considered sufficient for them to learn about the topic.

5.3.2 Discussing and distributing learning content

Fifteen students shared learning content they consumed on Facebook in offline conversations with family members, significant others, and people of close proximity, such as roommates. Talking about the topic strengthened social relationships when the topic was a common interest. In other cases, though much fewer in number, students reached out to friends whose opinions were likely to differ so that they could hear a different

perspective. For example, P30 talked about reading a news article about religious employers denying their employees contraceptive coverage in health insurance. She said: "*One side agrees with this and another side does not. Since I'm not religious, it was hard for me to grasp the concept of it...After reading this article, I asked a Catholic friend her opinion of contraceptives and she said wouldn't use them but she wouldn't impose that on other people.*"

Within the Facebook platform, liking, sharing, sending the post as a private chat message, and tagging a friend were all frequently used methods for distributing the learning content. In particular, sharing over private chats resembled offline discussion, as students often conversed selectively with close friends over chat regarding the learning content. Liking a post was the most common activity since it required the least effort. In some cases, liking a post was for the purpose of keeping a personal record, similar to bookmarking. Yet, this liking action also became an unintended sharing action because the liked post would show up on the News Feed of one's network of friends by default.

After consumption, it was common for students to share information they perceived to be non-political, such as that related to science, campus resources, or personal inspirations. Sharing these types of content signaled students' interest and in some cases, expertise. On the contrary, students held reservations about distributing information about politics or controversial social issues, particularly content related to the 2016 presidential election. I will expand on the reasons and consequences for the lack of participation in civic issues in Chapter 6.

5.3.3 Researching about learning content

Eighteen students described at least one instance where they researched a topic they just learned about on Facebook. The topics they evaluated were predominantly political content and controversial social issues. Students were driven to research a topic mainly by four triggers: lack of credibility or known biases in a post, multiple accounts of the same topic, social significance of a topic, and personal importance of a topic.

Using prior knowledge in the topic and gut instincts, some students evaluated the content of the post. An apparent inaccuracy motivated them to find other sources to debunk the information they just consumed. P4, who used her domain knowledge to spot an inaccuracy in the news about Zika fell into this category. Some gauged the credibility of the information by evaluating the source. For example, P9 commented: "*Usually I check the source. If it's like Drudge Report, it's usually not super reliable.*"

Others decided to follow up on a topic after encountering multiple accounts of the same topic. This prompted students to examine different sources in depth.

The social significance of a topic also triggered students to further investigate. Take P30 for example. She saw a picture on Facebook claiming that women should not drink at all during pregnancy because it would cause fetal alcohol syndrome, and she said: "*I went from Facebook to the CDC [Centers for Disease Control and Prevention] website to see if it was real and it was real…It was the most controversial topic for a week because they blamed women for everything.*"

Lastly, students would conduct further research if the information was relevant to an important life decision. P11 encountered a large volume of information about presidential candidates on Facebook. She decided to use other sources to inform her choice of whom to vote for. She said:

> "*Since I'm 18 now, I can vote. Yes, I can vote now! I know it's [the election is] coming up this year. I kind of have my ideas on who I want, but again with school, I don't really watch the news, I don't really know what's going on, I felt like I should start to get a little bit more informed...Donald Trump gets a lot of social media attention. I feel I always see videos of people poking fun at that. But I feel that if I want to find information on that topic I would go on to a separate website.*" (P11)

P11 did not necessarily criticize the credibility of information from Facebook. Nevertheless, she realized that she could only get surface-value information about a presidential candidate, despite the frequent election coverage on Facebook. In a way, Facebook was conducive to trigger her interest; but she needed more credible and informative sources in order to make a voting decision.

When students were motivated to do further research, regardless of the exact trigger, they brought a level of awareness and self-reflection to their engagement with the content. To investigate a topic further, the most common practice was to look up the topic using a search engine and glance over the first few search results, which were typically mainstream websites (e.g., CNN, Wikipedia, YouTube). For example, P29 viewed polling

numbers about presidential primary contests from Google; P39 found and watched a full-length debate on YouTube.

In addition to brief web searches, a few students resorted to more advanced practices. Specifically, they consulted resources of authority, such as scholarly sources about scientific materials, or specialized political websites that give detailed histories of a candidate's positions (e.g., OnTheIssues, ISideWith); they compared multiple sources to spot potential inconsistencies (e.g., reading Fox news, CNN, and MSNBC about a same topic, P48). In some cases, students would discover new questions in their research, which led to subsequent investigation.

P16 went from a 2-minute video on Facebook in which Bernie Sanders gave a speech about the environment to an elaborate search about politicians' stances on climate change and other issues. She said:

> "*From this video, I spent a whole other hour of searching up who denies climate change and what are their stances. I first searched Hilary Clinton vs. Bernie Sanders on ontheissues.org. OnTheIssues is a website that has every candidate, not just the presidential candidates, but everybody who has been in the Congress, their past quotes, and their current stances on every major issue. That one [website] actually has a really terrible interface. So I just Googled another site. That one [website] compares all the candidates and you can scroll through their history, their background, how they rank based on certain issues. I think it was the New York Times. I clicked on climate change. Candidates who are pro-sustainable green*

energy all swarmed to one side and the rest just swarmed to the other side. That

one was more fun to look at. So basically [my process was] first [to search] who

believes in climate change. And second was just to go through all these candidates,

look at their stances on every major issues—everything from abortion rights all the

way to whether prayers should be allowed in public school. After that, I just

realized that there is nobody [candidates] that I can really agree with entirely."

(P16)

In addition to following up a snippet of information with extensive research like P16 did,

some students investigated a topic because they were concerned about the biases rooted in

Facebook networks. P35 commented:

"*I don't ever see anything supportive of Donald Trump because of the kind of*

people I'm friends with. Of course I won't support him myself. But maybe if I was

put somewhere else or part of a different feed, who knows how I would feel. I find

myself influenced by the things that I see. But you also have to recognize that and

try not to be influenced by that…I want to have my own opinion and not based off

someone else's. I want to do my own independent research. (Interviewer:

independent research?) Often what I would do is I would look into more historical

things. I try to avoid news sites because they are biased. You want to go to .gov or

Wikipedia—something that have no reason to be biased." (P35)

As shown in these examples, some students were aware of the biases any information

source might represent. Three students (e.g., P35) were also aware that their network of

like-minded friends and the News Feed algorithm heavily influenced the information accessible to them on Facebook.

5.4 Study 2 Discussion: Connected Learning in the Wild (on Facebook)

So far, I have presented different ways students used Facebook to support academic activities and different ways Facebook could promote students' personal interests. In those discussions, the networking aspects of Facebook were reoccurring themes. In this section, I will discus the interrelations between these three elements—academic-oriented activities, interest development, and personal and information networks—by revisiting some examples I have described and introducing new examples.

5.4.1 Connecting personal interests to academic activities

Genuine personal interests provide a foundation to support academic activities. Interests reflect a student's intrinsic motivation to learn and help the student sustain and direct their attention. In my study, interests prompted most academic activities on Facebook that I observed in Section 5.1, especially those that were not directly related to schoolwork. For instance, students reflected on, made sense of, and applied the topics they learned in class while using Facebook. Moreover, students explored application domains of their fields, career options, and tried on broad academic identities. All these academic-oriented activities were interest-driven.

A number of students explicitly juxtaposed school-required learning and interest-based learning on the same topics. For example, even though P26 was disinterested in the Andrea

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Yates case when she learned about it in class, she was much more invested in the topic when she encountered it on Facebook one year later. On Facebook, she could see how her peers reacted to this topic through their comments and likes; she could also view opinions from people who are not in her friend network by reading the most popular comments. Consequently, the new interpretations of the controversy, which she was exposed to from the input from a broader social context, extended what she had learned in class. P4 went to great lengths to research scientific work on the Zika outbreak beyond what the curriculum had required of her simply because she was passionate about debunking misinformation online. For P15 and P25, taking an interest in a school subject on Facebook meant exercising autonomy. Self-direction encouraged students to find meanings for themselves. This process contrasted with the formal class requirements that often left these students wondering about why it was important to learn certain subjects.

