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Re-mastering the Master's Tools:

Recognizing and affirming the life experiences and cultural practices of urban youth in critical
computational literacy through a video game project

A thesis submitted in satisfaction
of the requirements for the degree Doctor of Philosophy
in Education

by

Clifford H. Lee

2012

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2012

ABSTRACT OF THE DISSERTATION

Re-mastering the Master's Tools: Recognizing and affirming the life experiences and cultural practices of urban youth in critical computational literacy through a video game project

by

Clifford H. Lee

Doctor of Philosophy in Education

University of California, Los Angeles, 2012

Professor Marjorie Faulstich Orellana, Co-Chair

Professor Ernest Morrell, Co-Chair

This study examines how a video game project that focuses on students' lived experiences and cultural practices teach critical literacies and computational thinking. Specifically, this research looked at how the pedagogy, processes, and student products demonstrated culturally relevant pedagogy practices, critical literacy, and computational thinking. This design-based research study utilizes critical literacy, sociocultural learning theory, and culturally relevant pedagogy in the framing, structure, design, and instruction of the class. This study took place in a 10th grade Computer Science elective course in a Los Angeles public high school. Data were collected with: field notes, audio and video recordings, small group interviews, and student-produced artifacts. Data were analyzed using grounded theory and a multimodal social semiotics approach. Findings suggest that locally based, historicized content relevant to students' lives and their communities

resonated with them through critical literacy development. Similarly, culturally relevant pedagogies that fostered and nurtured students' choice in the selection of personally meaningful topics while producing a multimodal composition to an authentic audience supported development of voice and agency in their work. Findings also showed the affordances of combining critical literacy and computational thinking in producing a critical computational literacy framework. The research showed students' seamlessly use their computational thinking to design and produce a multimodal serious video game with personally meaningful messages that explicitly pushed against dominant narratives of marginalized populations and their communities.

The dissertation of Clifford H. Lee is approved.

Tyrone Howard

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University of California, Los Angeles

2012

DEDICATIONS

To the loves of my life: Maria Isabel Ramirez & João Tenzin 樂然 Lee Ramirez

Since I first began teaching, I had a feeling there may be a time when I might bury a student, but I never imagined the East Oakland life clock would come calling so soon. This is dedicated to all the youth that died before their natural time. Rest in power to Nancy Nguyen, Marco Antonio Casillas, Jose Rocha, and Luis Garibay. Your spirit continues to drive the work I do.

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- ★ “We are the ones we have been waiting for.” - June Jordan
- ★ The mark of a true revolutionary is found in the success of the most marginalized and not in the distinctions and accolades one receives from dominant, hegemonic institutions.
- ★ “We are going to emancipate ourselves from mental slavery because whilst others might free the body, none but ourselves can free the mind.” – Marcus Garvey

Fam

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CHAPTER 1

Statement of the Problem

We have to look no further than the 2011 uprisings in the Middle East to see the importance and potential for this research. Despite attempts by Egyptian officials to silence communication by severing mobile and Internet services, the masses found ways to circumvent the blockade with their technological know-how. Ahmed Mader, a civil engineer by training and one of the leaders of the April 6th Youth movement, used video sharing (Youtube), social networking (Facebook, Twitter), and social justice training (Nelson Mandela and Sergio Popovich of the Serbian Otpor Student Movement) to organize, challenge, and ultimately defeat the tyrannical leadership of Hosni Mubarak (Kirk, 2011). This ongoing struggle highlights the significance computers and technology play in our current and future society.

This example offers several points of relevance and metaphorical connections to this research. Like the social media giants of Facebook and Twitter, the video game industry was initially conceptualized for entertainment and profit-generation, but over time people began repurposing these tools for educational and even social justice endeavors. Unlike the sometimes trivial and rote test-taking drills disguised as educational games, the serious games¹ category has demonstrated the potential in changing ideologies and behaviors (asthma, diabetes, smoking) in young people and adults (Wong et al., 2007). Games for Change, a non-profit organization seeks to “facilitate the creation and distribution of social impact games that serve as critical tools in humanitarian and educational efforts” (“Games for Change,” 2012). Although the general definition of “serious games” includes government-developed games to mimic military

¹ “Serious games are being designed, developed, and assessed for a diverse population of users and encompass a broad spectrum of varied content for education, government, health, military, science, and corporate training” (Wong et al., 2007).

scenarios, for the purposes of this study, I will re-define the category to emphasize the role of personally relevant games created with a critical social impact purpose.

Similar to the way the Arab Spring movements leveraged the near universal appeal and access of these tools, video games has reached close to ubiquitous usage rates among teens in the United States. Students can effectively use this medium to appeal to others in voicing counterstories to the existing dominant ideologies of them and their communities. Like the organizers of the Egyptian revolution, the urban youth in this study demonstrated purposeful strategizing and planning to effectively use this multimodal tool to create and solicit the emotional appeal to communicate an effective and powerful message. Unlike the immediate results and actions of collective organizing in Egypt, these students pushed others in the more subtle and personal forms of ideological change. Some may even argue that the process of ideological shift or change is much more difficult to create than the physical organizing of collective action. It is with this lens that students created their serious video games; with the explicit goal of changing individual's views who play their games.

While the technological skills served as a means to strengthen their message, they equally developed real, concrete computational thinking skills to serve them in their future. If the former leaders of Egyptian government had understood the potential power of these innocuous tools and stripped people's abilities to access these devices, how differently would the Middle East look today? Similarly, by limiting our urban youth's access and opportunities to these technological tools, how will they be able to re-envision the world around them?

Women, Blacks and Latinos are routinely denied access to high-level computing classes in secondary schools (Margolis, 2008, p. iv). Much of this is the direct result of deficit ideologies that assume low representation is attributed to disinterest or an inability to learn the material

(Margolis, 2008). Though much has been made about the omnipresent use of the Internet by young “digital natives,” most of focus has been on consumption (C. Luke, 2004) and only more recently, on multimodal youth production (Hull & Nelson, 2005). Without access to classes and resources that place traditionally marginalized populations at the center of high-level computational problem solving, their voice and future will continue to be silenced.

By utilizing the tenets of culturally relevant pedagogy in Computer Science, where cultural competence and critical consciousness are on equal footing to academic success, marginalized students will be motivated and engaged with content that are historically absent from high-poverty, majority Black and Latino/a schools (Margolis, 2008). Over three decades of culturally relevant pedagogy research has successfully demonstrated that curriculum and pedagogy that recognizes, values, engages and affirms the prior knowledge, experiences, and cultural practices of students are effective in supporting student learning (Au & Jordan, 1981; Banks et al., 2007; Milner IV, 2011; Mohatt & Erickson, 1981). While the underlying tenets have stayed the same, the execution of it has profoundly changed. The incorporation of youth cultural practices must also include their digital cultural practices. As educators, our role has now expanded to include teaching young people to become critical consumers of digital content: video games, websites, Youtube videos, digital stories, personal and public social networking sites, and other multimodal texts. While supporting students to become critical media consumers is an admirable first step, educators must teach students to become critical digital *producers*. Not only is expanding computational fluency to underrepresented students crucial towards equalizing the field of computer science, but in equalizing society through the access and production of new information and the inclusion of historically marginalized voices in the field. Digital products that explicitly challenge the prevailing social, political, and economic status quo have the

potential to instill widespread social change. By illuminating the sociopolitical forces that reify dominant groups' position of power, students will be engaged and empowered to create and utilize digital tools to deliver personal and meaningful messages to transform their immediate *and* global community.

By deliberately creating space and time in the classroom for students to reflect, explore, and analyze personal and challenging issues in a nurturing and inviting environment, a community culture of support is developed to collectively navigate these struggles. Given the socially toxic environments many urban youth of color face in and around their school and community, it is not surprising that post-traumatic stress disorder rates are comparable to youth in war-torn countries (Berman, Silverman, & Kurtines, 2000). Coupled with the lack of adequate counseling services, many students yearn for a place to voice their struggles in a safe, respectful, and empowering environment. Beyond the pie-in-the-sky, superficial hope found in some urban schools, this curricular project sought to deliver the critical and genuine hope that allows our young people to make sense of their struggles through self-reflection, discussion, and analysis (Duncan-Andrade, 2007). Through the development of a personal and meaningful serious video game, students developed increased agency and empowerment by creating a 21st century tool to represent and speak to others.

Explanation of the Study

Prior to this research study, I conducted a trial run, simplified version of this project as a pilot study with a different group of students. Mr. Perez² and I collaboratively planned, reflected, and taught that unit. Lessons learned from that study provided us with insights that led

² A pseudonym for the teacher's actual name.

to modifications in the goals, purposes, and pedagogy that informed my second iteration of the unit. Greater detail of that process will be described in chapter three of this proposal.

As researcher, curriculum designer, and teacher, I utilized design-based research methods to support effective teaching and student learning while utilizing the natural classroom environment to examine teaching and learning practices (Sandoval & Bell, 2004). This qualitative research study examined a seven-week video game project in a gender-balanced, 10th grade elective Computer Science classroom that I co-planned and co-taught. Prior to the research unit, I had worked with Mr. Perez as his educational coach for the first six months of the 2010-2011 school year. In this role, I observed lessons and facilitated reflective conversations about the class and planned lessons together. Although I took the lead in the design and teaching of this unit, I continued to consult with Mr. Perez on a daily basis and we reflected on daily lesson plans frequently.

In this curriculum unit, I studied students' developing critical literacy skills as consumers of content (video games, advertisements, websites, films) and producers of artifacts. Through a critical literacy framework, students investigated, researched, and self-reflected about their lives in the context of larger sociopolitical issues. The culmination of this unit was the creation of a video game on a student-selected topic disseminated on the Scratch³ website⁴. Using a medium that is familiar and fashionable to youth, students produced a digital text or a serious game with the intent to initiate change by challenging dominant ideologies of urban students of color.

I worked with this group of students from the first day of this class, for two to three days a week until the start of the project. For the seven weeks of the research unit, I was there before school, during class, and immediately after class every day.

³ An MIT Media Lab created computer language interface that teaches, motivates, and encourages the learning of computer science programming concepts.

⁴ <http://scratch.mit.edu/>

During the first two weeks of the project, students analyzed a variety of digital artifacts from a critical media literacy perspective. Students analyzed the power of Google and Facebook engineers in shaping everyday decisions and ideologies, examined the role of corporations in influencing individual wants, interrogated the news media's abilities in shaping discourse, and historicized the violence in impoverished communities by learning about inequitable sociopolitical and socioeconomic structures. Concurrently, students engaged in reflective journaling; where they questioned, analyzed, and reflected on the affect of different dominant groups' power and influence over various facets in their lives and on society. Journal reflections also served as points of departure for brainstorming their ideas and messages for their final video games. In weeks three through seven, students focused on the design and creation of their game through Scratch. During the final week of the project students' collaboratively problem-solved glitches, published their games, completed their final reflections, and participated in small group interviews.

The collection of research data commenced on the first day of the project. Since the majority of the first three weeks of instruction were teacher directed (lecture, guided discussions and small group work, etc.), data collection primarily came from field notes, researcher reflections, audio and video recordings, and student-produced artifacts (handouts, journal entries, homework). Field notes were generated based on raw notes and audio and video recordings of class activities. Field notes, reflections, and student-produced artifacts were also be used to inform day-to-day lesson plan modifications and unit adjustments. As the class pedagogy shifted from direct instruction to a more student-centered approach, additional data collection tools were needed. Class focus moved from being critical consumers of media to becoming critical producers of a multimodal artifact. This change required greater understanding and recording of

students' metacognition of their developing and evolving final product. I utilized "think-alouds" during independent and group work time to better understand student's rationale, thought process, and meaning making of semiotic representations, action, story development, logical reasoning, and algorithmic problem solving. The "think-alouds" were complemented by final written reflections and small group interviews after the completion of their video games. These additional tools allowed students to describe and explain their thinking in the creation of their video games.

Rationale for the study

Often described as digital natives, the vast majority of children in K-12 schools today are growing up using multiple devices for communication, accessing instant information, and spending hundreds of hours playing a variety of video games. In the past, communication may have involved one mode of interaction at a time; writing/reading a letter or engaging in a phone call. Today, many young people are increasingly immersed in a world of multimodal interactions since adolescence. One area that has witnessed this exponential growth is in video games.

The latest release of Call of Duty: Black Ops⁵ grossed \$650 million in its first week of release. To put this into perspective, the biggest all-time opening weekend for a movie grossed less than one quarter of that ("The Numbers: Box office data, movie stars, idle speculation," 2011). Video game playing is also a nearly universal phenomenon among teens; 97% of 12-17 year olds reported that they play computer, web, portable or console games (Lenhart et al., 2008). Although young males have traditionally dominated video game consumption, a shift is occurring towards a more diverse audience (Williams, Martins, Consalvo, & Ivory, 2009). These

⁵ A first-person perspective shooter game that takes place during the Cold War era.

numbers clearly demonstrate the widespread impact of video games among young people in America today.

Unlike other popular culture medium like film, television, or music, video games are unique in their ability to respond and adjust to the player's decisions. This multimodal, interactional experience may partly explain the exponential growth of the video gaming industry over the past three decades. Like films in their initial reception in schools, video games have been similarly viewed with disdain and scorn by school officials. However, game use is beginning to gain traction with some educators who see their potential games for learning (Gee, 2007; Jenkins, 2000; Quest to Learn: School for Digital Kids," 2009; Sanford & Madill, 2007; Squire, 2006). Beyond their commercial and consumer popularity, video game *production* offers its creators development of systems thinking, roles and identity, representation, audience, message delivery, and intuition (Flanagan & Nissenbaum, 2007; Hayes & Games, 2008).

But an important concern with the use of videogames in classrooms, especially from a critical literacy perspective is its continued reification of stereotypical representations of women and minoritized groups. A study of 150 top video games from 2008 showed a gross under-representation of females, Latina/os, Native Americans, children, and the elderly in playable characters (Williams et al., 2009). Although African-Americans were equally represented, this study showed they were mostly relegated to stereotypical roles of athletes, gangsters, and street people (Williams et al., 2009). Additionally, many of the messages and themes of games promote simplistic binary notions of good versus evil or zero-sum game decisions and actions that poorly reflect the nuances and richness of the real world. A few games have attempted to show the complexity of people and society (Sims series, Second Life) and have had critical and commercial success. There is also a growing movement to develop serious games that educate

and promote the needs and voices of institutionally marginalized communities (Flanagan & Nissenbaum, 2007).

Some have argued that the consummate narrow and superficial messages and themes and underrepresentation and stereotypical depictions of marginalized groups in video games is attributed to the homogenous field of programmers. In 2009, only 3.4% Black, 5.8% and Latino undergraduates completed a Bachelor's degree in Computer Science from PhD-granting institutions (Zweben, 2010). The rates are even more striking when examining those who earned Masters degrees: 1.6% (Latino/as) and 1.5% (Blacks) and PhDs: 1.4% and 1.3%, among Latino/as and Blacks, respectively (Zweben, 2010). Graduation rates are equally as polarized among females with CS degrees: 11.3% for Bachelors, 22.1% for Masters, and 18.4% for PhDs (Zweben, 2010). More appalling is the fact that high rates of international students (62.2% Masters and 48.3% PhDs) may account for the increased diversity in graduate programs (Zweben, 2010). Among game designers, the numbers are even more stark: 88.5% are male (Gourdin, 2005), and 88.3% white, 7.5% Asian, 2.5% Latino and 2% Black (Williams et al., 2009). This data partly explains the preponderance of stereotypical representations but more emphatically points to an exigent need to promote and diversify the videogame design industry.