I am not arguing for the superiority of interest-driven learning on Facebook over school-based learning, even though my sample of college students seemed to be more invested in the former. In fact, without the knowledge they acquired from formal coursework (e.g., the Andrea Yates case for P26, the treatment of the Zika virus for P4), these students may not have engaged with these subjects on Facebook in the ways I observed. Without the encounters on Facebook, they also may not have extended their understanding of these topics. In other words, school-based learning and interest-driven learning on Facebook appear to have a complementary relationship. Figure 12 illustrates the relationships between academic activities and personal interests.
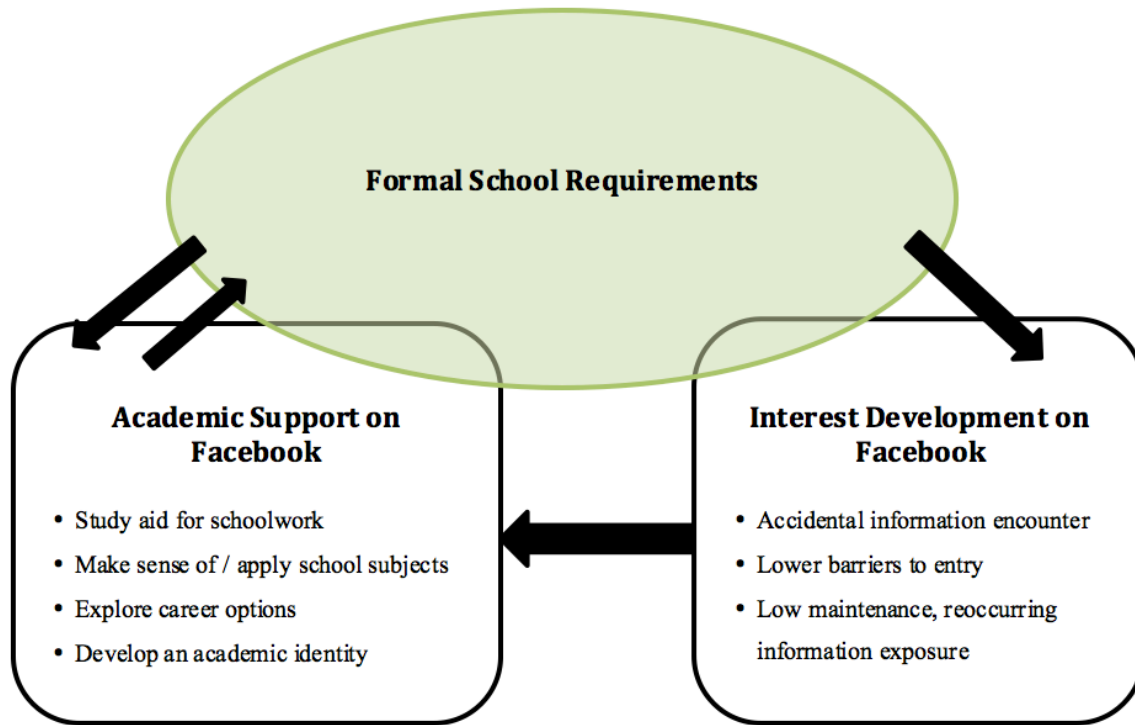
Figure 12. The relationship between academic-oriented activities and interest development on Facebook

5.4.2 Connecting personal and information networks to interest development

Students' interest development was supported on Facebook through accidental information encountering, low-cost, reoccurring exposure to information, and low-entry barriers to complex subjects. The first two mechanisms were both manifestations and outcomes of the networking environment. Specifically, students directly connected to a variety of information sources (by intentionally subscribing to sources of interest) or indirectly connected to information sources through personal contacts, thus creating complex personal and information networks. These networks made it easy for students to encounter topics they might be interested in and to repeatedly receive information on topics of interest.

In a sense, treating Facebook as a primary point of information access, and websites like CNN as "*secondary sites*" (P40), implies a mental model where Facebook is the modern version of a web portal that aggregates information sources (e.g., the home page of Yahoo.com). Before social networking sites like Facebook, people used to take a glance at a web portal and "shop" for what interested them from the available information, such as weather, stocks, or news. However, information that goes on the front page of a web portal is relatively consistent across all users and includes limited information chosen by a handful of editors who work for the interests of a corporation. On Facebook, the News Feed algorithm takes into account a user's personal network and past interactions with this network to produce the information the user encounters. Like P25 depicted: "*Everybody has their own friends and those friends have other friends. They'll like or share articles they find interesting. And eventually it'll get to your News Feed and it's like, oh, this is interesting!*" In short, information that is available to "shop" from is more catered towards an individual's own interests on Facebook as a result of the networked environment and Facebook's algorithm for personalization. This phenomenon is also a double-edged sword, for which I will provide further discussion in Chapter 7.

5.4.3 Connecting personal and information networks to academic activities

The networking environment can also facilitate academic learning directly. Specifically, Facebook offers individuals a space to share information with their network. It also enables global support networks that extend beyond students' networks of close friends. In the following, I will expand on these two points.

First, the network structure and the participatory culture of Facebook provided students with a space to provide input to their networks. As shown earlier, most students took advantage of the networking environment to consume learning content catered to their interests. A small number of students also contributed back to their respective networks, primarily through sharing content they had consumed and validated.

In my earlier example, P4 investigated questionable information about the Zika outbreak on Facebook using PubMed and Google Scholar. She then shared validated information with her network in order to propagate credible information that often appeared to be lacking. P12, who learned about gravitational waves on Facebook and shared sources he trusted on this topic, said: "*I want to inform other people because I think knowledge is important.*" P26, a Latina living in the U.S. her whole life, learned about the complex and contradictory dynamics in American politics, especially concerning white privilege and refugees, by reading a range of articles on Facebook. As a result of her learning about the importance of civic engagement, she encouraged her Facebook network to vote: "*I can't vote but I can inspire others to vote—because I'm not a citizen of this country. But I know most of my friends can but they choose not to. Throughout the presidential elections, that has been my focus, that they should go out to vote.*"

Driven by a need to disseminate high quality information (like P4), an eagerness to share knowledge (like P12), and an obligation to raise awareness (like P26), a small number of students took on the responsibility to contribute back to their networks by providing information that could lead others to engage in self-directed learning. While this group of students was already limited in number, even fewer shared information on political and

social issues, though content in this category was mentioned the most frequently in diaries and interviews. In Chapter 6, I will expand on the imbalance between students' consumption and participation with regards to political information.

Second, students reported to have found inspirations and motivations from peers as a result of the networking environment. Sometimes, emotional support that helped students thrive academically in college was not directly sought out or even from people in their immediate friend circle. Take P9 for example. She was more motivated to set high academic goals when she saw her professor congratulating a former student on Facebook. In other words, that student became P9's role model through a common connection (i.e., the professor) although they did not know each other. Others benefited from reading inspirational remarks shared by their network during difficult times. P21 stumbled upon a quote shared by his friend at a time when he was struggling academically and financially. He said: "*I was just stressed out. When you are feeling down, getting words of encouragement helps bring you up. This is 'no pressure no diamonds.' If you think about it, hard work, perseverance, pulling through struggles, overcoming them makes you a better person.*"

A total of four students talked about instances where they received emotional support for academic work on Facebook. Despite this small number, these instances suggest that reading about others' accomplishments, struggles, reflections, and words of inspiration create new global support networks. These support networks extend beyond a student's close friend circle, which is how we traditionally understand support networks.

Based on the discussions in Sections 5.3.2 and 5.3.3, Figure 13 extends Figure 12 and completes the relationships between academic activities, interest development, and the networking environment. Figure 14 shows the relationship of these three aspects on Facebook to connected learning.
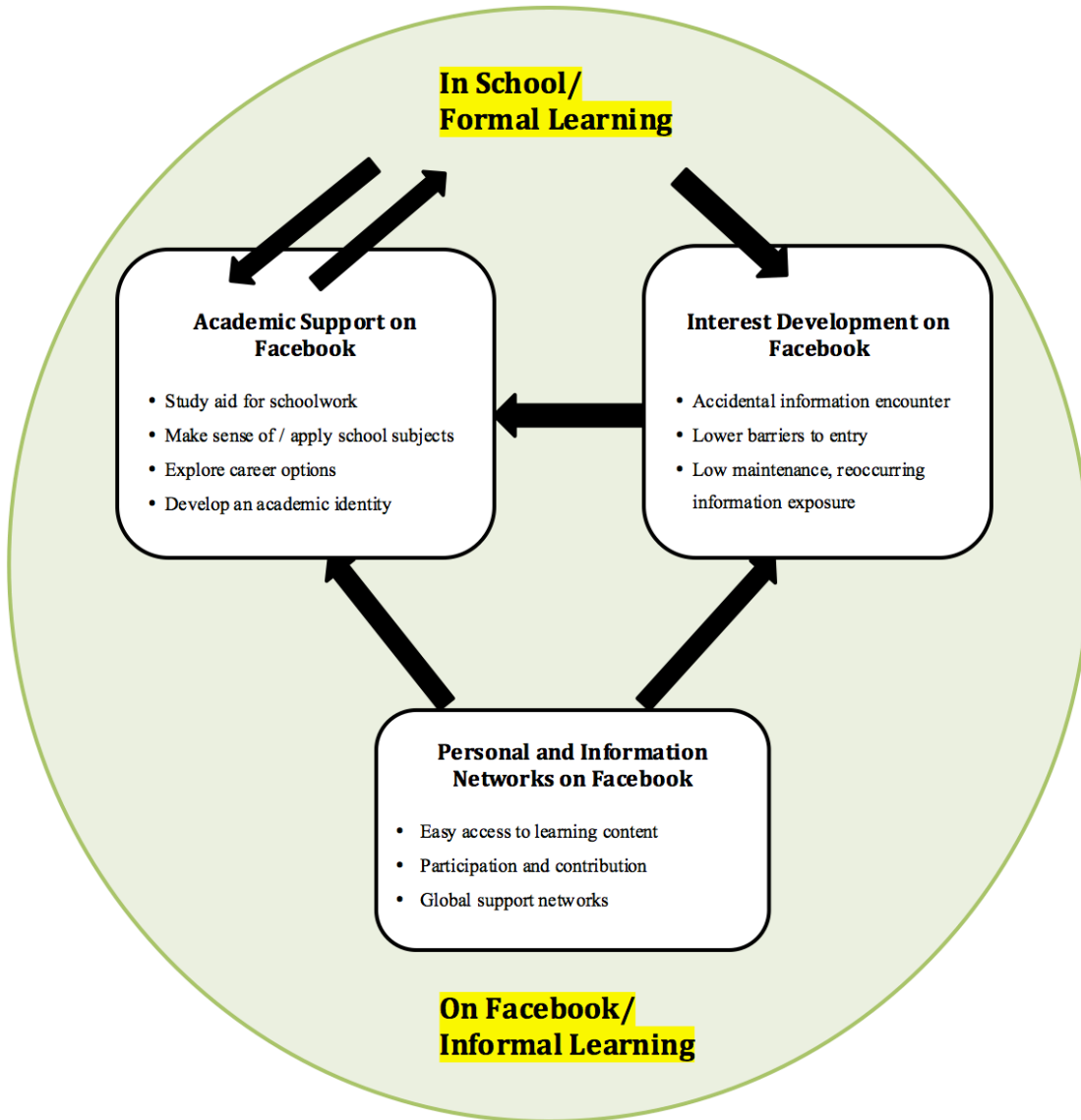
Figure 13. The relationship between academic-oriented activities, interest development, and the network environment on Facebook
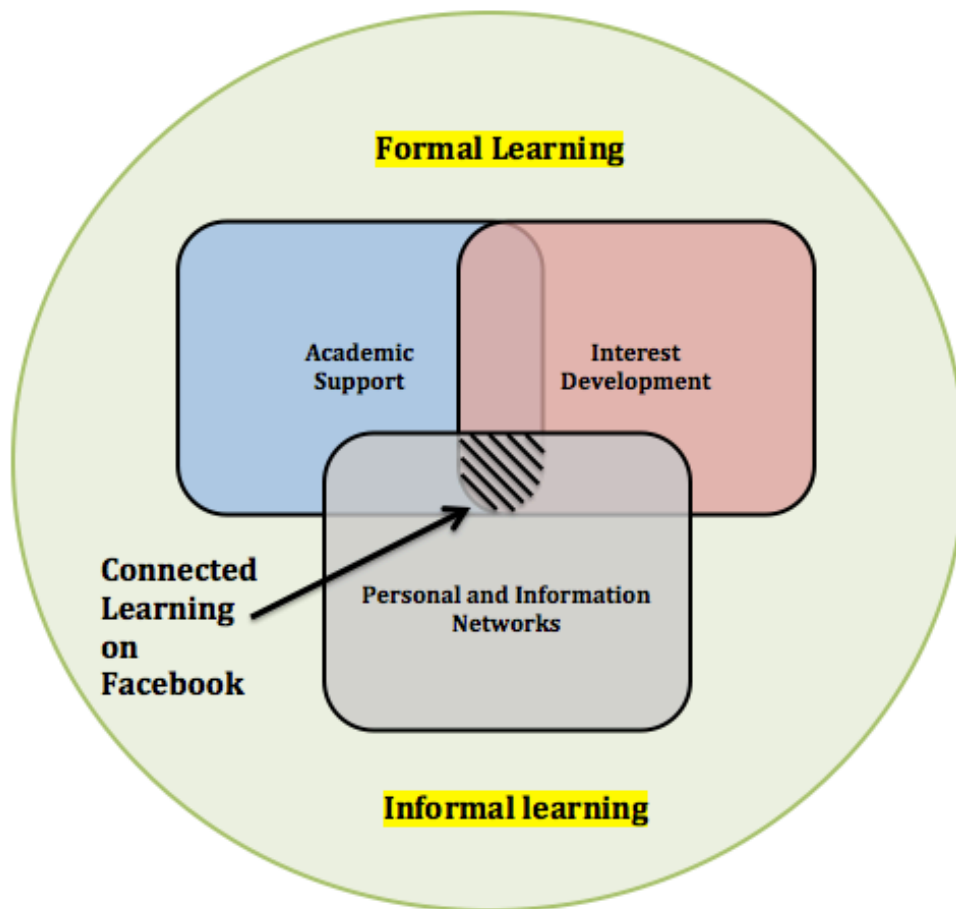
Figure 14. Connected learning on Facebook

Facebook's mission[3] is "*to give people the power to share and make the world more open and connected,*" which is not intended for education. However, the findings allow us to see that, first, connected learning can take place in spaces that are not designed for educational purposes. Specifically, for a lot of students in my study, Facebook use is situated at the intersection of the three main elements of connected learning, The networking environment provides a foundation to support personal interests and academic learning on

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[3] https://newsroom.fb.com/company-info/

Facebook; academic learning and personal interests on Facebook further support formal learning in school. Consequently, the boundary between formal and informal learning becomes blurred. Extending Ito et al.' work, I specified how the three key components of connected learning relate and influence each other in the context of college and Facebook.

CHAPTER 6

STUDY 3: ENGAGING WITH POLITICS AND SOCIAL ISSUES ON FACEBOOK

Current events, politics, and social issues were the top subjects students talked about in interviews. Out of 373 diaries, 103 were related to political and social issues, which were submitted from 38 participants. Since college students are in a critical period of time for exploring worldviews (Arnett, 2000) and political identities (Schwartz et al., 2013), I focus on a subset of informal learning in this chapter and examine students' subjective experience when they engage in politics on Facebook. The guiding research questions in this section are: how do college students engage in political and social issues on Facebook (RQ5) and what benefits and drawbacks are associated with learning about civic issues on Facebook (RQ6)?

6.1 Overview

In the interviews, 38 participants selected and extensively discussed 51 diaries of political and social issues, including the 2016 presidential election, other political topics, gender and race, stigmatized topics, and the economy. Table 9 summarizes the detailed information of the 51 diaries that were discussed during interviews. The remaining 12 participants did not make any diary entries related to politics or social issues.

The majority (N=34) of college students in the sample used Facebook as their primary news source. Other primary news sources included mainstream news outlets (e.g., CNN, the

New York Times) and other social media sites like Reddit. Twelve students reported that they did not read news. Note that students could rely on more than one type of primary news source.

Table 9. Topics of political and social issues discussed in interviews.

Topics	Examples	# of diaries
2016 U.S. election	Bernie Sanders campaign; Trump attacks Clinton	18
Other political topics	First female Native American federal judge; Bill Clinton addresses Black Lives Matter protesters	8
Gender, race, and public policies	Racial stereotypes; objectify women; Planned Parenthood; abortion; contraceptives	8
State and international affairs	Flint water crisis; oil spill in the Amazon's waterways	7
Other social topics	Anxiety disorder; unfair treatment of mental health patients in the ER room	5
Economy	Rising minimum wage; college tuition; poverty	5

Five students used mainstream news outlets instead of social media sites for news. They praised the formality and professionalism of reputable sources like CNN, NBC, and the New York Times, and believed Facebook to be "*different people arguing*" (P29) using one-sided arguments without facts to back them up. Two of these five mainstream news readers were concerned about biased coverage of news as a result of the News Feed algorithm.

Within Facebook, students got their news in various ways. A little more than half (19 out of 34) relied on friends' posts, which included original postings of personal opinions on news

along with likes, comments, or shares of news from media publishers. Twelve students mainly glanced at the trending topics, which were aggregates of different sources of, and discussions about, the same news topic. Others deliberately chose to subscribe to specific sets of sources in order to personalize what they want to read—seven students primarily read from popular media producers (e.g., Buzzfeed, AJ+, NowThis, Upworthy), and five from mainstream news outlets. Note that some students used more than one primary source on Facebook.

In the following sections, I first uncover the benefits students experienced when consuming news on Facebook. This will give us some insights on why college students like to use Facebook to learn about civics, which grounds their practices in discussing and disseminating news. News participation reflects and influences how a student understands current affairs, takes stances in critical issues, and associates themselves with a political identity or identities. News participation on Facebook can be shaped by social norms around disclosure and impression management, which I will detail in the section that follows.

6.2 Benefits of Learning about News on Facebook

6.2.1 Convenience of access

Getting news from Facebook was often a byproduct of college students' daily social and communication routine, and therefore took little extra time or effort. P22 talked about why

she liked to read news from Facebook: "*I'm already going to message someone. I'm already there. There are a lot of things to do in one place, and that makes it easier.*"

More than half of the Facebook news readers (20) commented that they would not have gone out of their way to seek news or check updates from news sites because it was "*too much work*" outside of their daily routine, especially when their goal was to get a general understanding of current issues instead of having a deep engagement. As P46 described: "*I don't want to know too much about it but I don't want to know too little about it.*" Requiring minimal effort, Facebook became an outlet for news: some glanced at the trending topics to get an overview of the public interests, some let various news media push breaking news to their News Feed, and others inevitably encountered friends' recommendations due to the nature of social networking.

6.2.2 Multiple perspectives

Fourteen Facebook news readers believed that they were able to get a fuller coverage of news on Facebook compared to using any single news source. Though a small number, four students intentionally subscribed to diverse news sources in order to automatically receive multiple news articles written about the same topic on News Feed.