By limiting the production of new technologically advanced tools to a highly selective and homogenous group of individuals, much of our digital world will continue to be dictated by a smaller and smaller sphere of influence. As our globalized world becomes increasingly shaped by the operations of computational tools, those who hold access and power to these tools of creation are readily revising and rewriting the intentions of the public. Rushkoff states,

“Just as we think and behave differently in different settings, we think and behave differently when operating different technology. Only by understanding the biases of the

media through which we engage with the world can we differentiate between what we intend, and what the machines we're using intend for us – whether they or their programmers even know it" (Rushkoff, 2010, p. 21).

Rushkoff emphatically pushes for a need to (1) gain access and knowledge to the tools of computational production and (2) critically analyze the current constructs of various technological tools and how it can serve to influence our daily thoughts and decisions. His point harkens back to previous arguments made by Herman and Chomsky (2002), where they highlighted the need to critically examine the influence of the political economy in the media. So, in teaching computational thinking, one must not become overly transfixed by the tools of technology, but use critical literacy to interrupt and eradicate the continual production of misogynistic, racist, classist digital tools that simply reifies hegemony. The dual process of opening paths and teaching critical literacy would create a pipeline for historically marginalized groups to create products and offer counter-narratives to the existing development of new technological artifacts.

Many researchers have demonstrated the importance self-reflection and the recognition of one's positionality in the context of teacher education and learning (Gay, 2003; Whipp, 2003; Zeichner, 2009). For many materially unprivileged urban youth of color, they possess a wealth of experiences and knowledge to engage in this process. Collectively reflecting on past and current experiences facilitates the process of shared understandings and further develops a community of compassion. By situating critical literacy around personally selected themes and messages, students will develop greater awareness of their environment and an increased motivation to complete this multi-layered, time-intensive project. The dissemination of their

final projects for an authentic audience may facilitate their agency towards initiating change and promoting empowerment in others.

The use of a youth-oriented, technological medium familiar to many students serves to challenge the traditional notion of the omniscient teacher and the banking model of learning (Freire, 1993). In this setting, dynamics of power structures are fundamentally changed and teachers must rely on students as resources of knowledge. This process facilitates the co-construction of knowledge and further develops a community of learners (Freire, 1993; Rogoff, 1994). Reliant on the strengths of each other, the classroom culture helps teachers and students develop a richer understanding in how structure, game design, game play, purpose, goal, audience, message, and theme all play vital roles in the construction of a message.

Numerous studies have pointed to the importance of leveraging students' cultural practices in addressing the achievement gap (Howard, 2010; Milner IV, 2011; Morrell, 2008; Orellana & Reynolds, 2008), but few have focused on the technological knowledge *and* prior experiences students bring with them into the classroom. This research shows new ways to conceptualize culturally relevant pedagogy and the immediacy to develop curriculum and pedagogy that surfaces this. Further, this research shows how to leverage this untapped potential while developing critical literacy lenses in the new digital world.

We know a lot about how young people engage in critical literacy, particularly in English and Social Science classrooms, but what about the field of Computer Science? Currently and historically, urban students of color have not had access to advance computer science classes nor computational thinking. This study demonstrates the possibilities a culturally relevant programming unit has for urban students of color in shaping their understandings of critical literacies and computational thinking. It has the potential to nurture a new group of critical

programmers that serve to use the latest technological tools to interrupt, challenge and transform the hegemonic powers of dominant groups.

By focusing my study on the meanings students make from the video game project and how the process and pedagogy shape those meanings, I intend to uncover a more nuanced understanding of students' sign-making process; particularly their interest in selecting, transforming, and arranging the various modes in their final products. The multimodal aspect allows for an analysis of the various modalities and their affordances. By investigating their final products and their explanations of them, I expect to better understand this social semiotic process of sign making. This research methodology also demonstrates new and profound ways on "reading" and analyzing the data. This work has the potential to show educators and researchers new modes in which students construct and represent their social world, as well as new learning opportunities.

Research Qs

How does participation in a video game production project shape students' critical literacies and computational thinking?

1. How is critical literacy and computational thinking revealed in student-produced artifacts?
2. How does the pedagogy and process shape students' critical literacies and computational thinking?

CHAPTER 2

Literature Review

I begin by reviewing a brief historical evolution of “literacy.” Next, I will highlight previous work that was instrumental in how I conceptualized my research study. Finally, I will describe the three conceptual frameworks that influenced my thinking about this work.

Literacy

There are few axioms in the social sciences that are universally accepted across the broad range of ideological and political spectrums. The importance of literacy is one that nearly every segment of society and corner of the world shares: it holds a key relationship with a society’s ability to function and develop. Though the definition of literacy may vary from literary analysis of canonical texts, an ability to use various repertoires of linguistic practice, creation of multimodal artifacts, or an ability to be critical consumers of popular culture, most would agree that an ability to read and produce academic language is a requirement for personal and professional success (Morrell, 2008). Without going into a deep analysis of economics, every single country in the world with a high Gross Domestic Product (GDP) per capita has a highly literate population. Though many have criticized the use of GDP as an indicator of a nation’s success; “people derive utility or well-being not merely from the command over income alone” (Neumayer, 2000, p. 276), it continues to stand as an international barometer for the development of basic living standards for a country. Basic literacy, or education stands in unison with health services, safety, work conditions, leisure time and a healthy and sustainable environment as basic prerequisite for improvement in the living standards of a population (Cracolici, Cuffaro, & Nijkamp, 2010).

The emphasis on dominant academic language acquisition is key when discussing literacy. Although the United States may show a literacy rate of 99% for males and females (CIA Factbook, 2003), the inequitable outcomes of materially unprivileged, immigrant, Black, Latino and Native American populations are striking. What may explain this glaring disparity when nearly all of its citizens can “read and write?” One explanation may lie in the Census Bureau’s definition of literacy. Another may be the appalling disparate literacy rate when disaggregated by race and class. The relationship between literacy and different segments of society are even more pronounced when we learn that most inmates in prisons are high school dropouts; more than 50% of the adult prison population have low literacy skills (P. E. Barton & Coley, 1996) and “nearly 40% of adjudicated juvenile delinquents have treatable learning disabilities that were undiagnosed and unaddressed” by schools (Darling-Hammond, 2007). So even if individuals that are counted by the Census as literate adults, many apparently lack the dominant academic language of power (Delpit, 1995) or the language to access and navigate in and around the institutions privileged by mainstream society. As Freire (1993) described, developing academic skills will enable marginalized groups to “fight for the transformation of an unjust and cruel society where the subordinate groups are rejected, insulted, and humiliated” (p. 135).

Traditional psychological approaches to literacy saw it as a “cognitive phenomenon” or things people did “inside their heads” and focused singularly on an individual’s ability to read and write (Gee, 2009, p. 15). They saw readers and writers as performing mental functions of decoding, retrieving information, comprehension, and inferencing (Gee, 2009). Much of this mirrors those of World War II-era behavioral psychologist that saw learning as a mechanistic process of knowledge transmission and reception (Jonassen & Land, 2000). By narrowly

defining literacy as an inert and static set of practices and skills, it presumes the neutrality of this schooling practice that is framed within the confines of the language of power or White middle-class, American standard English (Delpit, 1995; Knoblauch & Brannon, 1993). This fails to address the multiple literacies (Cope & Kalantzis, 2000) our students are increasingly bringing with them, the importance of situated context (D. Barton & Hamilton, 1998) for understanding the ideological (Street, 1984) and the connection between power, society and literacy (P. Freire & D. Macedo, 1987). By ignoring the sociocultural and sociohistorical implications of literacy, it reduces literacy to didactic, decontextualized decoding and writing of words and letters. Thus, even at its most rudimentary level, literacy must include the sociopolitical circumstances found in critical literacy, in order to support meaning making for all learners (Gregory & Cahill, 2009).

A narrow definition of literature also leaves readers with limited choices; largely canonical Western texts dominated by white male authors. More contemporary definitions of literature have added a more flexible and open interpretation to include the importance of understanding context, intent, beliefs, assumptions, and values behind literature from the canon, which also began to incorporate voices of women, racial and ethnic minorities and contemporary authors (Cruz, 2010; Recommended Literature Search Reading and Language Arts," 2010).

Despite these successes, the purpose of schools, particularly through the lens of social and cultural reproduction theorists, continue to privilege and perpetuate the ideologies, knowledge, and cultural practices of dominant groups and has resulted in the reification of inequalities and injustices in our society (Bourdieu, 1991; Giroux, 1988; McLaren, 2007). The existence of a hierarchy of cultural characteristics creates an inherent bias towards those with power and results in subordinant groups or materially unprivileged and underrepresented minorities striving to possess the “cultural capital” of the elite and rejecting their own “cultural

capital” as inferior or deficient (Gonzalez, 2005). An example of the preponderance of dominant ideologies in literacy is found in Scollon and Scollen’s (1981) study of the Athabaskian people’s view of essays (the typical academic literacy form in school). They learned that for the Athabaskians, writing an essay to a fictional audience (someone they did not know) is a violation of cultural communication norms because it is a form of cross-cultural conflict (Scollon & Scollon, 1981). This highlights the exigent need to contextualize literacy within the community and the students we teach.

New Literacy Studies

Juxtaposing itself against traditional literacy, New Literacy Studies (NLS) argues that literacy (reading and writing) is an inherently social *and* cultural phenomenon. “Literacy need[s] to be understood and studied in its full range of contexts – not just cognitive, but social, cultural, historical, and institutional... Written language is used differently in different practices by different social and cultural groups” (Gee, 2009, p. 15). NLS recognize that the written word cannot be isolated from oral language and action, but must be understood in how these different and varied contexts (situations; participants; ways of knowing, valuing, believing; involvement of tools and technologies) shape its practices. NLS’s strong sociocultural connections is seen in its focus on examining the distinctive social and cultural literacy practices a “peripheral participant” is apprenticed into a “central participant” (J. Lave, 1996; Jean Lave & Wenger, 1991) and how one should act, interact, talk, know, believe, and value certain ways of reading and writing (Gee, 2009). Thus, “literacy” becomes “literacies,” as it encompasses myriad types (academic literacy, gamer literacy, hip hop literacy). NLS has also expanded “literacies” to include “activity systems” (Engerstrom, 1987), “Discourses” (Gee, 1990/1996/2007), “discourse communities” (Bizzell, 1992), “cultures” (Street, 1995), “communities of practices” (Bizzell,

1992; Gee, 1990; 1996; 2007) and others. It is the belief that by following these different organizations of people, they would see how literacy is developed and used with action, interaction, values, tools, and technologies (Gee, 2009). Though limited in its singular focus on the sociocultural contributions to literacy practices, NLS offers considerations that students will make and derive different meanings through the various digital tools that were used in this study. Similarly, the examination of larger social and cultural influences were studied in the digital media as well as the creations students produced.

The New Literacies Studies

The New Literacies Studies continues the tradition of seeing written language as a tool for sending and receiving meaning and written language as shaped by social, cultural, historical, and institutional practices (Gee, 2009), but expands its focuses into non-print literacies, particularly “digital literacies” and literacy practiced in popular culture (Gee, 2009). Like NLS’s use of the plural form of “literacies” to connote the multiple ways people use literacy in different practices, the New Literacies Studies also sees the different “digital literacies” that participants use with a variety of digital tools in myriad settings and contexts. This “digital turn” can be attributed to globalization the past ten years and explosion and ease with which people can now communicate with one another (Mills, 2010).

Much of this was foregrounded by The New London Group’s (1996) definition of multiliteracies, housed in their two main arguments in recognizing “the multiplicity of communications channels and media, and the increasing saliency of cultural and linguistic diversity” (p. 63). The changing world of communication is best highlighted by Kress’s (2000) emphatic notion that in order to understand language and its uses, we must understand the effect of all modes of communication that is inherently present in any text. Although he was explicitly

referring to the use of images in textbooks and other media, his point demonstrates the need to understand the changing landscape of communication through multimodality. This has only been made more important with the exponential growth of the Internet and mobile technology since his writing. It is within this particular lens from which we examine the multiple and different ways with which students engage in literacy practices in critiquing and producing their own serious video games.

Media Literacy and New Media Literacy Studies

Founded in the tradition of Communications, Media Literacy was primarily concerned with the way people make meaning from media (advertisements, newspapers, television, film). This often involved meaning making from images, sounds and multimodal artifacts (a mixture of different modes of images, sound, movement interacting together). Since its inception, media literacy advocates pushed for an activist role in explicitly teaching a critical interpretation of the media they receive. Harkening back to the founders of the Frankfurt school, some media literacy advocates have argued that people are manipulated by the mass media (Horkheimer, Adorno, & Schmid Noerr, 2002) and can in turn manipulate others with media. Others (Alvermann, Moon, & Hagood, 1999; Lankshear & Knobel, 2006) place greater agency in the savvy of individuals to use media and to make meaning of media in unintended ways. The relevance of this argument is particularly profound in the world of digital media; where images, sounds and multimodal artifacts are increasingly becoming easier to produce, remix, redefine, re-produce and disseminate (Bezemer & Kress, 2008).

Building from the media literacy movement of critical analysis, new media literacies (NML) help us understand the different ways young people are reading and writing today. Previous understandings of literacy were limited to reading and writing in textual artifacts (books

and papers), today meaning making occurs through video, audio, digital and physical constructions of products. Instead of silently and independently reading a single mode, textual medium, young people today are “reading” multimodal presentations in networked spaces (Jenkins, Newmedialiteracies.org, 2010). The “new” in NML contrasts with tradition notions of communication and highlights the need to consume and produce words in new and novel ways. With the relatively inexpensive, widespread and easy-to-use technological tools today, literacy allows one to communicate through multimodal forms. Integrating these forms together, one can effectively create a single medium to create an immersive experience for an audience in the form of a digital story, blog, Web page, video game, music video, or presentation. These digital tools have shifted the participant and spectator imbalance. No longer relegated to the role of the consumer, people can now produce digital texts in forms previously reserved for professionals. Social networking platforms (Facebook, Twitter, LinkedIn) and devices (mobile devices, iPads) have transformed the way large networks and groups can form and communicate. These digital tools have given rise to a culture of “Pro-Ams” where youth capitalize on the ubiquity of the Internet and other digital tools outside of school to learn and become experts in these spheres (Gee, 2009).

Clearly, our educational system has not kept up with the exponential growth of these new media literacies. To remain relevant and engaging with texts our young people are reading and producing, seismic ideological shifts must occur among adults in and around education. Borrowing the bidialectal approach of teaching standard language usage while also honoring and using students’ community language, new media literacies can similarly co-exist with the teaching of dominant language practices. In fact, this new “bilingualism” can serve students by engaging students in the participatory culture of new media literacies, while teaching to

standards demanded by the state and other institutions. Since the shift is movement away from individual expression to one of participation and creativity, it seems to be an ideal scenario to connect these learnings in ways that build off the strength of both. At the same time, this convergence of curricular and pedagogical practices can support the meta-investigation of paradigm shifts in power within the classroom. The teacher no longer needs to be the sole knowledge-bearer but instead can acquiesce to the expertise of students.

Digital Storytelling

Use of new media literacies is a growing trend in many classrooms around the nation but research is just beginning to examine the power and potential of these tools. The proliferation of digital stories in English language arts and other classrooms have highlighted how this tool can be used to connect traditional literacies with those that are relevant to students.

Digital storytelling is an emerging art form of personal, heartfelt expression that enables individuals and communities to reclaim their personal cultures while exploring their artistic creativity. While the heart and power of the digital story is shaping a personal digital story about self, family, ideas, or experiences, the technological tools also invite writers and artists to think and invent new types of communication outside the realm of traditional linear narratives ("The Center for Education Reform," 2008).

Hull and Katz (2006) demonstrated how digital storytelling, in conjunction with supportive social relationship and opportunities to participate in community based organizations, can lead to forming and giving voice to individuals to become agentive selves; influencing present circumstances and future possibilities. Their case study of two young people found that the use of digital storytelling for personal narratives offers individuals an opportunity to

comment critically on their social life, and “reposition themselves as agents in and authors of their own lives” (Hull & Katz, 2006, p. 69)

In many ways, the creation of these counter-narratives allow for students’ voices to surface is powerful in and of itself, serving to expand knowledge beyond traditionally accepted forms of knowledge, which has typically served the interest of dominant groups and ideologies. Furthermore, “it [digital storytelling] allows learners to construct their own learning, thus engaging students in inquiry and active learning processes” (Hathorn, 2005, p. 32). Through the process of creating a digital story, students are constantly questioning themselves and their partner’s actions and performances.

By having multiple semiotic modes, students must determine the meaning and message they are attempting to communicate to the audience. Through these processes, students are made aware of the complex process of shaping meaning through oral, visual, textual and music forms. Throughout editing, the discursive process of construction, modification, reconstruction, re-contextualization, and refinement results in an awareness of how words shape thoughts and in turn, their audience’s thoughts shape words. This example highlights the complex and multiple production processes required of an individual in producing a piece of “text” that effectively communicates a given message. It is with this that we galvanize students’ creation of multi-layered serious video games.

Conceptual Frameworks

Critical Literacy

Materially unprivileged students of color in urban communities have historically and institutionally received the short end of the symbolic opportunity stick. Besides inequitable material conditions and resources, few have had access to or an awareness to the codes of the

“culture of power” (Delpit, 1995). This has continued to keep marginalized groups in the dark and unable to explain the sociohistorical connections of their present condition. This ahistorical understanding has largely supported the movement behind meritocracy ideologies and educational reforms without implications of socioeconomic and sociopolitical factors. Transformation must begin with recognition of the power of “historicity” or the influence of past inequitable structures in shaping current worldviews and conditions (Hinchey, 2001). For marginalized populations, schools have the potential to engage students in understanding how and why knowledge, power, and society are inexplicably connected and where we, as individuals, fit within this system (Aronowitz & Giroux, 1991; P. Freire & D. P. Macedo, 1987).

Critical literacy offers a literacy to people to use words to rethink the world they live in and dissent on society; connecting the “political and personal, the public and the private, the global and the local, the economic and the pedagogical, for rethinking our lives and for promoting justice in place of inequity” (Shor, 1999). Using language as social action, we become activists within the larger society that we engage in. Thus, learning to read and write is part of the process of becoming conscious of one’s role and experience as a part of historical and social constructions around power relations (Anderson & Irvine, 1993). By supporting students’ questioning of power relations, identities, and discourses, students begin the self-reflective process of understanding themselves and their positionality in society. By turning inward, students are connecting outward. Their personal identities, experiences, and communication styles become part of a larger, shared collective identity with those who have struggled as marginalized people. They will begin to translate this internal nourishment of their brain and heart into action and skills that promote equitable and just outcomes.

By imagining ourselves in others, we begin to inquire about the voices who are heard and those who are missing (A. Luke & Freebody, 2002) or silenced (Harste et al., 2000), and those producing dominant narratives and those producing counter-narratives or counterstories (Farrell, 1998; Yosso, 2005). The explication of the multidimensionality of viewpoints demonstrates that our “reading” of the world have at times been manufactured and/or reinforced through larger sociopolitical forces. Thus, all learning, curriculum, pedagogy or even language becomes a social construction of ideologies shaped by power. Essentially, nothing is value-free. Every supposed unbiased curriculum or teacher has been shaped by values, ideologies, actions, and language governed and often dictated by the state. Even the medium of communication between the teacher and student is not neutral, but highlights a certain perspective or point of view (Bruner, 1986). Despite the seemingly intractability of altering this conundrum, poet Adrienne Rich (1979) offers hope to change this dominant paradigm:

“Language is power and... those who suffer from injustice most are the least able to articulate their suffering... the silent majority, if released into language, would not be content with a perpetuation of the conditions which have betrayed them. But this notion hangs on a special conception of what it means to be released into language; not simply learning the jargon of an elite, fitting unexceptionably into the status quo, but learning that language can be used as a means for changing reality” (Rich, 1979, pp. 67-68).

Her emphasis on using the language of the elite is clearly meant to highlight how we use the “master’s tools” rather than simply acquiring them. The inherent political nature of Rich’s point is well taken by critical literacy to ensure the use of the dominant language by oppressed groups to engage in decisive action to dismantle the hegemonic structure that continues to privilege the dominant groups.

Traditionally marginalized groups continue to exist in our society without access to the language of power, yet proponents of the technological boom continue to highlight the equalizing power of the Internet in reshaping society. However, despite the exponential growth of technology in the past two decades, rather than a narrowing of the socioeconomic divide, we have simply blurred the lines of disparities.

Computational Literacy to Computational Thinking

If critical literacy is the nourishment for the brain and heart, then computational literacy is the physical nourishment for the body. Although critical literacy offers individuals the ability to examine, critique, challenge, and change the existing inequitable conditions in society, it does not necessarily translate into the daily nourishment for survival. Computational literacy offers something more tangible.

During the current technological boom, the possession of computational literacies, even amongst the most marginalized, can readily provide a more secure material existence. However, similar to the acquisition of dominant written and spoken academic literacies, fluency in computational literacy does not necessarily translate into a more equitable society. As Rich described earlier, it is not simply learning the computational literacy of an elite and fitting seamlessly into the dominant group, but learning skills that can be used as a means for changing reality. For those that possess these literacies of power, they may support a more diverse pool of applicants into the computational literacy pipeline, but few indicators would suggest that this would create wholesale transformation in the development of tools for a more equitable society. Therefore, in the same way that academic literacies must be taught in conjunction with critical literacies, the same can be said of computational literacies. Unfortunately, the uphill battle for basic access and opportunities to these tools are far more daunting.

There continues to be a deep racial divide in the field of Computer Science (Margolis, 2008). The computer science world is a homogenous population of majority white and Asian males. A national study of Computer Science and Engineering PhD-granting institutions showed that only 8 percent of bachelor degrees and 4 percent of master's degrees went to African Americans and Latino/as (Zweben, 2006). During the 2010-11 school year in California, ("State of California Education Profile: Students," 2011) 57.1% of the public school population were Latino/a or Black, but only 9% of AP Computer Science test *takers* make up the total ("California Summary of AP tests," 2012). According to The College Board (2012), of those that took the AP test, with a scoring range between one to five, the mean for Blacks was 2.59, Mexican-Americans 2.4, Other Latino/as 2.34, Asians 3.56, and whites 3.5. Rates among female test takers were equally as appalling; only 21% were female ("California Summary of AP tests," 2012). Much of this is the result of the non-existence of or substandard offerings of computer science courses in low-resourced schools with large numbers of African American and Latina/o students (Margolis, 2008). The affect of institutional racism seemed to play a large part in these inequitable outcomes. Excuses for not having quality computer science courses available for students of color include beliefs by adults that they were "not interested" or "not capable" of handling such rigorous material (Margolis, 2008).

The mainstream media has done a tremendous job of creating and depicting the illusion of the omniscient, technologically-savvy "digital native"; able to quickly learn and adjust to new technological tools, while simultaneously juggling several at once. However, the difference between utilizing mobile devices and its applications, surfing the Internet, creating and maintaining a Facebook page and those that utilize higher-order computer programming skills to

develop the programs and infrastructure are dramatic different. This is the difference between being computational literate and computational thinking

For the sake of this study, computer science is defined as the “study of computers and algorithmic processes including their principles, their hardware and software designs, their applications, and their impact on society” (Tucker, 2003, p. 6). Computational thinking is the ability to understand and use computers to store, transform, and transfer information while using algorithmic thinking: a list of well-defined, step-by-step instructions for accomplishing a task to solve problems and design systems (Wing, 2006). Despite Wing’s germinal call-to-arms to address and define computational thinking for K-12 students and educators, there remains widespread differences on what should be incorporated and discounted from this definition. Though similar to critical and mathematical thinking in many ways (thinking creatively while synthesizing and applying prior knowledge, in a logical manner), some have emphasized its difference as incorporating a combination of thinking skills. Barr, Harrison and Conery (2011) argues that it is more tool oriented; makes use of traditional problem-solving processes like trial and error, iteration and guessing in contexts, where previously it was impractical, but with the advent of technology, it can be automated and attempted at much faster rates.

Under these definitions, the stereotype of the silent, automaton computer programmer should be replaced by highly creative and intelligent individuals with the ability to bring prior knowledge and experiences to resourcefully problem-solve and engage in complex communication with others (Levy & Murnane, 2005). Further, Resnick argued that the kinds of activities involving computational thinking (simulation, modeling, abstraction, automation, analysis) also requires “an iterative design, refinement, and reflection process” (Barr, Harrison,

& Conery, 2011, p. 50). It is precisely through these encapsulating definitions that allow for overlaps between critical literacy and computational thinking.

Culturally Responsive Pedagogy (CRP)

We have long known the importance of using culturally relevant pedagogy to connect to the lives, prior experiences, and cultural practices of the students we teach (Banks et al., 2007; Gonzalez, 2005; Ladson-Billings, 2009). Effective educators, by which I mean teachers who consciously and skillfully mediate learning and growth (personally and academically) by valuing and effectively using the students' backgrounds as a resource, often possess a strong knowledge of their subject area, pedagogy, and their students and communities (Rose, 1995). Additionally, developing strong student-teacher relations; especially in showing genuine care for students (Noddings, 2005; Rose, 1995) and having high academic expectations (Ladson-Billings, 2009; Thompson, 2007) are also essential to creating a thriving classroom culture. All of these characteristics must operate in unison to effectively mediate the learning for public school students who are increasingly coming to school with backgrounds and experiences different from the majority of the teaching force. The literature on effective CRP has shown us that students must experience success in developing academic skills, sustain and develop cultural competence in the classroom, and increase critical consciousness to challenge prevailing social patterns of inequality (Ladson-Billings, 1995). Academic success is a proposition that is consistently echoed by various researchers of CRP (Ladson-Billings, 1995; Nieto, 2010; Villegas & Lucas, 2002).

CRP derives its name from its emphasis on recognizing, valuing, and incorporating students' abilities, experiences, cultures, participation styles, frames of references, and community resources to enhance learning (Villegas & Lucas, 2002; Zeichner, 2009).

Unfortunately, history has consistently viewed non-dominant groups' culture (lower socioeconomic status and minoritized groups) from a deficit perspective, rather than as a resource from which schools can build from (González, Moll, & Amanti, 2005). A deficit perspective of diverse student population will create challenges to teaching in culturally responsive ways (Ladson-Billings & Tate, 1995).

Aside from recognizing the cultural and racial hierarchies C. D. Lee (2002), Orellana and Bowman (2003), and Gonzalez (2005), also push against static notions of underrepresented students backgrounds and call for a transformative schooling that values and validates the accumulated cultural and linguistic backgrounds and skills of the diversity of students' histories and identities. C. D. Lee's (2001) cultural-historical activity theory approach to deconstructing the cultural practices of her students in an analysis of a text highlights a novel approach in coaching, scaffolding, and facilitating learning in an urban middle school classroom. It highlights the need to understand culture, as well as race, ethnicity, and social class as a complex, fluid, situated, multifaceted, and socially constructed process that teachers must recognize in order to best support students in reaching their potential development level (Gay, 2000; Gutierrez & Rogoff, 2003; Howard, 2001; Lee, 2002; Orellana & Bowman, 2003).

Various qualitative studies examining the importance of cultural competency have shown different methods teachers have used to incorporate the knowledge of students and their communities into the classroom (Diaz & Flores, 2001; Duncan-Andrade & Morrell, 2008; Moll, Amanti, Neff, & Gonzalez, 1992). Moll, Neff, Amanti and Gonzalez's (1992) work with teachers and university-based researchers doing ethnographic research in the homes of their working-class, Mexican students demonstrate that when teachers learn the sociopolitical and economic ramifications of the border city and context of the households of their students, they

are better prepared to develop curriculum and pedagogy that supports and improves the long-term social relationships between students and teachers. Their study highlights the need to “analyze the social history of the households, their origins and development, and... the labor history of the families, which revealed the accumulated bodies of knowledge of the household” or the funds of knowledge that students bring into classrooms (Moll et al., 1992).

Morrell’s (2005) work with students as critical researchers of the language and literacy practices of urban communities, cultures, popular culture, and the constructions of youth of color by the mainstream media highlights the variability of CRP. Recognizing that CRP goes beyond surface level connections of culture, Jimerson (2010) demonstrates that an Asian-American text in a largely African-American and Latino classroom can and does offer relevance when situated around the interconnectivity of experiences. These studies prove pedagogy that “speaks to youth” goes beyond mere connections to racial, ethnic, and cultural understandings, but incorporates varied experiences, frames of reference, and community resources as genuine responsive pedagogy (Villegas & Lucas, 2002). A point of caution is worth noting here. Villegas and Lucas (2002) remind us that besides knowing the student and their communities’ funds of knowledge, the instruction must be well-designed to support the learning and development of these students.

The work of Morrell (2005) and Jimerson (2010) reveal the evolution of CRP beyond the narrow confines of traditionally defined racial and cultural practices. For young people today, their participation and involvement in other forms of community (popular culture: sports, the arts, and even entertainment like video games) need to be utilized in much the same way we’ve learned from previous research about the salience of culture competency in the classroom. Social networking, “surfing” the Internet, and video games are just a few of the technological

forums where young people are spending a disproportionate amount of their leisure time. In the same way that previous researchers (Au & Jordan, 1981; Mohatt & Erickson, 1981; Moll et al., 1992) demonstrated the importance of recognizing and using students' language and sociocultural practices in the classroom, teachers must do the same for the diversity of other knowledge students bring into classrooms with today.

Sociocultural Learning Theory

For marginalized students to experience academic success, teachers of culturally relevant pedagogy must be adept in knowing how students construct knowledge and how to best support their development with effective learning strategies (Villegas & Lucas, 2002). Rooted in behavioral psychology and communications theory, instructional design during the 1940s and 50s assumed that learning essentially encompassed knowledge transmission and reception (Jonassen & Land, 2000). Also known as traditional instruction or the banking model, this form of instruction continues to dominate schooling practices from Kindergarten to higher education today. A critical flaw under this model is the interchangeable use of the term: student and learner. This fallacy assumes that every student or learner in the classroom has willingly chosen to enter the classroom space ready and willing to learn. This disregards the heavy-hand social conditioning of schools as institutions that control the learning process for each individual. Instead of a learner who “construct[s] their own meaning from their experiences” (Jonassen & Land, 2000, p. iv), students are often told what to memorize and regurgitate on some form of assessment. Movement away from the transmission model of instruction did not begin until the 1980s and 1990s, when learning began to develop theoretical foundations from different disciplines, with some similar assumptions and foundations. Learning theorists realized that “learning is willful, intentional, active, conscious, [and a] constructive practice that includes

reciprocal intention-action-reflection activities” (Jonassen & Land, 2000). For individuals to make meaning, they must resolve differences between what they know, and what they want or need to know. This places knowledge building as an inherently personal and socially constructed process.

The social nature of the meaning making process has begun growing in significance. As people who share the physical world with one another, we also share meanings we make from it. These cultural habits can connect and differentiate us, but as social creatures in society, we rely on feedback from others. This assumption of social negotiation and learning is the underlying foundation for much of sociocultural learning theory. Learning does not occur in isolation, but through meaning making with others. Our interactions with various communities shape our practices, knowledge and beliefs about the world and our local society, which in turn are shaped by our knowledge, belief and values. Our “legitimate peripheral participation” (Jean Lave & Wenger, 1991) is shaped by the culture we engage in and conversely the culture is shaped by individuals within it. As a result, when we discuss learning, we must consider the sociocultural and sociohistorical environments from where the learner derives, as well as the tools and mediation systems that are used (Jonassen & Land, 2000). Rather than an isolated endeavor, the ideal learning environment is one that utilizes knowledge of the learner, community context, and the historicity of these toward a personal and meaningful mediation of the learning process.