> "*I like and follow the pages for the New York Times, the Washington Post, the Atlantic, Fox news, CNN. And because I follow all five of those at least, probably more than that, I can see all of their posts whenever they go on and I'll just scroll to those and see through that. I enjoy seeing a lot of people are quick to dismiss Fox as*

being not credible towards everything and same with CBS and MSNBC. I think they
are both incredibly credible if you read them together. If you read the liberal bias
of NBC and the conservative bias of Fox, then you get at least some sense of a
picture of this is what people are thinking." (P48)

For those who had yet to adopt a media-diversifying strategy on Facebook, it was not uncommon for them to chance upon opinions outside of their typical media exposure by simply being on Facebook. P9 was raised in a Republican household. Though growing up watching Fox news, she now identified herself as a feminist and an enthusiastic advocate for women's reproductive rights. It all started when she serendipitously encountered different opinions on Facebook (e.g., gender issues), which encouraged her to question her old values. Once she started to accept more progressive values, she chose to subscribe to media such as *Planned Parenthood Action* on Facebook to get regular exposure to liberal leaning information. Here is P9 attributing her development of a progressive identity to the different opinions she read on Facebook and social media:

> *"Before Facebook, before social media, I was just kind of in my own world.*
> *Whatever I saw on the news or whatever my parents told me was right. And now*
> *I'm realizing, no, just because it's on Fox news or because my dad says it doesn't*
> *mean it's right. I think figuring out who I am and what I believe has been part of*
> *being on Facebook and on social media, because I see different opinions and I'm*
> *like, oh wait, I think I agree with that more than what I used to agree with because*
> *I didn't know any better. Because I only had a limited source of news."* (P9)

For others, though they did not change their fundamental values, friends' posts exposed them to civic topics that they would not otherwise seek out proactively. For example, P4 was usually interested in reading about science and public health on Facebook, and her friend's posts expanded her interest:

> "*She's very much like 'equality' and 'diversity' and all that kind of stuff…And I think it's good that she posts stuff like that because it's very different from what I normally look at, or what I normally post, in that way it gives me information, teaches me, on the other side of the spectrum.*" (P4)

Reading from friends inadvertently broadened one's views. Five students also mentioned that they read trending topics to get "*a review of the spectrum of the different opinions*" (P1). In sum, exposure to multiple perspectives either through intentional configurations of diverse sources or through unintentional encounters (e.g., from friends, from trending topics) can potentially encourage college students to find "*the middle ground*" (P9, P22) while still allowing them to have instant access with little effort.

6.2.3 Social sense making

Peer-generated comments and reflections helped nine students make sense of news. P50 read political posts from his friends not to keep updated with breaking news, but to understand an issue with different viewpoints. He commented: "*Because they post those paragraph posts, they will have evidence and explanation. Not only will I get opinions and*

views that are not my own, but I will also get evidence that will support some of my own

views. That's interesting and helpful for me."

P33, a newbie who only started to read news recently, stated that she relied on comments to "*get it*" because she would not have understood the context or implications of the news if she were to read it herself. Personal inputs like comments provided "*dumbed-down*" interpretations of news.

For others, these pointers provided additional resources to help the readers reflect and come up with their own understanding of the issues. For instance, P45 found out the real concern behind the lifelike Scarlett Johansson robot through reading friends' comments:

> "*Actually without the part of the commentary, I would have thought it was cool*
>
> *because I do like her as an actress and I probably wouldn't have thought about the*
>
> *fact that it was really objectifying women. Actually, I didn't think about how Siri is*
>
> *a woman and Cortana is a woman, I didn't really think about how they are all*
>
> *women to serve through robotic means until someone pointed it out in the*
>
> *comments.*" (P45)

6.2.4 Enhanced personal relevance

For 22 students, reading posts of political and social issues on Facebook resonated with them on a personal level. The styles of these topics were "*more relevant*" (P9, P35), "*heartfelt*" (P2), "*something you won't see on a website that has statistics*" (P29), or "*easier to understand instead of having an official talk about it*" (P28). Personal stories, video footage,

and pictures broke down the entry barriers that were often associated with politics and social issues. For example, P35, a white female senior examined the issue of racism from her fellow campus representative friend's experience. She read a personal story from her friend, whose neighbor called the police on him because he was black. P35 said: "*I personally don't think I know how that feels because of how I am and I have little experiences about that. I see how that does affect people and it opens up my eyes a little more.*"

P2, a Syrian born and raised in the U.S., commented on stories about Syrian refugees from the public page of *Humans of New York*. These first-person stories helped her connect with her roots and inspired her to raise public awareness of the refugee situation:

> "*It is different to go on Facebook and see more personal issues, very personal, because it is almost like, that's the city where my family is from, and that's the city I visited when I was younger. And to see those things and to hear about what's going on socially and politically, those really carried an impact with me, and I'd like to shed light on those issues and share them so that people can learn something from that.*" (P2)

Enhanced personal relevance helped students connect the stories of others to their own life, even when others are different from themselves. Such a personal connection could evoke one's deep interest, compassion, and empathy. As a result, one's stances that arose from a personal understanding of these social issues were more likely to be self-initiated rather than borrowed from someone else.

6.2.5 Social benefits (and the consequent self-presentation concerns)

Fifteen students reported that engaging with politics and social issues on Facebook promoted social engagement. These social benefits include keeping updated with topics of public interests, staying aware of friends' political viewpoints on controversial issues, and strengthening social relationships between like-minded friends.

Being "*less ignorant*" (P15) and "*able to talk to friends*" (P20, P44) in an offline context were important to college students. News that served a social function in our civic life was not new. What was new was that Facebook put friends' civic interests on a public display, providing the viewers with a quick study of the topics for online and offline discussion. Furthermore, some used Facebook to learn about friends' political stances in order to satisfy their personal curiosity or to take an informal poll.

> "*It's fun when somebody posts something controversial, and then you can see you have some friends who are on this side of argument or some friends who are on the other side. And I found that I've had friends who I thought were very liberal, and they actually have some very conservative viewpoints one way or another.*" (P16)

Furthermore, communicating about news through lightweight activities (e.g., sharing or liking an article) was a way to strengthen social relationships among people who already shared similar views. For example, passing around a news article about HPV vaccination was a way to socialize within P4's nerdy friend circle: "*I do have nerdy friends on Facebook,*

so we just send back and forth articles. The HPV article was linked by a friend who re-posted it. They tagged me in it saying: 'Hey! I think you'd like this.' I was like: 'OK, cool!'"

However, not all inputs from friends were accepted. After discovering that a friend had a different view than she expected, P16 jokingly said: "*Wow! I did not know that, un-friend!*" In other words, students benefited from friends disclosing their interests or opinions in order to gain social awareness of popular topics and individuals' stances. They then either warmly accepted (like P4) or judged others' input (like P16). Perhaps, by recognizing how they reacted to other people's posts, students realized that their own disclosure could also result in acceptance or rejection by others. In the next section, I will unpack the dynamics in social relationships surrounding news topics and students' consequent news practices.

In this section, I identified five benefits that Facebook assisted college students in learning about political and social issues. From students' points of view, Facebook provided convenience of access to news, afforded multiple perspectives on news topics, presented opportunities for making sense of news with others, allowed for styles of news that encouraged personal relevance and interest, and for some, strengthened social relationships.

6.3 Self-presentation around News on Facebook

While the accepted social norms on Facebook are changing overall (Schoenebeck et al., 2015), students expressed an even more pressing need to figure out the desirable behavior around topics of politics and social issues, as posts of these topics are growing in quantity

and visibility on Facebook. Students paid close attention to what they shared and how they talked about news in order to communicate a version of themselves that was considered appropriate. Since appropriateness is contingent upon audience perceptions, imagining the audience's reactions and figuring out who the audiences were impacted students' decision-making around news.

6.3.1 Concerns and goals for impression management

Students were meticulous about 1) negotiating whether to give off their personal character through news, 2) acting in normative ways, 3) maintaining an acceptable image over time, and 4) creating harmony in their networks.

Some students posited that the audience would derive information about their personal character based on *what* they are interested in. When talking about her liking of Michael Dyson's unconventional view on President Obama, P2 commented: *"I'm very particular about what I like and share, it's going to mean something…When people see that I liked it, they'll be like: 'Oh Nora [pseudonym] liked it, I'm interested in seeing what she likes.'"*

Some students felt that the audience would speculate *how* involved the posters were in a particular topic: *"If I just like it, people might see that I liked it. But if I shared it, people feel like I feel more strongly about it."* (P22)

Some students expressed their desire to achieve social approval by posting only normative content or by not showing their inadequacy. P35 commented: *"I guess there is more of a peer pressure. Like when you're trying to behave the same way as your friends. So people*

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would post things on Facebook that are similar to things their friends would post." P33, whom I mentioned in the previous section, often relied on comments to understand the news. She was concerned that her participation in news might reveal her newbie status and would thus fail at being approved of by her peers: "*I always want to comment on what they are saying or anything, but I don't, because I'm just afraid of other people judging me for my opinion...what if I said something wrong?*"

While these students carefully managed how they looked to others at the moment, three students were also concerned about how they might be perceived in the future. Data archives about one's political interests, stances, and development could subject a user to future scrutiny. For instance, P12 confessed that he craved multiple perspectives on politics but never gave his opinion on Facebook because he had considered a career in politics. He avoided keeping a public record "*so it doesn't come back.*"

While the aforementioned students felt that they became vulnerable when engaging in debatable topics, others were concerned about the impact of their actions on other people or on the community. Presenting different views could start a heated public argument or even jeopardize relationships. Not disclosing views was intended to create harmony.

6.3.2 Strategies for impression management and disclosure goals

In order to maintain a desirable impression, students need to identify for whom they are performing. Diverse audience groups (e.g., colleagues, family, middle school classmates, romantic partners, weekend hobby buddies) make up one singular friend list on Facebook, also known as context collapse (Vitak, 2012). As a result, it is increasingly difficult for users

to accurately tailor what they disclose and how, to the right audience. To maintain an acceptable self to all audience groups, a number of students chose to refrain from posting content that any of their audience groups might potentially find problematic, a practice also known as the lowest common denominator strategy (Hogan, 2010). For example, the progressive feminist who came from a conservative family commented:

"How would it look to my grandma who's reading this? That's why I filter my thoughts and I won't post anything too political or too out there because I know my parents see it, and my grandparents and other family members—people I want to respect me." (P9)

P48's comment below also demonstrated the use of the lowest common denominator strategy:

"I have a good number of friends who are on the right and others who are on the left…With me being plugged into the drama department, you can imagine there are a lot of Sanders supporters here and I am not personally a Sanders supporter. So I look at that and think if I have an article I think is interesting, but it speaks against Sanders or discredits him in some way, nothing good is going to come out of sharing this." (P48)

P48's comment reflected a bigger issue: audience groups can be created beyond the boundary of traditionally defined social groups. Content of posts (e.g., favoring a specific politician) can also delimit distinct audience groups. The dynamic nature of online

audience groups, compared to relatively stable audience groups such as family or co-workers, required users to constantly examine the different audience groups given the topic.

To mitigate this challenge, some students made sharing decisions based on whether they felt the content would potentially create audience groups whose competing values might lead to negative interactions. P40 stated that he only shared articles about art and never politics "*because I feel like with art everyone can appreciate art in some type of way. There won't be as much bickering. But with politics, there could be arguments.*"

If a student did not completely refrain from posting, they took measures to participate in a controlled manner. Some targeted specific audiences in (semi-)private channels:

> "*I don't share a lot of things publically. When I share something it's usually...an option called 'share in a private message,' and I'll share it to somebody I want to tell it to.*" (P16)

> "*You can create a secret group with your close friends, it's like a News Feed just for your friends. I post links on there, they can comment whatever they want. They are usually the ones I'm trying to send them [the links] to anyways, so instead of sharing it to everyone, I just share to them.*" (P20)

Others adopted a neutral tone to "test the waters" when sharing an article. Instead of throwing out their opinion, they framed the shared article as a means for eliciting different ideas:

"I'll just share it and I don't comment anything...I do have friends who are very conservative and some that are extreme liberals, politically speaking, so if I were to post something friendships get heated. So it's better to just say: 'Oh look at this, what do you think?' At that point I say 'what do you think' because they can read it and comment on it." (P12)

For those who were concerned about managing their image for the future, besides putting themselves "*on mute*" (P12), P22 strategized about reaching her audience without archiving her views:

"If I like something, someone else would see it too (on their News Feed), it's for the awareness sake...but if I share it, it's on my actual timeline. And sometimes I end up deleting them after a while. Because I don't want too many people to know exactly what I shared. It's been a couple of weeks, so it's not on anybody's News Feed any more, so there is no point of me having it on my record." (P22)

So far, I observed that it was common for students to refrain from voicing undesirable opinions in order to appeal to all audience groups and to censor themselves on topics that could potentially create audience groups in conflict. I also found a number of controlled participation tactics, such as targeting audience using (semi-)private channels, adopting a neutral tone to elicit opinions, and using a temporal strategy to negotiate short-term and long-term effect of participation.

Furthermore, in contrast to the majority of students who adopted various strategies to preserve a desirable social image around news, a small group of people proposed to shift the focus from themselves to the greater social good. They advocated for changing the climate of debate on Facebook. One participant stated:

> "*This one is from my friend. He is giving a general overview of his political views and the rest of it talks about the nature of debating an argument and his opinion on it, and how he wants people to debate and argue him to foster dialogue between different points of views. He also goes on about how it's sad that when people argue or debate and they don't agree, then it becomes personal, and that is a reason for them to stop being friends.*" (P50)

P50 confessed that he was the type of person his friend was talking about—alienating friends who did not share his views. When hearing a friend pleading for open dialogues, P50 reflected on his own behavior and sided with his friend. P26 and P30 shared a similar sentiment. Even though they had observed unpleasant exchanges on Facebook regarding disagreements over controversial topics, they still hoped to see more rather than less conflict. P30 commented: "*It helps people who are ignorant to know about issues and then they get educated. Sometimes, keeping things public helps.*"

The urge to confront important societal issues, despite the social challenges that may arise from talking about them, reflected some students' desire to take ownership of and responsibility for the civic information circulating in a social networking platform.

6.4. Study 3 Discussion

In the interviews, I observed two main themes centering on students' engagement in political and social issues. Informational, personal, and social reasons motivated the majority of the sampled college students to use Facebook as a primary news source. However, students' desires to maintain a socially acceptable image altered how they discussed and distributed news. Next, I discuss angles from which I gauge the effect of using Facebook to learn civics.

6.4.1 The good

Reading news from Facebook fits into college students' daily social and communication routines. As a result, many students who would not have gone out of their way to read news are now getting some news exposure. Personal accounts and various informal formats often spark students' genuine interest in current events and social issues. Furthermore, a small number of students who have a media diversifying strategy on Facebook find it easy to compare across different sources. Granted that anyone who is interested can search on multiple news sources to reduce the influence of media bias, Facebook helps simplify such a process of manually checking.

6.4.2 The bad

Easy access to news on Facebook is not without its own downside. Past research has found that Internet users are more likely to look at and spend more time in information that reinforces their existing opinions (Garrett, 2009). The News Feed algorithm presents users

with what they want to see based on their preferences in information sources and past activities with selected friends. For the college student sample in particular, those who intentionally assemble diverse news sources on Facebook are the minority. Most students seek convenience by relying on the trending topics or simply glancing at items on their News Feeds without making further efforts to follow up. Therefore, students are susceptible to their own confirmation bias and algorithmic selection bias (Bozdag, 2013).

Specifically,, only a few students admitted that they liked to connect with people who shared similar views; one Facebook news reader and two non-Facebook news readers talked about algorithmic influence in News Feed; and no one questioned how trending topics became trending topics. In fact, students perceived trending topics to be filtered by the general public, representing the true interest of the crowd. While the students were not completely wrong, media attention on the potential systematic political biases in trending topics (Nicholson, 2016) or the lack thereof (Stretch, 2016), has demonstrated a lack of transparency to the general public on these critical design choices. In response to the criticism from the media, Facebook released a news report stating that the trending topic is a product of algorithm, human judgment, and personalization (Osofsky, 2016).

In other words, though most students perceived a range of benefits in consuming news on Facebook, they are dangerously unaware of the algorithmic selection bias or their own confirmation bias.

6.4.3 The ugly

Accessing news from a social networking site like Facebook provides a vehicle for students to gain social awareness of the hot topics and friends' political interests and stances. However, some students use the information others disclose to judge or alienate them when disagreements occur. Perhaps, by recognizing how they react to their peers' posts, students start to realize that what they themselves disclose, and how, can also result in either acceptance or negative judgment by others.

Consequently, for most students, I observed an imbalance between them taking advantage of the participation of others while contributing little or none themselves. In particular, students feel a strong need to imagine who the audience members are, what their reactions might be, and what they consider to be desirable with regards to sharing a piece of news. These concerns cause the majority of Facebook news readers to refrain from participation or resort to controlled participation (e.g., in a private message channel) such that their interests or opinions do not subject them to public scrutiny. Doing so nevertheless impacts the public discourse negatively, as the amount of diverse opinions entering into the platform is limited and potentially valuable inputs are publicly invisible. A lack of heterogeneity and openness in the public discourse could further hurt these young adults themselves who need diverse, even competing viewpoints to develop their own views. The trend in my sampled college students indicates that young adults will likely to continue to use social media like Facebook for news. Therefore, it is imperative that young adults take ownership and responsibility for what kind of news circulates in a social networking platform and how, because Facebook is participatory in nature.

6.4.4 Designing for civic learning on social media

It is equally important to design for norms of participation that are conducive to open dialogue while supporting users' disclosure goals and privacy concerns. Currently, when a user likes, shares, or comments on a post, the action is by default broadcast to their entire network through the News Feed, unless the user specifies the privacy settings of each post to customize access to different audience groups. Even if a user makes an effort to craft audience groups for each post, which is unlikely given the laborious process, the boundary between different audience groups is less easily defined in the context of online interactions with political and social issues.

Take P9 for example. She was aware that the conservative views of her father and grandmother would clash with her progressive views. Simply customizing her posts to family and non-family-members would not solve her problem, since a Facebook friend who was not a family member left uncivil comments on topics related to Planned Parenthood. Similarly, P48 had liberal and conservative friends on Facebook. Among his liberal friends, some supported Bernie Sanders while P48 himself did not. A lot of these Sanders supporters were in the drama department, where P48 also had close connections because of his photography interests.

P9's and P48's dilemmas were caused by context collapse, the integration of multiple distinct audiences in one single social network (Vitak, 2012). Tensions arise when audience groups of conflicting value systems view and interact with each other in a single network. Previous studies often implicitly categorize audience groups according to offline social

functions (e.g., family, co-workers, and classmates) that are relatively stable and known to the user. The examples of P9 and P48 demonstrate that audience groups at a more granular level than those previously defined can also cause context collapse. Specifically, what defines the boundaries between audience groups can vary based on a particular issue. For example, support for a politician can subdivide a user's democratic friends. Furthermore, the audiences defined by one metric (e.g., political affiliations) can overlap with audiences defined by another metric (e.g., academic departments). When the complexity of context collapse is driven by the combination of a specific issue (e.g., support for a politician) and traditional social groups (e.g., the drama department), current available solutions on Facebook, such as creating static customized groups, are not scalable.