Vygotsky (1978) demonstrated the use of mediators or person and/or artifacts that facilitates a child’s actualizing of their potential developmental level and to what degree the mediation must occur to best support learning. One strategy is seen in Rogoff’s (1994) extension of Vygotsky’s zone of proximal development concept by highlighting this practice in a community of learners. Students work cooperatively to make meaning, relationships, and

understandings of concepts that build off of each other's interpretations of information. Only by understanding principles of sociocultural learning theory, as well as sound pedagogical strategies like backwards planning (Wiggins & McTighe, 1998) can educators effectively support the academic success of their students.

Drawing from critical literacy (Shor, 1999), culturally relevant pedagogy (Banks, et al., 2007; Gonzalez, 2005; Ladson-Billings, 2009), and sociocultural learning theory (Lave & Wenger, 1991) this research leverages the intersections in these traditions, as well as its distinctions. Building from critical literacy, this research expands the notion of traditional written and spoken text (The New London Group, 1996). By becoming conscious of one's role and experience as a part of historical and social constructions around power relations (Anderson & Irvine, 1993), this research extends students' questioning to the multimodal digital world. By studying the meaning making process young people engage in through the multiliteracy activities of videogame play and design (Sanford & Madill, 2007), we developed a more nuanced understanding of the learning involved in this process. Because of the multimodal social semiotic modes, students must determine the meaning and message they are attempting to communicate to the audience, and through these processes, students are made aware of the complexities in shaping meaning through oral, visual, textual, and auditory forms (Kress, 2010). In the tradition of critical literacy, developing praxis through action and theory (Lewison, Flint, & Van Sluys, 2002; Morrell, 2008; Shor, 1999), culturally relevant pedagogy similarly argues for a sociopolitical consciousness, while developing academic achievement and cultural competence (Ladson-Billings, 1995; 2009). These three pillars drive the foundation of this curriculum explicitly targeting the historically underrepresented populations of women and Latina/os in Computer Science.

CHAPTER 3

Research Design

This design-based research study (Sandoval & Bell, 2004) examined a researcher-designed, seven-week critical literacy video game project, True Life Remixed, in a South Los Angeles Computer Science classroom. Tenth grade students read, researched, analyzed and reflected on various forms of media and its relations to macro sociopolitical issues in their community. After selecting a research topic of their choice, students produced a message-driven, “choose-your-own-adventure” video game with the express purpose of initiating social change to those who play their game on the Internet. This curriculum unit was conducted between April – June 2011.

This research study was carried out in an elective course that is a partnership between the school district and a local university, with the goal of increasing interest and excitement in the Computer Science field for traditionally under-served populations; Black, Latina/o and female students. Students were exposed to theoretical discussions between technology and human society, the Algorithmic problem-solving process, web-design, programming, and robotics. The True Life Remixed project was a modified version of unit four from the curriculum guide. Students were asked to create a “serious game” about an aspect of their life or an issue in their community. Students engaged in activities that asked them to identify stereotypes about them and their community and produce a video game that presented a counter-narrative message to the dominant one. I collected data through field notes of class observations, student handouts, journals, video and audio recordings, final reflections, video games, and small group interviews.

This research study investigated how students' participation in a video game curriculum project shapes their critical literacies and computational thinking. Specifically, I examined how students reflected, produced, and represented themselves and society through their games.

Data reduction and analysis occurred in five main phases. The first phase was conducted concurrently with data collection. I reread daily field notes on a weekly basis to create memo reflections that reflected emerging themes and trends. At the end of the curriculum unit, I started by scrutinizing students' reflections of their projects (through final written reflections and small group interviews). This was prioritized in the data analysis plan to privilege student voice in articulating their experience and reflection of the project since this represents their culminating views of their critical and computational literacies from the unit. Next, I selectively analyzed lesson plans, field notes, and audio-recordings to clarify, contextualize, and inform students' points from their reflections. These selections provided me with moments that represented particularly poignant examples of developing critical and computational literacies. In the fourth phase, I re-examined and analyzed student-produced artifacts (journals, reflections, handouts, drawings) for further clarification of their reflections. I also followed individual student work trajectories from initial brainstorming of ideas to final product, coding for instances of emerging themes, trends, and ideas. This allowed me to look at changes in discourse, ideologies, and representations of themselves and society over time. In the fifth phase, I used a multimodal social semiotic approach⁶ to examine the students' serious video games. I elected to use this approach because these products possess multiple modes and layers, many of which occur simultaneously. To effectively capture the rich and complex layers of data, I separated out the

⁶ A multimodal social semiotic approach recognizes the various ways in which people make meaning and learn. "The social semiotic part of the theory attends to uncovering the sign- and meaning-maker's interest; to the semiotic work done and the principles used in selection, transformation, transduction, arrangement of modes. The multimodal aspect attends to the modal resources used and to their affordances" (Kress, 2010, p. 221).

various parts. In this way, I focused my attention to the different aspects of the creation, construction, and meaning-making process. Using abductive reasoning (an incomplete set of data is used to form initial hypotheses) allowed for a more creative, intuitive, and revolutionary reasoning process towards my findings (Thagard & Shelley, 1997). I separated the games into computational practices (design and programming) and representations (how signs are represented and how they convey meaning), while looking for evidence of critical and computational literacies.

This research was informed by a pilot study I conducted between December 2010 and February 2011 (over the course of five weeks). The initial pilot study examined three distinct phases of the curriculum: the explicit teaching of critical media literacy with various forms of popular media; personal examinations of macro sociopolitical issues that connected to personal and meaningful issues in their lives; and the creation of a video game with the express purpose of educating others about the lives of urban youth.

This pilot study helped me re-conceptualize the framing, pedagogy, and products of this curriculum and the focus of my research questions and data collection instruments. I learned to better integrate the teaching of critical media literacy and students' prior experiences; increase scaffolding and support in the development of students' video game messages; and a more explicit focus on developing community and peer support to aid in collaborative learning and problem-solving. The changes in the research study included: greater focus on students' meaning making processes, particularly the signs and representations in the games (examining their products with a specific approach); improve opportunities for students' explanations of their games (by asking more specific think-aloud questions); and a more expansive view on the significance of audience in their production process. These lessons led to modifications in the

research: data collection methods (increase use of journal reflections, focus group interviews vs. surveys); the renewed focus on and adoption of a multimodal social semiotic approach to video game analysis; and more focused research questions around specific outcomes.

This second iteration of the study expanded on the pilot study; there was significantly more overlap and intersections between the three phases of the project. Critical literacy was explicitly taught during week one and two through short, documentary video clips and critical media analyses in popular culture (advertisements, magazines, TV shows, semiotic images, and digital multimodal products). Self-reflection activities began at the start of the semester but a greater focus on personal reflections commenced during week two and three of the project. These two areas worked together in connecting the personal microanalysis of the self with larger sociopolitical implications of power, institutions and society. Student self-reflection pedagogies borrowed heavily from the success of other urban, autoethnography research projects with youth (Camangian, 2010). By researching and writing about themselves with a lens toward culture, students gained a greater understanding of the influences of larger societal institutions on their daily lives. The third phase of the project was the student production of a “text” or serious video game that challenges their audience to think critically about themselves and their society. Computational literacies such as (algorithmic problem solving; organizing, analyzing, and representing data; systems thinking) was taught through the creation of their video game project in a project-based learning format. Freedom was given to students in the selection and design of their video. This pedagogical strategy allowed engagement and personal investment to flourish and learning and development to develop organically; where ideas drove the technical acquisition of skills.

In my research study, I collected data of activities directly before, during, and immediately after class. These moments often captured conversations with students and between students, often though not always related to the curriculum. During the final two weeks of the unit, additional data collection included times when students came in during second period, at lunch and/or after school to finish their video games. I video and audio-recorded all class sessions and audio-recorded non-class time conversations with students and the co-teacher. I wrote field notes after each session and analytic memos at the conclusion of each week. I collected most of the student-produced artifacts (handouts, journals, videogames, reflections) during the seven-weeks. In the last week of the project, I conducted small group interviews with all of the students who were present on the last days of the school year.

Background into the site.

My access to this site was quite fortuitous as it came as a result of my graduate student research work as an educational coach for the Los Angeles Unified School District's (LAUSD) Exploring Computer Science (ECS) program. After visiting fifteen different teachers and thirteen different high schools as a part of this program, I was drawn to Mr. Perez's classroom. He had an easy-going teaching style, a strong rapport with students, and most importantly, was open to a complete modification of the programming unit from our curriculum guide. Earlier in the school year, Mr. Perez chose to focus on student engagement and computational thinking as his two goals. With background experience in Culturally Relevant Pedagogy, I supported Mr. Perez's focus by co-planning curriculum and pedagogy that would be more meaningful and relevant to his students. Mr. Perez's role as the school's main technology and network support provider alleviated any unforeseen technical and/or computer problems during the entirety of the project.

The students, parents and guardians provided signed assent and consent forms to participate, be interviewed, and audio/video-recorded prior to the first day of the project. Each form was explained to students by both the researcher and teacher and students were given the opportunity to abstain from the research component at any point. Students were informed that participation or non-participation in the research would have no influence on their performance or grade. Additionally, since a majority of the class had Spanish-speaking parent(s)/guardian(s); the consent form to participate, to be interviewed and audio/video-recorded was translated into Spanish. Every permission packet contained a Spanish and English letter to avoid possible stigma in requesting a Spanish form. This study is a part of the multi-year, district-wide research study that has been previously approved by the IRB offices of UCLA and LAUSD. All forms were approved by UCLA North General IR (Protocol ID#10-001701, 12/13/2010) and include information covering my research study.

Rationale for Methodology.

Design-based research studies supports the bridging of scientifically-sound, generalizable laboratory research (Graham & Stacy, 2002) with the complex instructional interventions found in classroom educational research (A. L. Brown, 1992). Using a design-based research methodology simultaneously support effective teaching and student learning while utilizing the natural classroom environment to examine those teaching and learning practices (Sandoval & Bell, 2004). Specifically, it recognizes the moment-to-moment changes and modifications in curriculum and pedagogy that are the natural outcomes of working within a real classroom.

Since I examined how the pedagogy and process shaped students' critical and computational literacies, I will describe the influence of sociocultural learning theory on the framing of the class structure, activities, and products. From Vygotsky's (1978) theory that

learning and development occurs through social activities that incorporates their surroundings, previous experiences, and how they make meaning and convey that information to others (J. S. Brown, Collins, & Duguid, 1989; Jean Lave & Wenger, 1991), I created a curriculum that hinges on these very ideals. By giving students opportunities to use prior knowledge, life experiences, and cultural practices, they can more readily make meaning of new information. Structuring genuine group work activities allows students to interact and make sense of the information through the support of expert others. Following Vygotsky's zone of proximal development (1978), consistent teacher recognition, encouragement, accolades and classroom systems and structures, students more readily actualized their potential development level through peer support. Further, cultural historical activity theory also supports the framing of this curriculum in its ability to utilize cultural tools and artifacts important to youth (youth language practices, multi-modal literacies in video games, social networking sites, popular culture) to mediate learning and development (Cole, Engeström, & Vasquez, 1997).

Many of these concepts are iterations of culturally relevant teaching practices (Ladson-Billings, 2009). In addition to the necessary cultural competence, students will develop academic skills through computational literacies, as well as new media literacies. Thus, the structure and pedagogy of the curriculum lends itself to the three pillars of culturally relevant pedagogy - cultural competency, academic success and critical consciousness.

Description of the Sites and Selection Rationale.

Following the sociocultural tradition that higher-order thinking, learning and development occurs through social interactions (Cole, 1996; Vygotsky & Cole, 1978; Wertsch, 1991) and curriculum and pedagogy must interact with the sociocultural and sociohistorical

conditions of the site (Moll et al., 1992), I will now spend some time discussing the context of the location and the students.

Selection and Description of the Focal Site.

Sylvester High School is located in the urban, working class community of Truba. It sits at a location that was once a major automobile manufacturing plant in Southern California. According to 2009-10 figures Sylvester has a 2,855 9th - 12th graders. This recently built school (2005) sits on nearly 58 acres of land and as such, is one of the largest in the entire school district. A middle school, built at the same time, sits adjacent to the high school and both were constructed to relieve overcrowding in nearby schools. Despite these intentions, the current student population already exceeds the architect's original plan for a 2,500 student body. However, the multiple, tan-colored buildings, wide and well-lit corridors and a large open courtyard gives it an airy and spacious feel. Upon first impressions, many visitors remark on the community college-like atmosphere of the school.

Despite the grand and fortress-like scale of the high school and middle school buildings, they are juxtaposed against older, stout buildings across the street. Sylvester is bordered by single-family homes on two sides, an industrial building on another and railroad tracks on its remaining side. In the mornings and afternoons, the tiny two-lane street in front of school becomes a maze of cars, pickup trucks, SUVs, and vans crawling at a standstill. At every street intersection, swarms of teenagers march to and fro; rushing to get to school or meandering their way towards their parents' cars or homes. Surprisingly, these weekday bustling intersections only represent about half of the morning and afternoon rush hour since the adjacent middle school's schedule is purposely staggered to start and end thirty minutes after the high school's schedule. The outcome of these attempts to alleviate this mind-boggling traffic jam is a high

school schedule that begins at 7:30 AM and ends at 2:30 PM. As a result, lunch period usually begins at 10:37 AM and on some alternative schedules as early as 9:30 AM.

Although Sylvester maintains a Truba residence-only policy, several students have mentioned that they actually live in neighboring communities and use relatives' addresses in order to establish residency. Some of the neighboring communities have higher poverty and crime rates than Truba. The adjacent community of Elmhurst has an infamous reputation for gang activity and violence. Imperial high school, which is located literally and figuratively across the railroad tracks from Sylvester underwent a mandatory high school transformation in the 2011-12 school year; the school district originally reconstituted the school and re-established it into three smaller schools. However, one of the two charter management organization-led schools pulled out and now only two smaller schools remain. The other school is being directly managed by the Mayor's office. Additional information shows that the census tract for Imperial high school has double the number of households with an income below \$10,000 per year and only about half the population is in the labor force; 31.8% compared to 59.3% ("Selected Social Characteristics in the United States: 2007-2009 American Community Survey," 2011). Finally, the racial divide is particularly glaring when we see that the two high schools' respective census tracts are divided by a single street but one is 95.3% Latino compared 57.8%. Further, the Black population is 0% for Sylvester's census tract whereas Imperial's is 41.9% ("Selected Social Characteristics in the United States: 2007-2009 American Community Survey," 2011). These numbers do not fully capture the history and strength of the black community in Imperial, which was once a center for African-American culture, politics and organizing. The historically Black neighborhood and population of Imperial may in fact be one of the reasons why many Latino students in the Elmhurst community use relatives' addresses to attend Sylvester.

During the 2009-10 school year, the student population of Sylvester High School was 98.9% Latino with the remainder being African-American, White, American Indian or Alaskan Native, Asian and Filipino, in descending order (California Department of Education, 2011). According to district numbers, 88.3% of the students qualify for Free/Reduced lunch, a general indicator of the poverty level of the school. Despite the large Latino population of the school, only 28.4% of the students are English Learners, with approximately 48% having been reclassified as Fluent-English-Proficient students (California Department of Education, 2011). This may be explained by Census tract numbers where 54.2% of the population is born in the U.S., while an overwhelming 88.6% of those who are foreign born immigrated to the U.S. over 10 years ago ("Selected Social Characteristics in the United States: 2007-2009 American Community Survey," 2011).