I propose to leverage the convenience value and the potential of gaining multiple perspectives through power users on Facebook. Though a small number, I found four students proactively composed their News Feeds by subscribing to multiple news sources in order to access different viewpoints. I do not intend to generalize this observation to most college students. In fact, most of the participants were convenience-seeking and lacking awareness of the systematic biases in the media. Nevertheless, I think users like these four individuals can offer a valuable opportunity to their respective networks: Katz and Lazarsfeld's (1955) model of personal influence states that information often flows from traditional forms of mass media (e.g., an article on CNN) to influential readers and then on to a less active audience that seeks guidance or social confirmation from influential readers. I therefore recommend that Facebook introduces a new sharing function where users can compose and share with their friends a "news playlist" instead of sharing a single

article. In this way, power users who have a media diversifying strategy can provide friends (especially those who spend minimal effort in obtaining news items) with potentially greater access to multiple perspectives without having to disclose their own stances. Users who have relied on single or limited news sources on Facebook can use this function as an incentive to branch out their news consumption. Producing or even consuming multiple angles on a same topic can help alleviating the echo chamber effect (Flaxman et al., 2016; Garratt, 2009).

CHAPTER 7

DISCUSSION: FACEBOOK USE IN COLLEGE STUDENTS' LEARNING ENVIRONMENTS

In this thesis, I argue that structured learning in school and self-driven, interest-based learning on Facebook are mutually beneficial and complementary. So how do we effectively incorporate Facebook use into learning? Four directions that have emerged from the empirical study help address that question. First, it is imperative that students become more aware of their attentional states when they are about to use Facebook. To promote healthy use patterns and promptly intervene in unhealthy use patterns, I suggest that students visit Facebook when they are alert, highly engaged, and finished with their tasks at hand. Second, a student's identity associated with a domain of interest can both enhance and restrict learning opportunities on Facebook. Educators should take into consideration that identity could be a double-edged sword in a social platform where different communities overlap. Third, students commonly treat Facebook as a gateway to their information routine, which both caters to their interest and subjects them to biases in information. Therefore, it is crucial to teach young adults to be aware of and work around biases that come with algorithmic filters and personalization. Lastly, students and educators should reflect on their evolving responsibilities in the changing landscape of learning. A fruitful line of research and practice for educators includes: 1) recognize, value, and effectively assess intermediate learning steps in connected learning and 2) incorporate

Facebook (and social media broadly) into a curriculum as opportunities to provide students with guidance for information literacy and critical thinking.

7.1 Connected Learning Bridging Formal and Informal Learning

To investigate whether and in what ways college students' informal learning activities on Facebook are consistent with elements of connected learning, I collected diaries that were written over a 7-day period from 50 regular Facebook users in college, with whom I also conducted interviews. Results showed that students engaged in learning activities on Facebook that were often related to their academic subjects and civic issues, in a process that was driven by their own interest and supported by a networked environment. In Chapter 5, I discussed the interrelationships between the key components of connected learning—academic orientation, personal interest, and peer networks—that occurred in students' interaction with Facebook and suggested that the line separating formal and informal learning became blurred as a result of this type of interaction.

In their interviews, students expressed a great deal of frustration and disinterest in school-based learning, reflecting students' growing detachment from the university (James, 2002). The main criticisms of school-based learning from my sample of college students were: 1) they felt forced to learn about topics without knowing why these topics were important; 2) they followed a formal curriculum to fulfill their degree requirements, yet they had a hard time seeing how they could apply different classes and topics to create a meaningful career path.

Facebook use assisted, at least in part, in addressing both concerns. Information encountered on Facebook triggered students to reflect on and make sense of topics they learned about in class in a new context, a process that complemented school-based learning. Students also used Facebook as a supplementary venue outside of a structured space (e.g., classroom, workshop) to apply knowledge learned in the abstract. Moreover, some students explored career options and their broader academic communities by following extracurricular clubs, academic groups, and professors on Facebook. These activities are all driven by students' own sense of curiosity rather than required by a formal curriculum, suggesting that students are able to derive meaning for themselves through self-direction on Facebook.

Facebook provides those learning opportunities because, first, the recreational nature of the environment encourages students to follow their interest and make choices for themselves. Second, peer networks provide a social context that facilitates learning. For instance, peer-generated comments and reflections helped nine students make sense of news. Some students were able to access global support networks that went beyond their immediate close friend circles. Furthermore, some students contributed back to their networks, a process that incentivized them to research the subjects more and reinforced their identity in a community. In other words, getting support from the network and contributing back to the network both create learning opportunities (Ito et al., 2013). Third, colloquial terms, relevance to a familiar subject, and short, entertaining media formats reduce the entry barriers for students to understand otherwise challenging or serious topics. For instance, serious political topics were considered to be "*more relevant*"

(P9, P35) *and* "*heartfelt*" (P2) on Facebook. A personal connection could also evoke one's deep interest, compassion, and empathy.

Structured learning in school and self-driven, interest-based learning outside of school, appear to occupy the two ends of a continuum. They are mutually beneficial and complementary to each other. Formal curricula provide knowledge bases for students to easily recognize learning opportunities on Facebook. Learning opportunities on Facebook extend and enhance school-based learning by offering new perspectives in a new social context or by encouraging students to carry out research that is not required in school. For instance, the knowledge P4 acquired in public health major helped her detect inaccurate coverage about the Zika outbreak on Facebook; her engagement with news about public health on Facebook led her to conduct further research using reputable sources, which in turn enhanced her understanding of those topics. These findings advance the growing body of research that calls for widening the ecology of education (Dabbagh & Kitsantas, 2012; Sefton-Green, 2004) by providing evidence that learning spans across formal institutions and leisure activities over time. Existing research on informal learning and connected learning in particular has often concerned funded, organized learning centers during out-of-school hours (e.g., computer labs, after-school programs, libraries) (Ames & Burrell, 2017; Bilandzic, 2016; Davis & Fullerton, 2016; Sefton-Green, 2004). In online leisure-oriented space, research has examined interest-driven learning in gaming (e.g., Gee, 2005; Steinkuehler, 2012) and in creative content creation communities (e.g., remixing) (e.g., Ito, Baumer, et al., 2009; Kafai & Peppler, 2011; Peppler & Kafai, 2007). Research interest in informal learning on social media is growing and yet still in an early stage (e.g., Cain &

Policastri, 2011; Dabbagh & Kitsantas, 2012; Lin & Farnham, 2013). My work extends this growing body of research by showing a variety of ways Facebook use is incorporated into a student's learning ecology.

7.2 Leveraging Facebook in Learning

How do we effectively use (or not use) Facebook for learning? In the following, I present four directions that students, educators, and researchers should consider when approaching that question.

7.2.1 Using Facebook optimally

To use Facebook optimally, students need to make an effort to incorporate Facebook into their learning environments in a non-disruptive manner. Rheingold (2012) proposed a concept—*infotention*, which he used to advise users to hone their mental discipline to direct attention and use technical means to configure a social networking environment that is informative and meaningful. This line of interest advocates for the importance of empowering users to cultivate better social media use skills. My dissertation contributes to this line of research by offering insights into how a user can hone their attention skills.

In Chapter 4, I examined students' characteristics of attention at the beginning of a Facebook use session and at the time when they encountered learning content on Facebook. When a student visited Facebook right after schoolwork, which was often associated with higher concentration and lower interest and enjoyment, they spent less time on Facebook. Additionally, students' interest and enjoyment levels increased more

when they encountered learning content if their Facebook use was following schoolwork. It is as though the mental state of studying carries over into Facebook use. If this conjecture is tested and replicated by future studies, then we can even leverage this opportunity to engage students in more meaningful interaction (e.g., learning for their interest) on Facebook after schoolwork.

In Chapter 5, I observed that some students reflected on academic topics when they encountered related information and some students engaged in further research after reading a learning post. In those instances, reflecting on and following up with information stimuli require sustained attention. Since students are likely to be in a more focused state after schoolwork compared to after other leisure activities, I argue that students taking a Facebook break after schoolwork might not be detrimental; it might even be a better condition for students to engage in informal learning on Facebook. Informal learning on Facebook can in turn benefit school-based learning, as I have argued in Chapter 5. Therefore, I have hopes that learning for school requirements and interest-driven learning outside of school can coexist in a way that is mutually beneficial. We need to caution, however, that if a student plans to resume studying after Facebook, a Facebook visit with elaborate learning activities (like P16 who spent "*a whole other hour of searching up*" the political stances of politicians) could be disruptive. Therefore, I suggest that students visit Facebook when they are alert, highly engaged, and finished with their tasks at hand for optimal learning experience on Facebook.

After leisure activities, by contrast, students were more likely to engage in lengthy Facebook use. When their interest was already low in the leisure activity, students were

likely to spend even more time on Facebook. Prolonged Facebook use that lacks direct one-on-one interaction has been reported in prior research as indicative of students' low subjective ratings of mental well-being (e.g., Kross et al., 2013). I therefore recommend that students pause before going on Facebook and reflect on their attentional states. As I have conjectured, students might engage in a series of activities with similar attentional patterns. If a student already has a low engagement level, the moment before going on Facebook would be an effective moment for intervention that breaks potentially unhealthy use patterns.

7.2.2 Identity and learning

Instances of connected learning on Facebook demonstrate that individual's learning activities are embedded in social processes. In particular, a few instances illustrated that students engaged in learning activities because they were motivated to become a member of their academic community or to be associated with an "expert" status in a certain domain, similar to what previous research has found (Lave, 1991; Lave & Wenger, 1991). For example, P48 reviewed APA ethical guidelines because his professor was interested in the topic. Associating oneself with an affinity for science also encouraged students to conduct research outside of class requirements (e.g., P4).

In Lave and Wenger's work, developing an identity that is associated with a community encourages learners to pursue learning. A student's Facebook community is multi-layered, however, encompassing their broader academic community (e.g., psychology major), different friend circles, communities of special interests (e.g., public health, politics, Star

Wars), as well as communities that serve certain social functions, such as family and church groups. Perhaps as a result of these overlapping communities, students perceive that being associated with a certain identity might be negatively viewed and evaluated by *some* of these communities. In particular, many students make efforts not to reveal their political identity through news participation in order to maintain an acceptable image to all communities they interact with on Facebook. Therefore, a student's identity can both enhance and restrict learning opportunities on Facebook,

Political interests, stances, and worldviews can develop and evolve over time. Accommodating change is important for emerging adults who are developing their political identities and worldviews (Arnett, 2000; Perry, 1998). Multiple examples in interviews demonstrate this notion: P9 switched from a conservative background to progressive thinking as a result of exposure to news on social media; P12 considered a future career in politics and was therefore conscientious of keeping his still-developing stances private; P33 had just started reading the news and found herself struggling to catch up on recent events of the election; and P50 switched from alienating friends with different views to now advocating for a change in how we discuss politics online. These examples demonstrate the changes that can occur when a person is developing their civic identity. In the current design of the platform, Facebook has limited capacity for accommodating these dynamics. By default, the timeline archives data history and the News Feed broadcasts every action, creating a record of these "works in progress." Therefore, a number of students opted out of participation; those who did participate mostly talked about or shared news in private channels, such as in one-on-one chats or in secret groups, which are

not accessible to uninvited users. When students limit their public participation, the amount of diverse opinions entering into the platform is limited and potentially valuable inputs are publicly invisible, creating a negative impact on the public discourse.

Taken together, students seemed to be willing to develop and communicate an identity of their respective academic domains through their interaction with Facebook. However, the majority of them were concerned about associating themselves with a political or civic identity, thus censoring their online news participation. Future research needs to take into consideration that identity can be a double-edged sword in a social platform where different communities overlap. I suspect that what makes Facebook a place conducive to connected learning—easy access to peers, high visibility of a peer's interest and identity— is also the reason for students to carefully negotiate which part of their identities they want to display.

7.2.3 Modern day web portal—catering to interests and inviting biases

The process of using Facebook as a starting point to access other information sources (especially news) was common among my sample of college students. This observation echoes other studies that have reported that users increasingly consume news media content on Facebook (Barthel et al., 2015). It also suggests that accidental information encountering (i.e., the act of accidentally "bumping" into useful or interesting information without intentionally looking for it, Erdelez, 1997, 2000) is an integral part of college students' information routines today. Some students even rely on Facebook to deliberately

engage in accidental information encountering, remarking that Facebook is "*an outlet to the whole world*" (P44).

For these reasons, I have argued that Facebook is the modern version of a web portal that aggregates information from diverse sources. The difference between this modern day portal to a traditional portal is that the News Feed algorithm curates information a user sees by taking into account the user's personal network, their past interactions with this network, and information sources to which they subscribe ("News Feed FYI," 2016). Algorithms are powerful automation, which save individuals efforts in foraging for information. As shown in Chapter 5, a personalized information environment can often successfully cater to a student's existing interest and pique their new interest in subjects that they are likely to have affinity for. Also shown in Chapter 6, students often do not go out of their way to seek news; they take advantage of the convenience of Facebook where news is pushed from friends (through their likes, share, and comments) and news sources they follow, and compiled and recommended by the Trending function.

The downside of such a personalized information environment is that users are likely to be exposed to biased information, which systematically favors certain content (e.g., political ideology) and not others. Information bias can be hard to detect especially when the information environment seems to be working toward students' needs. About two thirds of my sample did not do any follow-up research on the learning content they consumed. The remaining one third of the sample engaged in further research. However, most of them stopped at a brief Google search, an activity that is also powered by opaque algorithms that can systematically favor certain content over others (i.e., search engine bias) (Goldman,

2005). Biased rankings of search results can engender serious impact, such as shifting voting preferences (Epstein & Robertson, 2015).

To combat these multiple sources of bias in information filtering and personalization, four students intentionally subscribed to diverse news outlets on Facebook to receive multiple news articles written about the same topic. This practice is in line with recent work that found users manipulating an algorithm's inputs to maintain control over social media feeds (Eslami et al., 2015). A handful of students consulted resources that have no incentive to be partisan. However, the small number of these students indicates that students in general are a vulnerable population susceptible to algorithmic bias.

Traditionally, media companies have been accountable for the information they put on their front page. Now, a Facebook user's News Feed is the new front page, and it is what each user makes of it. The responsibility to ensure a quality, diverse information environment has shifted, at least in part, to the users. Therefore, I emphasize that it is crucial to teach young adults to be aware of and work around biases that come with algorithmic filter and personalization, which leads me to the next section on how educators can play a valuable part.

7.2.4 Changing roles and responsibilities

In a traditional learning environment, teachers provide authorized content and students receive this content. In a connected learning environment, students play a far larger role. They have more agency in choosing what they learn and why they learn; they also have

more responsibility in how they learn. Based on empirical observations in this study, individuals and media outlets of varying degrees of credibility are the content providers. Students themselves, their peers on Facebook (including their teachers), and the opaque News Feed algorithm altogether become an assemblage of content curators. Students learn, not because they have to, but because of their personal interests, their affinities towards certain social groups, and their desires to express and maintain a personal identity. And students learn through making connections across different settings and through choosing, evaluating, reflecting, and researching learning content. In this changing landscape of learning, the role and responsibility of an educator also needs to change in order to prepare students for effective learning both in school and in life. I suggest the following two directions for educators.

First, connected learning that occurs on social media needs to be included in learning assessment. Up until recently, researchers and educators have used measures in school settings to assess learning in informal settings (National Research Council, 2009). They use this practice because they often do not recognize certain content or procedures as learning until they can be eventually categorized into academic disciplines or measured in existing metrics (Moss 2001; Sefton-Green, 2004). Tests of general knowledge, Gee (2010) criticizes, often decontextualize human actions thus failing to show whether learners have internalized or can actually apply their knowledge. He in turn advocates for fusing learning context into the assessment rather than distilling the specific skills or knowledge out of learners' practices and community norms.

This dissertation responds to the call for learning assessment reform. During the study, many students used Facebook content to develop new interests and make connections to topics they had studied in school, sometimes following up with additional research. All of these activities are examples of intermediate learning steps. They are transient and their results may not appear in traditional metrics. I urge educators to legitimize the importance of these intermediate learning steps, which will require some way of capturing and assessing them. For capturing, I suggest that future research use a combination of ethnographic methods and automatic logging over longer periods of time to explicitly examine the sequence of media resources and tools that students use to connect formal and informal learning settings. For assessment, in this study, the development of personal interest, reflections, and information skills are the outcomes of these intermediate learning steps. Ito et al. (2013) describes "depth and breadth of interests, learning supports, and academic orientation" as what they considered "proximal outcomes." Schwartz and Arena (2013) use students' personal choice as an analytical construct to assess learning outcomes. I propose that future research to compile these different ways of describing learning outcomes to develop a more unified terminology for assessment.

Second, educators need to help students develop critical information skills that they can apply across formal and informal learning contexts. In this study, larger group of students did nothing to follow up with a learning topic; a smaller group of students used web searches to minimally engage with the topic; and the smallest group of students conducted extensive research. The contrast highlights opportunities for educators. I propose that educators should play a facilitator role instead of (only) an authority role that transmits

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sanctioned content (e.g., content in textbooks) in the classroom. As a facilitator, educators cultivate students' interest in a domain, train students on information skills and critical thinking, and invite students into a broader academic community as apprentices and collaborators. In contrast to formal education where a single educator provides scaffolding for students (Weigel et al., 2009), intermediate learning steps in a connected learning environment serve as opportunities for scaffolding that is implemented by educators, peers, and the broader communities a student identifies with.

I propose that educators consider including social media activities as part of a curriculum. Here students could be encouraged to search for course-relevant content and share it on social media. Educators can take this opportunity to guide students to detect unreliable information or falsehood (Wineburg, McGrew, Breakstone, & Ortega, 2016), recognize bias in information, effectively search for information, and validate or debunk information. This process has two objectives. First, it creates a personalized pool of information generated by students' autonomous choices. Personal choice itself is an important element of learning (Schwartz & Arena, 2013). Second, it transforms student-driven, leisure activities into tools for teaching and learning important information skills and critical reflections, which benefit students both in class and outside of class.

7.3 Limitations

There are several limitations in this dissertation, discussed below.

Participant sample. This study only recruited regular Facebook users (i.e., self-reported to use Facebook on the computer for at least three times a day in the recruitment phase). Automatically logged Facebook data from this study (see Table 2) confirms their regular use. Therefore, findings are only generalizable to college students who use Facebook regularly on a daily basis. I chose to focus on the personal computer because that is where students primarily conduct their learning activities. Future studies should look into mobile Facebook use in a student's learning environment as mobile Facebook might serve as a quick means for checking notifications, chats, and news (Matsa, 2016). It is possible that students' practices and concerns around mobile news are different. For example, while trending topics are easily visible on the desktop version, they are hidden under the search box for the mobile Facebook interface. Furthermore, students could allocate and negotiate attention differently when switching between studying and mobile Facebook use, as a recent review suggests a complicated relationship between multitasking with mobile phone and learning (Chen & Yan, 2016).