During the 2010-11 school year, Sylvester was in its fourth year of Program Improvement status; a Federal Accountability measure that gauges schools based on student test score performance. It did not meet the annual measurable objectives (AMOs) mainly because it did not meet the 55.6% proficient or above AMO for English/Language Arts for 2010 (42.1% for Sylvester students), the 54.8% for Math (39%), nor the 90% graduation rate (70.38%) set by the State of California (California Department of Education, 2011).

This site was selected because of the previous relationship it had with the Exploring Computer Science program and the willingness and interest of the teacher to expand and modify the curriculum and pedagogy to the interests of the researcher. This site is also highly representative of many typical urban comprehensive secondary schools: a large population of high-poverty, minority students; a history of inequity and lack of access and opportunities to

computer science courses and by many measures, a poor academic performing school (graduation rates, college-attendance, test scores, drop out rates, etc.)

Description of Participants.

This study included thirty 10th graders and two 12th graders enrolled in the Computer Science (CS) elective class. There were seventeen female and fifteen male students. In comparison to other Exploring Computer Science classes in the district, it was a little unusual that there was a slight majority of female students in this course. Out of the thirty-two students who filled out the pre-course survey, all of them identified as Latina/o, Chicana/o, Mexican, or Mexican-American while two students identified as Mixed Race. One student also identified as White. Of the 31 students whom I had data for, four students were classified as Limited English Proficient (LEP), three were Initial Fluent English Proficient (IFEP), twenty-two were Reclassified Fluent English Proficient (RFEP) and one student was listed as English Only (EO). Based on the school's poverty index, 26 of 31 students (84%) met this standard. Also, two students are designated as part of Gifted program. Student performance on the California Standards Test (CST) in English Language Arts varied greatly; three were Advanced, eleven were Proficient, twelve were Basic, three were Below Basic and two were Far Below Basic. Math performance in the CST was quite a bit lower; zero were Advanced or Proficient, nine were Basic, twenty were Below Basic, and two were Far Below Basic. Similarly, the cumulative GPA through the first half of their 10th grade year was quite low: five students had a GPA below 1.0, ten students between 1.0 – 1.99, eleven students between 2.0 – 2.99, and only three students had a GPA above 3.0. If this trend continues, out of a class of 31 students, not even half (14) of the students would have the minimum requirements to qualify to attend a California State University and only 3 students for the University of California system.

Although an elective course, nearly 67% respondents explained that administrators placed them in this course compared to three students who showed genuine interest in computers. However, in the same survey, nearly all respondents shared that they are “somewhat to very interested” in learning about computer science. This may allude to the fact that approximately 73% of students recognized that they “need computer science in their future work/career” and nearly 78% agreed or strongly agreed “knowing computer science will help me earn a living.” In relation to our autoethnographic video game project, almost 50% of the students stated that they had a less than an intermediate understanding of programming skills upon entering this class. To further illustrate students’ interest and engagement in Computer Science, 80% of the students disagreed or strongly disagreed with the statement that “computer science is boring.” Participants described their uses of computers and/or laptops as: homework (93.3%), searching the Internet (86.7%), music download (80%) and Myspace/Facebook (76.7%). Interestingly, every one of the students stated that they have access to a computer/laptop outside of class. Participants also showed a high degree of motivation towards higher learning; 80% of respondents stated that they plan on going to a community college but only 20% to a 4-year university immediately after high school. For the students in this Technology magnet within the larger school, students are required to take one of three paths of technology courses. This course represents one of their optional paths.

Data Collection: Participant Observation

My research role in this qualitative, design-based study was as a participant-observer. I co-taught and collected data Monday through Friday during the entire class period for the seven-week curriculum. During class time, I was both the teacher and researcher. Depending on the day and the activity, I facilitated discussions, taught through direct instruction, observed small

group discussions, asked questions while students worked, took field notes, and/or observed my co-teacher deliver instruction.

Recognizing the challenges of occupying both of these roles, I relied on two recording devices during class that aided in my field note writing process. I used the Livescribe Echo pen with attached Echo 3D recording ear buds to audio record conversations. I used the Canon ZR930 digital camcorder with an Azden ECZ-990 Zoom Microphone to videotape classroom activities. The Echo pen allowed for audio playback of occurrences of the classroom by simply pointing the pen to a location on my notes. This greatly increased memory recall of class interactions and activities when I wrote my field notes. The addition of the Echo 3D recording ear buds provided greater flexibility in capturing student voices from across the classroom, in one-on-one and small group conversations. The placement of the ear buds around my collar also lessened the intrusiveness of the Echo pen with its LED displayed “REC” button. Although limited by its ability to clearly capture the voices of quieter and physically distant students in the classroom, its size and portability provided flexibility for data collection. The digital camcorder with attached zoom microphone complemented the Echo pen with its ability to capture audio more fully and provided data of the physical setting of the classroom. This allowed me to review the facial and body language of different students and movement around the classroom. Detailed lesson plans also facilitated my memory recall of each day’s activities. All of these tools assisted me in writing of field notes. Each field note provided descriptive accounts of the day’s activities, with a priority placed on interactions with focus students and activities that are particularly relevant to my research questions. For example, when a student made a remark that demonstrated their use of an algorithm in problem solving glitches in their program, I wrote a

note of it in my field notebook. This highlighted places in the audio recording for me to concentrate on during the writing of my field notes.

Following design-based research methodologies, the writing of field notes facilitated and informed future lesson plans as I reviewed, reflected and wrote about each day's activities. I took advantage of momentary transitions and breaks in activities to jot down words or phrases of interesting phenomenon to jog my memory. I also collected data through a pre-project survey, lesson plans, field notes, analytic memos, digital video and audio recordings, focus group interviews, and student artifacts.

Focal Students.

In an attempt to gain greater depth in the perceptions, meaning making, learning and development process of students, I selected five focal students. I conscientiously sought out their thoughts in think alouds⁷, examined their work with greater attention, and some participated in additional focus group interviews during the project. Small group interviews and think alouds provided opportunities for students to reflect and describe their thinking process as a complementary feature to the examination of their project. These in-project data collection points provided me with special informants to make changes and modifications to the curriculum and pedagogy.

Prior to the start of the project, I spent over thirty-five hours in twelve weeks with this class of students. I selected a diverse group of students based on their computer experience, previous academic performance, engagement in the class (based on observations and interactions), willingness to participate, and gender balance. I used my knowledge and

⁷ Think alouds are one-on-one conversations between the researcher and the participant. Most of my questions related to what participants' were working on, why they chose the representations they selected, and an explanation of their production and problem-solving process. A more detailed explanation will be provided below.

relationships with students to select those that were most comfortable with articulating their thinking with me and in a small group setting. I first asked them for their permission and interest in participating in more in-depth and extensive research processes. Then, I began the additional data collecting process.

While I recognize that there was the potential for selection bias, I tried to be cognizant of inherent preferences for and against certain students and wrote about those in my reflections before I made a final decision. I also consulted with Mr. Perez about the students I considered, based on the criteria I described. This “zoomed in” approach allowed for greater insight, depth of understanding and richness into themes that arose during the larger class data collection.

Privacy and Respect of Participants.

One caveat I would like to add is that I made every attempt to prioritize the needs of the community, classroom culture, learning, trust between myself and my students, the personal lives of the students, and Mr. Perez above the research study. I mention this because the work here unveiled personal struggles and challenges in the lives of students and I made a concerted attempt to balance the importance of learning through educational research while protecting the lives and personal experiences of students. When issues arose that were particularly sensitive and/or troubling, I consulted with Mr. Perez, my chairs, and/or colleagues.

Despite their signed assent and consent forms, I realize that occasionally students revealed more of themselves than they may prefer, especially over time. In these situations, I reviewed the purpose of my research study and reminded participants that their words and actions, though anonymous, will continue to exist through published papers, conference presentations and/or professional development. At these points, I checked in with participating

students about their level of disclosure they preferred. I emphasized the choice they have in striking words and data from the study.

Pre-Project Survey.

The pre-project survey was an electronic instrument conducted on the third day of class (prior to the start of the research project) on www.surveymonkey.com. It was created to give teachers information about students' perceptions, experience, background, and interest in computer science. Knowing what tools were available to students allowed us to tailor and customize our curriculum and pedagogy to the needs, experiences, and interests of the students. We did not expect the survey to provide us with an in-depth understanding of students' cultural practices but merely served as an indicator on some important basic data for our planning needs. For example, when 100% of the students stated that they have access to a computer at home, this gave us the necessary information to assign homework that required the use of a home computer. At the same time, while every student acknowledged that they identify as Latino/Hispanic, we did not assume that we had a monolithic, static Latina/o population that spoke Spanish. We recognize that a more comprehensive and fluid account of their culture must be taken into consideration and can not simply assume their race/ethnicity alone will provide us with the necessary information to make decisions about who they are (Lee, 2002). For a more comprehensive view of students' culture, we need to acknowledge how geography, immigration status, generation, social class, gender, family history, migration patterns, language and religious affiliations all have merits in shaping an individual's culture (Howard, 2010).

Student-Produced Artifacts: Student Background handouts.

Each of the following student-produced artifacts was used to gain insight into how students were perceiving, interpreting, and making meaning of the content and the class. They were also utilized to inform the teaching of the class and the unit.

On the first day of class, students were given a “Student profile sheet” and a handout titled, “It’s all about me.” The “Student profile sheet” asked for basic information like: where do you live, phone numbers, who do you live with, and extracurricular activities you are involved in. The “It’s all about me” provided teachers and classmates with information about meaningful things in their lives: something you are proud of, nicknames, most embarrassing moment, a bad habit, pee peeves, hopes and dreams, favorite musician/song/food/etc., and what are you willing to put in and gain from the school. This information served a few different purposes: it provided information to teachers about different dimensions of students’ lives; it continued the process of community building among their peers through an activity in groups; and it provided us with conversation starters to build relationships and trust with different students. The follow-up activity involved students memorizing every piece of information on these two handouts from each of their group members, then teachers would selectively choose one group member to sit quietly in front of the class while their peers guessed their answer. The student in front would verify the accuracy of their guess by writing their answer on a white board. This activity involved every student in class and elicited excitement during the game and created a collective knowledge-building experience.

These pieces supported my role as a researcher in gaining important background information about the students. This often served to provide a more nuanced understanding and context behind future pieces of data that students produced. For example, gaining knowledge of

a student's home context (where and with whom they lived with) served to better understand possible explanations in the representations of home in their video games.

Digital Video and Audio Recordings.

A digital camcorder recorded every class session during the entire seven-week project. I began recording one to two minutes before and after the official start and end of each period. The additional coverage is intended to provide insights into moment-to-moment analysis in non-official classroom time; interactions and activities of students, teachers, and between students and teachers. The camera was placed in different stationary locations (on a tripod) throughout the project since research shows that minimal movement of the camera is less distracting for the participants being recorded (Erickson, 2006) but multiple locations will allow for different perspectives of the classroom. Most often, it was placed in a corner of the room behind the teacher, so that students' faces can be captured. By including both the instructor and students, an emphasis on "reciprocal relations between the teacher and the students" (Erickson, 2006, p. 178) is demonstrated. I also placed the camera with adequate views of all five focal students.

As previously described in the Participant Observation section under Data Collection, I also used the Livescribe Echo pen and attachable Echo 3D recording ear buds to provide another tool to record class happenings. I began recording a few minutes before the official start of class for similar reasons as described above. However, I often continued to record for ten to twenty minutes after class to record post-class reflections and debrief with Mr. Perez during the passing period and at the beginning of his next class. This had been the routine that Mr. Perez and I established.

I recognize that video and audio recordings are not a complete replication of reality, or a neutral phenomenon and as the researcher, I may be privileging certain students or activities by

the mere placement and/or movement of the camera. Nonetheless, the digital video recordings allowed for a rereading of the data, particularly of critical moments in class. Video recordings allowed for line-by-line analyses of the discourse, body and facial expressions, movement, and student reactions captured in a particular moment in class. Video and audio recordings served to complement field notes, focus group interviews, and student-produced artifacts. They served a greater purpose in the writing of field notes than data analysis and coding.

Field notes.

I used my Echo pen, microphone ear buds, digital video camcorder, zoom microphone, written lesson plans, and raw field notes from my notepad to assist me in capturing classroom phenomenon through field notes. Despite my acknowledgment to students that these recordings were mainly for my personal research purposes, students may have modified and/or altered their responses and behavior because of these recording devices.

The process I used for generating thick descriptions in my field notes were as follows. When possible, I wrote down my immediate reactions to the day's lesson in "Reflection from today's class" at the end of each field note. Then, I highlighted key events that took place. This may have included a particularly poignant discussion that led students to question the messages they received from television commercials or a think aloud conversation with a student that explained the rationale behind selecting a homosexual couple for their game. The purpose of this is three-fold: to gauge my initial reaction to the overall class, focus on specific occurrences in greater detail, and to ameliorate further memory loss from the time when it occurred. I typed this directly into field note files on my laptop. This usually occurred in the back of Mr. Perez's classroom after the research class ended or in my car outside of another school site. As soon as it was possible, I wrote down a detailed account of class events, using the highlights as an outline

for the field notes. I frequently used the Echo pen audio recordings and camcorder (rewinding and playing different parts) when I wanted to capture the exact words and physical reactions of Mr. Perez, our students, and/or myself.

During the first two weeks of observations, I captured detailed student interactions with the curriculum and their peers, complemented with direct quotations from class. Most of these field notes were over ten pages in length. By week three, I became more selective in what I wrote. For example, instead of attempting to capture every comment/question raised in discussions, I focused on parts of discussions that explicitly connected to critical literacies and self-reflective practices. When students provided an example from their life, I wrote about it in my field notes. When a student questioned the legitimacy of the data we were using, I wrote it in my field notes.

I continued the practice of starting with my initial reactions followed by highlights of the day's events. Then, I began expanding on parts of the curriculum that were more explicitly connected to critical literacies and self-reflected practices. I often synthesized the general activity in class and focused on writing thick descriptions that related to my research questions. Specifically, upon reviewing my highlighted points and re-listening to audio-recordings of specific instances, I would select those that really captured areas demonstrating critical literacy and self-reflective practices. Computational literacies were not introduced until the second half of the curriculum. An example of the benefits of using multiple data collection tools was evident when a discussion became indecipherable due to the distance of students to my Echo pen, but the video recording was able to capture the various student voices, facial expressions, body language and their other classmates' reactions. Conversely, Echo pen audio recordings captured clear and

coherent student voices when I walked around and observed small group activities, versus the limitations of the camcorder's fixed locations.

There were instances where I was not able to write field notes immediately after class. In these situations, efforts were made to write field notes before the end of the day. Additional benefits of daily field notes was the opportunity to immediately review, re-examine, re-observe, reflect, and make changes to curriculum and pedagogy for the following day's lesson. The immediacy of this harkens to Sandoval and Bell's (2004) argument that "design-based research simultaneously pursues the goals of developing effective learning environments and using such environments as natural laboratories to study learning and teaching."

Student-Produced Artifacts: Journals, Project Handouts, and Video Game Projects.

Student journals were a valuable source of data since this was the place where students analyzed various digital, video and audio media. Research has shown that reflective journaling supports critical thinking and metacognition (Vojnovich, 1997). Student journals were used to support their development of critical literacies; they reflected and analyzed websites, music videos, songs, social networking sites, commercials (video and print), digital stories and Youtube videos. Question prompts were more specific and targeted at the beginning of the unit to facilitate the scaffolding processes of reading media critically. After several weeks of critical readings, analyses, and discussions, question prompts became more open-ended. This allowed for more creative and critical analyses of the various multimodal pieces. This change in the question prompts will allow for a closer inspection of the role of pedagogy in shaping the students' development of critical literacies. Throughout the writing prompts, students were constantly asked to pay attention to way various media used language, sounds, symbols, signs, and the intersectionalities of them to produce messages (Kress, 2010). By critically examining

these popular culture artifacts, students were challenged to question normalized or conventional interpretations and the processes that created them.

By reflecting on and deconstructing their articulations, students began the process of critically analyzing messages given to them (Barthes, 1967; Saussure, 1915/1966). Morrell argues that we must be “aware of the various social, ideological, cultural and political contexts where language and literacies of power operate” (Morrell, 2008, p. 5). As educators concerned with providing the tools of critique and analysis, we must unpack the ideologies that students are arriving to our class with. Through these processes, teachers are also learning about students’ meaning making of these artifacts and by connecting it to their learning and cognition, we produce pedagogical practices that are more accessible, relevant and meaningful for them (Howard, 2010). This point is made even more emphatic by Lee’s (2007) cultural modeling framework and Moll et al.’s (1992) funds of knowledge approach. Both essentially argue for the recognition of students’ everyday practices to develop higher-order critical thinking skills with academic content. However, Moll differentiates from Lee in his focus on the everyday lived experience of students’ families and their network (Gutierrez, Morales, & Martinez, 2009). By valuing students’ experiences in problem-solving, choosing material that is relevant and meaningful for them and “privileging students’ knowledge as intellectually rich and valuable,” students will clearly see their position within the learning process as insiders (Howard, 2010, p. 58). This is particularly true in the field of Computer Science in secondary schools, where a history of systemic marginalization of female and minorities has resulted in curriculum that is often didactic, systematized and offers little flexibility for innovation (Margolis, 2008).

Students used journals to reflect on their past, present, and future. Open-ended writing prompts asked students to engage in autoethnography practices to examine critical moments in

their lives, major turning points, challenges they have faced and have overcome, as well as hopes and dreams for their future. Many of these were framed around textual and multimodal models of reflection by other young people. The critical literacy lessons helped frame students' personal reflections around larger sociopolitical explanations. This allowed for greater depth and analysis as students engaged in reflexivity around their thoughts, feelings and observations. The writing was used as documentation of their self-reflective practices as well as a method of inquiry (Richardson, 2000) to help students with the "process of figuring out what to do, how to live, and the meaning of their struggles" (Bochner & Ellis, 2002, p. 111). Reflexive journals support students in redefining themselves to aid transform oppressive social structures (Morrell, 2008). Students selected particularly meaningful and salient topics to write in greater detail; which served as their initial foundation of their video game topics.

A conscientious effort was made to avoid fetish-sizing or over-romanticizing urban youth of color's struggles since not all students may be willing and ready participants in exploration and analysis of past and current struggles. Through students' self-analyses and my own interpretations of them, I gained a more complex understanding of students, their relations to others, and their environment. Although the writings may exclude/include some items, exaggerate or forget others, the reality is that it reveals truths based on how the writer experienced it at that moment in time. The sharing of these pieces was also a significant part of the journaling process as it built trust and compassion among this community of learners, particularly for many urban youth of color who enter class with fractured collective identities (Camangian, 2010). Unlike an autobiographical text, an autoethnography requires a critical analysis of the larger social, political, economic world and how they make meaning of their lives.

Further, it engaged students toward the development of the final product – a video game with a personal and meaningful message that was disseminated on the World Wide Web.

Student-Produced Artifacts: Project Handouts.

The “Designing Your True Life Remixed Video Game” (Appendix A) and the “Video Game Design Template” (Appendix B) are also worth discussing. These two text and non-text-based handouts illuminate students’ self-reflections on their lives and its application as a message into a purposefully thought-out design template. The “Designing Your True Life Remixed Video Game” handout helped students transform their initial brainstorming ideas behind the reasons for their game. It asked the student to explain the message/purpose behind their game, the target audience, and the feeling they want to create in the player. This handout pushed students to articulate in written text the often-unspoken rationale behind a creator’s intent. It also directed students toward a reflective process about the topic of their game. By reflecting on their past decisions, struggles, changes in their life, students engaged in reflexivity about their agency or lack of agency in their past, present, and future selves and their explanations for them. This process helped students play out “what could have been” scenarios if a different decision were made; what and how present and future decisions may shape their future; and how their hopes and dreams can be actualized. Students were encouraged and given the opportunity to share these handouts to group members and classmates. The dissemination of this material strengthens community through the sharing of life-altering changes, personal struggles, and triumphs. This activity supports what (Yosso, 2005) described as “aspirational and resilient cultural capital” when students are given a structured space to observe, analyze, discuss and make meaning of their past, present and future selves. The sharing process allowed

classmates to find connectivity to one another by mending fractured collective identities (Camangian, 2010).

The game design template facilitated the transition of a self-centered analysis of themselves to the production of an artifact that has the ability to educate, connect, and publish in a public space. The template helped students visually understand the process of game mechanics and forced the designer to develop purposeful choices in the visual, audio and design representations of their message. With an awareness of audience, students were constantly reminded to think about how each aspect of their game supports and promotes the message to their audience. This is an essential location of data analysis since it demonstrates students' application of their self-reflective practices as well as their recognition of various critical and computational literacies. The design process supported students' clarification of their roles through their representation of themselves, development of systems thinking and intuition as designers determine how player reaction will garner disparate responses and outcomes. They will begin to make connections between the game mechanics where rules constrain actions and the rules that govern their lives (Flanagan, 2009). Much like the projected identities found in games like *Second Life*, students have the ability to create and modify their present realities by dictating how they would want see themselves in a future self (Boellstorff, 2008; Gee, 2007).

Student-Produced Artifacts: Video Game Project and Final Reflections.

As the culminating project for the entire unit, this artifact presented multiple possibilities for analysis. In many respects, it demonstrated aspects of students' application and understanding of critical and computational literacies. Further explanations will be provided in the data analysis section on how this product was analyzed. Although other data collection instruments (think alouds, field notes, journal entries, video recordings) were used to highlight

students' learning process *during* the creation of the video game, the video game illustrates how students chose to represent themselves, others, their community and issues that were relevant to them at the point of creation. In addition to my analysis of all thirty-two students' video games, I included twenty-four (some did not turn them in) of the students in-depth, written final reflections (Appendix C) as another opportunity for students to explain the various components and representations in their game.

Audio-taped “Think Alouds”.

During various points of independent, partner and small group work, I engaged students in “think alouds,” where I posed questions to students to solicit their thinking process as they work to solve a problem, create a product, and/or explore a tool. This was collected through my Echo pen as I knelt next to seated participants. As Ericsson and Simon (1993) described, this protocol analysis allows the researcher to capture students' articulation of their thinking process as they concurrently engage with the material. Their research demonstrated that instead of changing participants' thinking, they merely supported the verbalizing of the “inner speech” (Ericsson & Simon, 1993). However, if students were asked to explain or carefully describe their thinking, they would be taking an additional cognitive step in processing and reflecting on their work and would change their mediation of the material. Since I had the dual role of teacher and researcher, my questions may ask students to explain their thinking process at different points of the project or “stream-of-consciousness” verbalization, but I may also ask for a summation or explanation of their learning. This data helped provide evidence of students' meaning making of critical literacies and computational literacies, while engaged in a self-reflective process. It also provided an examination of the effectiveness in the process and pedagogy in shaping students' understanding of these two literacies. Think alouds during the

final phase of the project (game production) also served to capture challenges and limitations students faced when attempting to abstract data or deduce algorithms from their real-life scenarios and justifiably represent them through simulated programming structures.

Small Group Interviews.

I conducted semi-structured small group interviews (Denzin & Lincoln, 1994; Seidman, 1998) with twenty-three students at the conclusion of the video game project. Each interview was conducted with three to four students in the back of the school library over two class periods. They were video-recorded, transcribed, and hand coded. Each interview was approximately thirty-five to fifty minutes depending on the lengthiness of responses. The retrospective data instrument serves to gain a more thorough insight into the pedagogical factors that shaped students' critical and computational literacies, as well as their application of this knowledge in the various products they produced (Ericsson & Simon, 1993). Included in Appendix D is the interview guide with question prompts. Every attempt was made to create a conversational atmosphere during the semi-structured interviews. I used language familiar to the participants and avoided looking at the script (Spradley, 1979) since research shows that interviewers' characteristics and behavior can significantly influence participant responses (Rosenthal, 1996). I used these conventions to help students feel at-ease in sharing responses. However, I recognize the unequal power dynamics that continue to persist as their teacher and interview facilitator.

Data Analysis

I want to preface this section by providing a brief explanation of my process in disentangling my data collection, reduction, and analyses sections into cleaner, compartmentalized parts. Like most qualitative research, this was a fluid and recursive process.

At times, data collection, reduction, and analysis overlapped. For example, as I wrote field notes and audio and video recorded class sessions, I also reviewed these daily data sources to take note of common themes and trends that informed curricular modifications and lesson planning. In following design-based research philosophy, the ever-changing realities of classroom environments dictated the daily realities for me. As a teacher and participant researcher, there were challenges and affordances in organizing, structuring, maintaining, and leading instruction while concurrently collecting data as a researcher.

Phase I: Data Reduction.

During my data collection process, I wrote periodic analytical memos to capture and reflect on activities, interactions, and moments that address my two research questions around critical literacy and computational thinking. Throughout each week of the curricular unit, I wrote down notable points and moments raised in class discussions, think alouds, and student reflections in these weekly analytical memos. Utilizing this as a day-to-day account of emerging themes, I generated a comprehensive “themes list” throughout the project. This “themes list” helped me keep a general account of the evolution of the research study. One example of a recurring theme was students’ interrogation and critically analysis (looking specifically at race, class, gender and sexuality) of mainstream narratives in video advertisements. At the same time, students also acknowledged difficulties in internalizing critical perspectives in their everyday actions and behaviors. Students remarked that although they could “read the world,” especially those found in advertisements, it was still challenging for them to change their consumption habits and discourse. This theme came out of different students’ articulation of variations of this point through the first two weeks of critical literacy curriculum.

After the completion of the study, I continued to add to this “themes list” as I transcribed small group interviews and final reflections.” This enabled me to see patterns and frequencies of themes both during and at the end of the data collection stage. I continued this process of theme tabulation and collection when I reread field notes and student artifacts.

Phase II: Data Reduction & Analysis: Privileging Student Voice.

After the end curricular unit, I conducted small group interviews with students that were in attendance during the last week of school. I chose to begin my data analysis by deliberately prioritizing students’ reflections and their experience of their project in their oral explanations and writings. As this occurred after their completion or near completion of their projects, it provided me with a view of their culminating critical and computational literacies. This was a conscientious effort to triangulate their reflections with their work throughout the seven-week unit, their final serious video game projects, and my analyses of them. I transcribed the six small group interviews verbatim and imported into ATLAS.ti version 6.2.27.⁸ I entered the data analysis phase with awareness that my initial codes would be expanded, contracted, and modified as a part of the coding process. During the process, I added new codes that demonstrated subtle and occasionally overt nuances to a code I had originally developed. For example, the all-encompassing code, Computational Thinking quickly expanded into Boolean logic, broadcast, systems thinking, and troubleshooting to accurately demonstrate the variety of ways students were showed myriad computational processes.

In order to code students’ final printed reflections (mostly typed and some handwritten), I scanned the typed versions into an optical character recognition (ORC) web-based program to convert it into a text format that ATLAS.ti could read. Then, I typed students’ written reflections

⁸ A qualitative analysis and research software program.

into a text document and imported those into ATLAS.ti. I checked all letters and words in the converted text to ensure accuracy in representing students' original reflections. I did not make any grammatical changes to their words and quotations in this document.

Since my research questions mainly focused on critical literacy, computational thinking, and culturally relevant pedagogy, I began the coding process by creating individual codes through these three general categories. For example, under critical literacy, I initially created the following codes: sociopolitical awareness, raising marginalized viewpoints, question commonly accepted beliefs, and social change. After coding a few students' final written reflections, I noticed variations of critical literacy that were outside the purview of these four codes, but could be housed under the critical literacy category. Therefore, I added two additional codes: sociohistorical and socioeconomical. These were created to highlight instances where students spoke specifically about people, events, situations, and things that have to do with the history or economic impact on societal systems, groups, or individuals. A similar process occurred for computational thinking and culturally relevant pedagogy. Understandably, the first set of documents I coded were quite time intensive, as I added and grouped codes based on student comments and reflections. Examples of codes that did not belong in the aforementioned categories include: signs, storytelling, decisions, hope, engagement, limitations, and disconfirming evidence. Some of these codes led to query searches and relationship analyses that led to inquiries beyond the purview of the original research questions. More of this will be described below.

By the end of this initial coding process, I had generated fifty-one distinct codes with over one thousand instances (with overlap) through student reflections. Most lines had multiple codes. For example, the following line from Antonio's written reflection had five different codes

(Hope, Reflexivity, Socioeconomic, Sociopolitical awareness, Students cultural practices)
attached to it.

I hope to go to college with my friends and share that college experience with the people I enjoy being with the most. Also too support my mom with helping her with bills and payments because she was always there for me, although we didn't have much money she tried her best on getting me what I wanted.

This inclusive coding process was deliberately done to ensure wide casting of various possible themes and findings that may emerge in the analysis process. It also allowed for more thorough cross-analyses of different codes to examine for relationships I may have overlooked during the themes-generation process. I also took note of themes and trends that emerged as I transcribed, coded, and re-read data.

As I reviewed my emerging themes, they provided me with guidance regarding where to begin my query process. By re-reading themes and trends that had developed over time, I noted interesting phenomenon that led me examine the relationships between selected codes. For example, one of my observations in the themes memos noted that several students brought up a particularly poignant lesson from earlier in the unit. Using the query search tool in ATLAS.ti, I looked at instances where “culturally relevant pedagogy” and “powerful quote” overlapped. By re-reading the nine quotes that showed up in the query tool, I was able to deduce the specific lesson (Made in America documentary) and the reasons why students were drawn to it. I continued this process for examining relationships and frequency between different codes and re-read the query tool results or quotes from students.

Phase III: Data Reduction & Analysis: Contextualizing.

Given that it had been over six months since I collected the data, I recognized that I needed a rereading and re-contextualization of class interactions. My query results and emerging themes led to my re-reading of lesson plans and field notes, and re-listening to audio-recordings. In some cases, I searched for students' names and other keywords under the file for lesson plans and/or field notes. When I narrowed it down to an exact class interaction, I referenced my Livescribe pen and interactive journal to re-listen to the actual conversation during class. This helped to clarify my memory and record the exact sequence of conversation and words used by Mr. Perez, our students, and myself. By focusing on these areas, I strategically "zoomed in" on critical points of classroom interactions. I selectively transcribed audio and video recordings of notable events (Green, Franquiz, Dixon, 1997). For example, a student's reflection brought up a class discussion about the statistical accuracy of demographics of their city, but I could not recall the exact discussion. Even after looking through my typed and dated lesson plans, I still had difficulty finding the exact moment when this conversation occurred. I searched my field notes file for keywords (the name of their community) and several files turned up. I opened each document and used the "find" feature in Word to discover the moment where the conversation took place. When I found the date, I was able to track the discussion through my Livescribe interactive journal to replay the exact recorded audio conversation. These tools complemented my traditional qualitative techniques of data analysis by providing me with an accurate representation of key moments in class discourse.

By triangulating students' final written reflections, small group interviews, and contextualizing their words in my lesson plans, field notes, and audio recordings, I selectively analyzed student quotes with a deeper understanding. For each quote, I provided background

information about the student, curricular and pedagogical context to what they discussing, an analysis of the student's point(s), and its connection to larger themes echoed by their classmates. This analysis of student quotes provided me with greater insights into themes, emerging findings, and points for further analysis. I probed certain findings by cross-analyzing additional student responses and referencing back to key moments in class. This recursive process of quote analyses and contextualization led me to narrow my research findings around the tenets of culturally relevant pedagogy.