Facebook logging analysis. A conservative threshold of 40 seconds was used to create Facebook sessions—if the time span between two consecutive Facebook visits (break duration) was less than 40 seconds, then these multiple visits were considered to be in one Facebook session. The threshold could be overly generalized based on the average time a college student spends on a computer window found in a previous study (Mark, Wang, et al., 2014) and the median break durations of this study. I recommend future studies to consider observing participants *in-situ* regarding when they switch in and out of Facebook,

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and for how long; or log all computer activities in addition to tracking Facebook use in order to establish a more accurate break time threshold.

Samples of attention in ES surveys and diaries. A student's engagement may increase for any Facebook use, not just learning posts. In this study, engagement is sampled only when a student encountered a learning post and not other type of Facebook content (e.g., cat videos, social events). Samples of students' attention associated with other type of content on Facebook would be needed to determine if students' engagement is higher with learning content. Students could also have over-reported their engagement levels in a diary because a diary is associated with learning content. In other words, participant might experience an experimenter demand effect, which refers to changes in behavior based on what a participant perceives as an appropriate behavior in a study setting (Zizzo, 2010). The potential intervening effect and the bias in self-reports are innate to the data collection methods. In order to completely eliminate these effects, future studies need to consider even less intrusive methods, such as to use bio-sensors (e.g., eye tracking, galvanic skin response) to capture participants' attention and engagement.

Diaries and interviews. To avoid interrupting participants' normal Facebook experience, I instructed them to report learning instances of more significance and avoid repeating topics. Thus the number of instances of learning on Facebook is likely to be an underestimate. Furthermore, the diaries and interview questions prompted participants to record and discuss cases they found interesting, valuable, or of learning value, pointing to a value oriented study design. Instances where students were concerned or disinterested are likely to have been missed by the data collection.

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CHAPTER 8

CONCLUSION

This dissertation was motivated by the prevalence of Facebook use in college and the inconsistent portrayals of its effects on college students' learning. I aimed to distill constructive guidelines for the general public to engage with Facebook in ways that maximize the benefits across different learning contexts by investigating the following questions: What are the activities and the associated engagement levels immediately before a college student starts to use Facebook? How do the activity and engagement levels prior to Facebook use affect a student's actual Facebook use? Does informal learning occur when college students interact with Facebook, and if so, how are students' characteristics of attention associated with learning on Facebook? Whether, and in what ways, are these informal learning activities on Facebook consistent with elements of connected learning? And then, focusing on the most salient subset of informal learning, how do college students perceive the benefits and shortcomings associated with news engagement on Facebook?

Answering these questions requires 1) quantitative measures of the context of Facebook use and the detailed use patterns, and 2) qualitative measures of the process, values, and challenges of learning with Facebook. Therefore, I chose a mixed-method approach and conducted weeklong studies of 50 undergraduate students who regularly used Facebook in the spring of 2016. Specifically, I collected and analyzed Facebook usage using automatic logging, together with samples of students' activity and engagement levels right before Facebook using experience sampling. Diaries and interviews were used to elicit students'

emerging practices of informal learning on Facebook and their subjective assessment of the process (e.g., interests, reflections, rationales, and concerns).

Key results and implications for students and/or educators include:

The ways in which college students incorporate Facebook into their daily routine might be more complicated than we previously thought. Specifically, Facebook use was more often preceded by leisure activities rather than schoolwork. Following these different activities, students exhibited contrasting attentional states and Facebook use patterns. These results reveal that a student's attentional states might carry over into a Facebook use session and might even increase when they encounter learning content on Facebook. For an optimal learning experience on Facebook, I suggest that students visit Facebook when they are alert, highly engaged, and finished with their tasks at hand.

When students used Facebook, they engaged in learning activities that were often related to their academic subjects and civic issues in a process that was driven by their own interest and supported by a networked environment. As a result, I argue that connected learning can occur in a leisure-oriented online space that is not designed for educational purposes. However, a number of limitations also render Facebook an ineffective place to learn. Specifically, Facebook content sometimes lacks depth and credibility due to its recreational nature. The algorithm-powered information filtering and personalization can also expose students to biases. And despite these concerns, the majority of the sampled students were reluctant, and/or lack the skills, to question, examine, and research the information they encounter on Facebook.

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Most of the sampled college students used Facebook as a primary news source due to the convenience, (perceived) multiple perspectives, personal relevance, and social benefits it provides. However, most students also felt a strong need to imagine who the audience members were, what their reactions might be, and what would be considered socially desirable when they planned to share a piece of news. These concerns caused the majority of Facebook news readers to refrain from participation. Some resorted to controlled participation in a (semi-)private channel. Doing so reduces the diversity of opinions entering the platform and renders potentially valuable inputs publicly invisible, thus impacting the public discourse negatively.

Through the analyses, a number of future directions have been identified:

1. Future research should sample a student's attentional states when they interact with different types of content (e.g., entertainment videos, social events) to extend this study that only sampled engagement levels associated with learning content. Additionally, to eliminate some of the methodological limitations inherent in experience sampling and diaries, future studies need to consider even less intrusive methods (e.g., bio-sensors) to capture participants' attention and engagement.

2. I only sampled students' attentional states at the start of and during Facebook use. Future research can extend this dissertation by examining the activity, its associated attentional states, and productivity immediately following Facebook use. With samples of activity and attentional states before, during, and after Facebook use, future research can confirm or dispute my conjecture of the carry-over effect of attention.

3. A number of intermediate learning steps were observed in a connected learning environment. Examples include students doing follow-up research about Facebook content, and making connections between information encountered on Facebook and topics they had studied in school. These learning steps are transient and their results may not appear in traditional metrics. I suggest that future research use a combination of ethnographic methods and automatic logging over longer periods of time to explicitly capture the sequence of media resources and tools that students use to connect formal and informal learning settings. Future research should also consider developing a more unified terminology to assess the outcomes of these intermediate learning steps.

Taken together, I am optimistic that learning for school requirements and interest-driven learning outside of school can coexist in a way that is mutually beneficial. I also have some reservations. The very qualities that make Facebook conducive to connected learning are also responsible for the limitations that can render it an ineffective place to learn. Researchers (boyd, 2014; Windburg et al., 2016) have already started to caution that labels like "digital natives" (Prensky, 2001) or the "Google generation" (Rowlands et al., 2008) often mislead us to think that this generation of youth are equipped with technology fluency and information skills to thrive in the digital age. I join these researchers in advocating for the necessity of educators' role in guiding students. In particular, I suggest educators tap into the pedagogical opportunities that social media platforms such as Facebook can offer in order to teach students critical information skills that can be applied across formal and informal learning contexts.

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APPENDIX A

INTERVIEW PROBES

Overview:

1. In general, is it a habit for you to use Facebook? (If so) Can you describe your daily routine when it comes to Facebook use? (If not) Can you describe under what circumstances do you use Facebook?

2. What are your primary reasons for using Facebook? (For example, to catch up with your friends' whereabouts; to de-stress or take a break; to access useful information; to keep up with events; to broadcast persona thoughts, to share useful information, to vent, etc.)

3. When did you start using Facebook? Do you find the ways you are using Facebook now different from how you used it when you first started?

4. Do you feel a sense of belonging on Facebook? (For example, belonging to group, a circle of friends, a specific community?) If so, how do you interact with this community?

Before reviewing diaries:

1. Based on your previous Facebook experience and not just this week, what types of content from Facebook do you generally find interesting, meaningful, or of personal value to you? Do you usually look for these types of content on Facebook, or do you encounter them without intentionally searching?

2. In general, do you consider Facebook a place to learn something?

   [if so] What are the things you've learned from Facebook? How does learning from Facebook different from, say learning at school?

3. Based on your previous Facebook experience, can you give me 1-2 examples about something you learned from Facebook, which had lasting impact on you?

4. How many FB friends do you have? What are the public pages or groups you often receive posts from? Of all the information you see on Facebook, do you usually pay attention to information from specific friends and/or specific pages?

5. How do you describe the way you pay attention to the massive amount of information on Facebook?

Now, please choose three diaries from all the diaries you submitted in the past week. If they cover different topic categories, please choose the most interesting or important one to your from each category.

For each diary:

1. Can you describe what is this post about?

2. Can use one word to describe the value of this post to you (e.g., useful, inspiring, educational)? And why?

3. Is this topic in any way related to your schoolwork? If so, how?

4. Is this topic in any way related to your career plan or future path, but not something you are currently learning from school?

5. How does learning about this topic relate to who you are as a person?

6. If you were not on Facebook, would you have learned about this topic from other sources or in other ways?

7. Whom is the post from? Did you evaluate the quality of the post based on the source? If so how?

8. What drew your attention to this post? You can take a look at your answer to the last question in the diary to refresh your memory.

9. What did you do after reading the information? For example,

    Did you find out more about this topic using other sources? If so, how? If not, why not?

    Did you share, comment on, or recommend the content to other people? If so, how? If not, why not?

    Did you use the information in any way (e.g., talk about it with friends, do more research about it)? If not, why not?

Closing

In closing, I want to double-check a few things with you.

Was this past week a typical week for you? [If not] How did it affect your Facebook use?

Was your Facebook use typical in this past week? [If not] What was different this week?

Did the surveys or study notes change how or how much you use Facebook on the computer compared to your typical use? [If so] In what ways?

Did the study influence your typical informal learning experience on Facebook? [If so] In what ways?