Phase IV: Data Analysis: Student-produced artifacts.

Phase IV and V of the data analysis process occurred recursively between students' final video game projects and the various steps they took to complete their final products. I will begin by first discussing the methods used to analyze these artifacts. Using preliminary findings developed from the aforementioned data analyses phases, I began re-reading and analyzing student-produced artifacts (journals, individual reflections, computational flow charts) prior to the building of their video games in Scratch. I examined student work in chronological order to better understand each individual student's learning trajectories of his or her video game products. Again, this was not a purely linear process as multiple occurrences pushed me to re-examine prior and latter reflections and student work. For several students, I methodically followed and analyzed individual student journal entries, reflections, and handouts to develop a better understanding of their learning process from initial conceptualization of their idea to their video game and final self-reflection. This was done to verify and look for discrepancies between my emerging findings and their work products. After a thorough analysis of students' final video game products, which I will discuss at length below, I reconsidered these video game-building artifacts for confirmation and/or disconfirming evidence of the findings I had ascertained. For

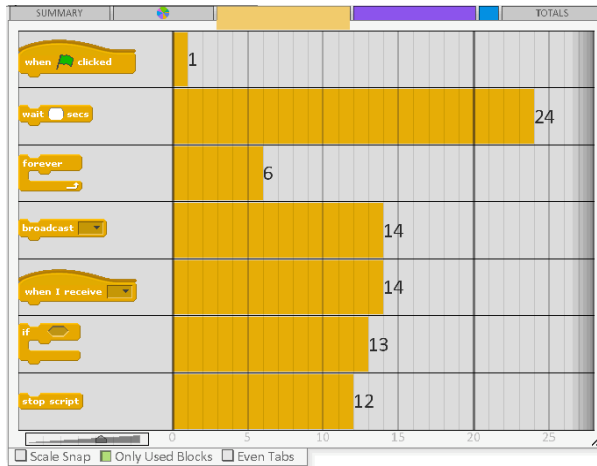
example, when making a conjecture to the rationale behind a student's choice in sprites, I looked for indications from past reflections that articulated his reasoning for choosing that particular character.

Phase V: Data Analysis: Student produced serious video games.

In order to accurately analyze the various facets of students' video game products, I divided the analysis into two parts: (1) components (programming code, message, decisions, game play, outcome[s]) and (2) representations (how signs are represented and how they convey meaning). Using a multimodal social semiotic approach helped me tease apart the complexities of a multimodal text with several layers of representations embedded in any given moment of the video game.

To better understand the various components in the student-produced video games, I first looked at students' demonstrations of computer science concepts. I referenced a document titled, "Scratch Programming Concepts v.14" [Appendix E] from the Lifelong Kindergarten Group at the MIT Media Lab to provide examples of programming code from Scratch in relation to programming concepts. Being a novice computer scientist, this document gave me the terminology and the research-based rationale between CS concepts and its demonstrations in the game. Next, I utilized Scrape, an MIT Media Lab's developed beta programming block analysis program, to help produce frequency counts of the various programming blocks in all thirty-two of the student-produced video games. The screenshot below shows the Scrape User Analysis tool displaying the presence and frequency of every programming block (under Control) used in a student's video game (Figure 3.1).

Figure 3.1 Scrape User Analysis



Some additional hand counting was required since Scrape’s block counting method did not fully capture the programming concepts of sequence, threads (parallel execution), synchronization and coordination. I created a frequency count chart illustrating each student’s demonstration of the various CS concepts in their games [Appendix F]. This process provided me with whole class data counts of specific demonstrations of CS concepts, as well as pointing me to individual examples to analyze in greater detail. As Scrape produced frequency counts of different CS concepts, I would examine specific programming threads in students’ games to give contextual evidence of their work through game play. This enabled me to see, hear, and better understand how their programming translated into game play and thus, another point of analysis. The use of the Scrape, combined with deeper examinations of game play in relation to the programming gave me the foundational evidence of students’ computational thinking as I describe in Chapter five.

For a more detailed explanation regarding how I imported the students’ video games into Scrape, I will outline it below. With the help of Brett Taylor, one of the developers of Scrape, I converted all of the student games from the .sb format to .txt files by opening one of the games

in Scratch; holding down the shift key and simultaneously clicking on “file.” This provides you with the option to “write project summary.” With this, I instructed the program to save the project summary .txt file into the “input” folder under “data” folder for “ScratchTextFileAnalysis1_9.” When I open the Scrape local graph tool, the student projects appear on the left-hand margin of the program. By dragging the student project name into the main interface screen, a chart (Figure 3.1) highlighting the various frequency counts of the programming block appears.

To analyze the messages, decision-making choices, game play, and outcomes of each game, I went through an iterative process of re-reading of students’ reflections and handouts pertaining to the message, rationale, purpose, goal, audience, design and execution of these items. By cross-analyzing it with their final video game projects, I began to develop a richer understanding between students’ thinking process (rationale, purpose, message, goal, what audience they were targeting) and their execution of their games (design and game play). This was a messy endeavor. I would play a student’s game, examining it for evidence of what they described in their reflections, while immediately referencing back to their design tools (ex. Computational flow chart) and reflections for evidence of their point. This was evident in my analysis of Jackie’s serious game about getting cancer treatment. In her reflection, she talked about wanting the audience to feel “the happiness of when youre life’s going fine and then the hopelessness of when you get a check up and the doctor tells you, you have a tumor in your neck and you have cancer.” I went back to her game, replayed it several times, looking for moments when I, as the game player, developed such feelings. I noted individual examples (images, text, combinations of the two), as well as through overall game play (final message[s], overall feeling, results of my decisions in the game). After noting these occurrences, I reviewed and re-

examined the entirety of her work (journal entries, reflections, handouts, design work sheets) and reflections (small group interview, final written reflection) for evidence that supported my reactions to her game. Then, I looked at specific computer programming concepts that she demonstrated that supported her points. This provided me with the basis of my conceptual framework that students' developed and demonstrated a critical computational literacy through the production of these video games.

Similar to my process for analyzing components, I privileged students' voice in directing my search for representations embedded within the game. Taking a departure from Kress's (2012) example of analyzing a participant's artifacts solely through the lens of the researcher, I favored the student's voice in articulating their rationale for specific choices in how they represented aesthetics in their game. Then, I looked for coherence between their explanations for various representational choices, the overall thinking process (again, message, purpose, etc.), and the actual game itself.

Examine the representations that were used – look for coherence between student explanations of their game and the game itself. Going back to Jackie's example, she specifically described a particular image she chose to convey hopelessness when one finds out they have cancer. When I played her game, I immediately noticed a black and white image of a girl with her hands on her head in a semi-fetal position. I took note of the disruptiveness of this image when contrasted with previous images of colorful, smiling faces. It was only through this iterative process of reading, analyzing, and re-reading of student work and reflections, combined with playing and analyzing their game, that I was able to come to develop findings regarding students' thinking, designing, and reflecting processes.

Multimodal social semiotics approach to video game analysis.

Following the traditions of social semiotics (Kress, 2010) and sociolinguistics (Gee, 2011) any communicative exchange relies on the recipient to interpret the message for it to have function, the signifier must think (however minute) about their audience and how they may interpret their message. By examining students' video game projects and their explanations, my aim is to uncover the processes by which the producers are engaging in Semiosis; how they expect their audience to interpret their videogames. Only by understanding students' cognitive processes of these multimodal texts, then can we begin to shed light on how they may be representing critical and computational literacies in student-produced artifacts.

While there have been various research methodologies to examine discourse (Fairclough, 1995; Gee, 2011), text (cite), and even multimodal interactions (Norris, 2004), there have been few models for analyzing the New Literacies of digital, multimodal text. The multimodal social semiotic approach offers many conceptual arguments on how to look at these texts (Kress, 2010), but few concrete examples of how to do it. I adopted a version of Pelletier's (2005) model for video game analysis in the separation of components and representations in video games. This may serve to disentangle the multiple modes and representations that occur in any given moment in such a digital text.

Positionality

Following the tradition of Critical Pedagogy, a concerted effort to be aware and make explicit one's perceived and real privileges are essential to conducting research. As Villegas & Lucas (2002) described, in order for marginalized students to genuinely develop transformative tools, their teachers must first recognize their privileged status and position in society and take ownership over the inequalities that they themselves may perpetuate by virtue of their citizenship

to dominant groups (Freire, 1993). Since I did not grow up in the same or similar community as my students, I have made every attempt to “truly engage the world and others critically” so that I may “join the oppressed in their struggle for liberation” (Freire, 1993, p. 42). I have done this by practicing in reflexivity or “the process of critical self-reflection on one’s biases, theoretical predispositions, preferences and an acknowledgement of the inquirer’s place in the setting, context and social phenomenon” (Schwandt, 1997, p. 136). This tenuous struggle is an indicator of the constant process of reflexivity that I continually engaged in; both inside and out of the classroom.

My positionality as an East Asian-American male adult in an overwhelmingly Latino school and community clearly places me as an “outsider.” Although I would like to think that having worked and lived in majority Latino communities for the past decade has garnered me access to some of the nuances and subtleties of this population, the reality is that I am first read as an Asian American. In fact, my prior experiences in the Fruitvale area of Oakland and Oxnard may actually create a false sense of understanding in the community I am conducting my research. Upon my first visit to Sylvester high school, I felt a certain degree of comfort as I drove by the myriad of Latino school children walking to school, the plethora of *taquerias*, *palateros*, and business signs in Spanish, but as I’ve gotten to know the students and the local community better, there are significant differences between these Latino students and communities I have previously been acquainted with.

Although Sylvester and the school I previously worked in share many similarities (average parent education level, free and reduced lunch population, high percentage of Latinos), there is a marked difference between similarities of racial and ethnic demographics and cultural considerations. Whereas a majority of my former students were first, one and a half, or second

generation immigrants from Mexico, El Salvador, Guatemala, and Honduras, the majority of my students at Sylvester are second, third and fourth-generation Mexican-Americans. To an outsider, this may seem minor, especially since school demographics typically lumped them all under the umbrella “Hispanic or Latino” category, but the differences are vast. My understanding of this was quickly realized when many of my students had difficulties finding the immigration history of their own families for a Web design unit. Though this had been a fairly simple endeavor with my students in Oakland, many of the Sylvester students had difficulty finding extended family members that could trace their family’s original immigration journey. Many had to rely on grandparents and/or older extended family members. In fact, only one student in a class of thirty-one was born outside the U.S. Further complexities can be explicated when we examine the immigration patterns and statuses, location of ancestor community, language practices and countless others.

Additionally, my assumption that a nearly identical free or reduced lunch percentage would indicate similar income backgrounds of students and their families was also greatly exaggerated. Although the minimum requirement for a family of four to qualify for the free or reduced lunch is an income below \$39,220 in 2008-09, there is no data to track number of household family members in proportion to the household income nor the ability to follow unreported wages. This information can have significantly disparate affects on a family of four who falls slightly below the minimum benchmark in comparison to a family of nine who survives on less than \$10,000 per year. Based on my previous experiences with students and their families in Oakland and at Sylvester, there are noticeable differences in the material privilege of the students. It would be safe to say that there were significantly more undocumented immigrant families who were highly materially impoverished in Oakland as

compared to the majority, documented, working-poor students of Truba. These reflections allowed me to understand culture beyond surface-level, demographic indicators bound the generic descriptors of race, ethnicity and income level but by more complex understandings that recognizes and incorporates family histories, religious affiliations, geography, language practices, youth-oriented cultural practices, gender, situated understandings and countless others.

My own experience as a materially comfortable immigrant from Hong Kong have clearly shaped some of my perceptions of language, culture, schooling, and society. Outside of my first through third grade experience in a multiracial, multiethnic, and socioeconomically diverse school, the majority of my K-12 experiences have been in largely white, suburban schools. Upon entering college at University of California, San Diego, I was greeted by classmates and dorm mates who came from a more diverse array of backgrounds. These experiences, coupled with Sociology, Political Science, Communications and Ethnic Studies classes provided me with academic explanations and terminologies to explain our differences and the roots of the inequities in our society.

During my junior year in college, financial wants provided me with an opportunity to tutor middle and high school students in Southeast San Diego. For the first time since early elementary school, I had a tangible outlet to place all of my academic knowledge and personal experiences into use. The physical conditions, curriculum, and pedagogy in the two different urban schools I worked in for two years lit a fire in me. I was disgusted at the discrepancy between my schooling experience and that of my students. In short, my experience as a young adult fueled my passion and lifelong commitment to fight for access and opportunities in education for materially unprivileged students of color.

When I first arrived at Truba High school, I introduced myself as a graduate student from UCLA researching the curriculum for the class. I explained that I was there to help Mr. Perez and I was a former English, Social Studies and Media Arts teacher in Oakland. During the first two weeks of class, I attended, co-planned and taught six classes during the introductory and community building lessons. In fact, I even taught an entire period independently since Mr. Perez was absent due to personal emergency. This was purposefully done to establish my role in the classroom as a co-teacher and to begin building rapport with students. By week two and three, students were posing questions to both of us without hesitation when they encountered challenges related to their work and school-related issues (schedules, tardy passes). Despite racial and cultural differences, students began to share information about their personal interests and inquired about mine. I began to observe that this seemed to occur more often with me than their teach-of-record, Mr. Perez. I began theorizing that this may have to do with our proximity in age, my appearance (jeans, collar shirt, sneakers, earrings, shaved head) and/or my constant connections between the academic content to their lives and cultural practices. Occupying space as a teacher and occasionally disciplinarian, while maintaining and developing trusting relationships with students was not usual for me. As a full-time teacher at a small public school, I constantly moved between these spaces without hesitation. I never felt that a teacher's role should be limited to the constraints of the bell schedule and have always had an open policy to students. I recognized that my perspective might not have been the norm for most teachers at Truba. This may have provided certain affordances and challenges when working with Mr. Perez. Having been his coach for over six months, I noticed my influence in his receptiveness and interest in incorporating the cultural practices of the students in his other class.

CHAPTER 4

Like many conceptual frameworks, the move from theory to practice often takes circuitous transformations. Culturally relevant pedagogy (CRP) is no different. Since Ladson-Billings' theorizing of this work in 1994, CRP has become overly simplified, diluted, essentialized, and reduced to superficial connections in practice. The essence of incorporating genuine cultural practices, promoting academic success, and developing critical consciousness in students has too often become generalizations of ethnic holidays and stereotyping of students' interests into classroom practices like Math Rap.

Instead of giving equal weight to academic success and critical consciousness, much research has focused singularly on students' cultural practices. Though commendable in its attempt to bridge academic content and student practices, it is not enough to address the inequitable conditions that continue to hamper materially unprivileged, urban students of color. An explicit focus on developing the sorts of academic skills and content knowledge that aids in their schooling success is imperative. Developing a sociopolitical awareness provides meaning and purpose in their work, as well as a critical lens that values them and their community.

In the most reductive forms of CRP, teachers have simply made generic connections between students' interests and scripted textbook curriculum. While admirable in their attempts to build relevancy for students, this is a far cry from the tenets outlined by Ladson-Billings' work. What is missing is curriculum and pedagogy that speaks directly to students in richer, deeper, and more complex ways that welcome and encourage students to bring their rich histories, personal struggles, past triumphs, questions about their community that genuinely supports improved understandings of themselves, their family, friends, and community. By providing choice in determining what is most meaningful for them, the teacher is privileging the personal lives of the students in the classroom. Through the content knowledge and pedagogical

mastery of the teacher, the curriculum is shaped around each student, so that they feel empowered to explore who they are, while developing the academic skills and sociopolitical awareness necessary to become lifelong learners in their personal, academic, and professional futures.

Having mainly taught in secondary Humanities and Media Arts classrooms, I developed curriculum that mirrored all three tenets outlined of CRP. As a classroom teacher, I have witnessed how a personally meaningful, project-based learning unit that leverages the community cultural wealth of my students enriched their habits of mind, work, and heart. In an attempt to replicate the successes of my past to the field of Computer Science, I created the True Life Remixed project.

In this chapter, I will begin with an examination of the culturally relevant curriculum and pedagogy of this project. This is done with the explicit purpose to be transparent regarding the processes involved in creating this unit and how one particular lesson connected strongly to students and their local community. I will share how findings suggest that historicizing locally-based curriculum channeled students increasing critical consciousness. Then I will address how students demonstrate their developing sociopolitical awareness when applied to examinations and reflections of themselves, others, and their communities. The impact of choice (students self-selection of topics personally meaningful to them) in assisting students' development of their voice will be discussed. An analysis of how this led to students' self-reported changes in their thoughts, actions, and behaviors will also be explored. Disconfirming evidence suggesting potential limitations of this work is investigated. Finally, findings regarding the transference of cultural relevancy, critical consciousness, and reflexivity to academic engagement, motivation, and identity will be examined.

Culturally relevant curriculum and pedagogy

As a non-local Asian-American educator in a predominately first and second generation Latino community, it was critical that I learned about students' backgrounds, interests, and local history. By co-designing, co-planning, and co-teaching the unit with a second generation Latino, Angeleno teacher, I tapped into his local knowledge base for guidance and development. The goals for this unit were to introduce students to the concepts of critical literacy and computational thinking through self-reflective practices. In this context, I define critical literacy as the ability to examine and write text⁹ while questioning commonly accepted beliefs, examining marginalized perspectives, deconstructing sociopolitical factors, and initiating/creating change. While computational thinking is the process involved in formulating problems and their solutions while utilizing fundamental computer science concepts and skills. The first half of the unit focused attention on examining various media through socioeconomic, sociohistorical, and sociopolitical lenses, while reflecting on students' position in relation to this material. The second half focused on the shaping of a self-selected, personally meaningful topic into a serious video game. The entire process is conceptually conceived, designed, and created by each student, with the ultimate goal of disseminating it to a public audience on the World Wide Web. I am re-visiting the goals of this unit because it has significant ramifications to understanding praxis for CRP.

Historicizing locally-based culturally relevant curriculum and pedagogy

A digitized tone sounds at precisely seven thirty in the morning over the public announcement speakers. Nearly all the students are seated behind a computer in six rows, which are perpendicular to the front wall of the classroom. In this arrangement, some students move

⁹ Includes non-traditional forms of text; multimodal artifacts that incorporates images, video, sound, movement, and user/program interaction independently or simultaneously.

their chairs to the right or left, depending on their row, to face the front of the classroom. There are muted conversations as students begin the process of waking up for their first period class. “Good morning everybody!” I greet the class, as I have been doing everyday since I started this unit. Students slowly begin to shift their attention to the front of the room and I ask them to turn their monitors off. “Let’s get back to our list of stereotypes [from yesterday].” I remind students. As a class, we came up with a list of stereotypes people have of their community. “Unsafe, gangs, thieves, rapist, drugs, prostitutes, do most people agree? Is that true?” Many students verbally and physically demonstrate their disagreements. Andrés responds, “It’s near Truba, not in Truba.” David concurs with Andrés, “It’s worse in Hamilton Park (a nearby community) than in Truba.” Elena agrees as well. Johnny thinks these issues tend to plague other cities, like Rip Beach. When I ask the class whether they feel unsafe here, most offer a half-hearted, “no.” More students offer specific area within the city they feel are “less safe.”

This opening activity began by students sharing stereotypes people have of their community. Then, we began examining and discussing the accuracy of these stereotypes through online data sources. During the data analysis of the high-crime stereotype, a discussion erupted when we noticed data that was contradictory to stereotypes. Sarita pointed out that despite the low rates of robberies, assaults, and rapes in their city, “These are only the reported ones.” Samuel strengthened her point by describing a recent incident where he witnessed a police officer deliberately slamming their door open to cause a bicyclist to crash. Though recognizing he did not fully understand the circumstances of the situation, he noted that the bicyclist was not riding in a manner consistent with someone escaping capture. Samuel hypothesized, “Maybe that’s why people don’t report it cause they don’t trust the police.” After this story, several students echoed in agreement and anxiously awaited their opportunity to share similar

experiences with the police. Students described instances where they felt the police abused the power they possessed.

This discussion highlights students developing critical literacy. When Sarita questioned the reliability of the data source, she demonstrated critical thinking skills in examining the authenticity of the information in relation to her own local experience. Samuel reinforced this notion by his sociopolitical awareness of the complex local realities of his community, raising marginalized viewpoints against those in power, while questioning the mainstream belief that the police are here to “serve and protect” the public. The questioning of data was further exemplified when students began examining the racial demographics for their city. Although most assumed their city was close to 100% Latino, the percentage was found to be closer to 90%. Immediately, students pointed out inconsistencies in the Census data collection process. Several highlighted the exclusion of undocumented residents. The culturally relevant pedagogy provided opportunities for students to utilize personal and local knowledge, within the context of their community and to question, critique, and examine “official” data with a critical lens.

These skills were further supported and strengthened with the examination of stereotypes in a neighboring, historically African-American community. Again, we collectively listed stereotypes and began investigating where these came from. As a precursor to a documentary video clip about the sociohistorical roots of the Bloods and Crips gangs, students were provided an opportunity to examine their own assumptions, then reflect and discuss in relation to macro socio-historical, economic, and political influences described in the film. This is the general pedagogical structure we used to practice critical literacy; reflections of their own experiences and ideologies, introduction of information and/or ways to examining themselves and their ideas, and practice utilizing these new lenses and tools to question commonly held beliefs.

At the end of the project, when asked to speculate why this film was referenced by her numerous classmates as a lesson that had a powerful impact on them, Brenda postulated, “I think its cause, like, it was like places we know. And we never, I guess we didn't really think about it.” Brenda captured an essential element of CRP that is grossly under-theorized. In addition to being contextualized in their local community, the key aspect that Brenda noted was that the film and subsequent discussions and reflections offered a new way to examine what had become normalized to her and her classmates. Most students, including Brenda, were raised in this community, which established a deep and rich knowledge of their neighborhood, but it also shielded her from being able to see things from a different perspective. Her recognition of this, though not entirely life transformative, provides the foundation of critically questioning, analyzing, and hypothesizing of new theories and ideas.

The following quotations, taken from class discussions, homework reflections, small group interviews, and final reflections demonstrate students’ critical literacy practices and their production of text that speak directly to their developing sociopolitical awareness.

After viewing a video clip that outlined the historically antagonistic relationship between the predominately white Los Angeles Police Department (LAPD) and the African-American residents of Elmhurst in the 1960s, students reflected on what they saw. In an attempt to deconstruct the roots of gang formation and subsequent violence that followed, Eréndira and Arturo referenced the issue of respect as a possible cause. In an attempt to delve deeper into their insights, I asked them why they felt like they needed to gain respect by shooting someone? Eréndira succinctly reasoned,

“Cause nothing else they are able to do, they get respect... Like they can’t get a job

cause... People won't accept them... That they could actually do a decent job. So the way they rebelled is being in gangs. And like proving to white people that they're like on top of them when it comes to gang status.”

Not only did Eréndira connect the psychological aspects of an individuals' self-worth and need for respect, but Eréndira hypothesize that young, low-income Black and Brown men may use gangs, as a tool, to gain power and respect over whites in a society where they possess limited means to gain respect through any legitimate institutions. She also connected the psychological damage of being constantly rejected by society as a sociocultural explanation to their actions and behaviors. When pushed to explain the foundation of these problems, Eréndira added, “Rejection... from society.” In this brief exchange, she demonstrates a nuanced awareness and understanding of macro sociopolitical factors that exacerbate these conditions. Her use of film evidence to illustrate her point not only demonstrates the her superb memory recall, but also points to her recognition of the powerful influence of sociocultural, socioeconomic, and sociohistorical conditions on the lives of poor Black residents of Elmhurst.

Following this, I inquired Arturo and Eréndira about similarities between what they witnessed in the video about Elmhurst in the 1960s and their experiences today, both of them noticed similar struggles between these Black youths with the challenges faced by present-day Mexicans in their community.

[Arturo] Cause like Mexicans can't get jobs. Like at Home Depot, you always see them standing outside, just waiting for someone to pick them up...

[Me] ...Like what happens? When they can't get a job?

[Arturo] They just stand there until they get a job I guess.

[Me] After a week or two, what do they do?

[Eréndira] They give up. They have to find another option.

[Me] What other options might they have?

[Arturo and Eréndira respond together] Drugs.

[Eréndira] Or like... People that kill people for money.

[Me] Have you heard of this?

[Eréndira] Yea. Or like [become a] coyote¹⁰.

Eventually, this small group discussion led Eréndira and Arturo to their agreement and conclusion that many individuals, given their socioeconomic circumstances, commit crimes because “something leads them to be like that,” as stated by Eréndira. Arturo concurred with this analysis.

This discussion is particularly poignant given the staggeringly different academic performances and status of these two students. Eréndira is a GATE identified, 3.2 GPA student, whereas Arturo has been designated by the school as the most “at-risk” student in this course. At the time of research, Arturo had a cumulative GPA of 0.56 with “far below basic” performances on Math and English standardized tests. By providing and nurturing communities of practice, students from varied academic performance backgrounds can share and even thrive in learning environments where each is challenged to reach their respective potential developmental level. Despite these schooling labels, they collectively reached a deep, macro sociocultural analysis of the roots of problems that plague many urban, materially poor communities. Although I was initially concerned that Arturo was struggling to follow this, he surprised and impressed me with his connection to the plight of the undocumented worker to those of young, black gang members in the video. Evidence of his following focus was seen when he added, “drugs” nearly in unison

¹⁰ Spanish term to describe individuals who are paid to smuggle people between the Mexico and United States border.

with Eréndira's response. Arturo may not consistently orally articulate his thoughts as quickly and as often as Eréndira, but it was clear to me (based on his verbal responses and body language) that he was actively processing the conversation and added points that furthered our discussion.

The psychological impact of the constant “stop and frisk” and/or “stop and question” tactics by the LAPD was not lost on students, as evident in the larger discussion. When asked who these young African-Americans were disrespected by, the class loudly echoed a chorus of “The police!” and “white people!” Juan raised a question that seemed to rise above the jeers of his classmate when he asked rationally, “Why would they give respect if they didn't get respect?” Notice that Juan's question references a commonly held belief, “Do not impose on others what you do not desire others to impose upon you.” By framing these individual acts around a larger, generally accepted tenet of humans, Juan calls into question LAPD's behaviors as socially and ethically untenable unjust actions that must be addressed.

Leveraging culturally relevant pedagogy to support critical consciousness

This similar point was echoed two days later in a discussion about respect. Initially whispered by Ileana to Esteban, who stated “They're [teachers] suppose to respect us and she's like [pointing towards Ileana], ‘Why should we respect them when they don't respect us.’” Ileana eyes grew wide with an expression of surprise and embarrassment by Esteban's outspoken nature and quickly add, “...well some teachers.” I applauded Ileana's point and personally connected her experience with my own. “I've heard that growing up too. Don't disrespect your teachers or don't talk back... Well, why is it a problem to question?” I attempted to connect it back to the video with the police, “Why did they [the black youths from Elmhurst] start not listening to the police?” Kundain quickly responded, “Cause they were disrespect[ful] to them.” I continue to

build on her point by arguing against the messages one might sometimes receive from adults. “Things that you hear normally by adults and other people that are suppose to be fact could be stereotypes.”

This seemingly inconsequential moment in class exemplifies the dynamics of the class structure and community. Ileana, an academically strong (by school measurements of testing and GPA), but fairly quiet student, was initially hesitant to question the normative behaviors of schooling, where student subservience is privileged over critique. But Esteban’s willingness to serve as Ileana’s amplification allows for a deeper, collective-interrogation of the school’s normative structures, behaviors, and actions. The nurturing environment of community-based practices, as seen through strong relationships among peers and their teachers results in Esteban’s paraphrasing of Ileana’s words to highlight a point he views as valuable to contribute to class discourse. Rather than being admonished for behavior perceived to challenge the traditional roles of power, students were instead encouraged to examine all aspects of their immediate environment. This culturally relevant curriculum and pedagogy works in unison to facilitate and nurture a critically conscious ideology while examining themselves. Further, my role as facilitator served to build and expand students’ developing critical literacies by modeling and connecting their experiences to those in the video.

These examples highlight the extent to which purposefully selected and crafted curriculum and pedagogy can offer pathways for students to connect, interpret, question, build, and develop critical literacy. By fostering a classroom environment and structure where students are encouraged to question and critique taboo topic and ideas in school, students begin to re-envision their surroundings and take risks in practice critical literacy in the classroom. Coupled

with curriculum housed a locally meaningful context provides students a way to practice critical examinations of systems, ideologies, and people that are relevant to their daily lives.

Turning outward to turn inward: Applying critical consciousness to their own lives

Leveraging students' cultural capital of local knowledge, they began applying critical literacy to their own lives. Again, following the trajectory of the sociohistorical video lesson on the formation of the Crips and Bloods gang, I will examine how four students began a reflective process of inquiry toward their lives and their surrounding community.

In a small group interview conducted at the end of the project, Armando expressed the profound influence the film had on him. In response to a question about how they chose their topic, Armando expressed his personal connection. "Well, it's pretty much about my life... Just my past." In an attempt to probe for aspects of the film that particularly resonated with him, Armando described the following:

...Where we used to kick it at, no Blacks would go to our street and like; we couldn't go over there... And even though they could now, they never would... But I started realizing... Now, except [because of] tradition... Even though they could, you know.

Armando describes the invisible, but potentially life-threatening street that historically divided the African-American community of Elmhurst and its neighboring, historically white community. Prior to the lesson on the formation of the Bloods and Crips gang, Armando had little knowledge behind the sociopolitical roots that separated these adjacent communities. Even as the two communities evolved to reflect the large influx of Latino immigrants in place of white residents, he continued to notice this self-imposed segregation. Equipped with new sociohistorical knowledge of Los Angeles gangs, Armando has now gained greater awareness and understanding behind various sociopolitical and socioeconomic factors that support the

formation of gangs. As a self-admitted “wannabe gangster” in middle school, Armando’s self-reflections describe his admonishment for his past behavior.

In a homework assignment asking students to reflect on their learning from the film, many wrote extensively about the commonly accepted stereotypes that did not accurately portray the residents of Elmhurst. Samuel challenged this reductive view by deconstructing the sociopolitical factors (systemic racism and the lack of opportunities) that really inhibit the people in the community. He concludes by alluding to a lack of sociohistorical awareness by those who stereotype people from Elmhurst because “they don’t know what they have been through”

Having lived in Elmhurst for part of her childhood, Michaela gave a firmly negative, one-sided portrayal of Elmhurst when we first began discussing stereotypes of that community. Over the course of watching the documentary on the history of gangs, subsequent discussions, and other opportunities to critically examine print and video advertisements, websites, video games, and songs, she offered a strikingly different perspective.

Elmhurst is not a bad place as they mention in movies, news, and songs... Overall Elmhurst is a decent community that care for one another and try to make the community a better place. Elmhurst has a lot of people that care for the children, city and the environment... People tend to look [at] the bad side [of] things instead of the positive side...

In her homework reflection, Michaela recognizes the power of various media in concocting a purely deficit view of Elmhurst. Instead, she acknowledges and appreciates the positive aspects of the community; specifically pointing out individuals within its borders that care for their children, the city, and the environment. The lessons on critical media literacy challenged

Michaela to see beyond the existing dominant media stereotypes of her former neighborhood.

Eréndira had a similar conjecture.

The reason we see Elmhurst as bad, is because of the news. When in reality the news only broadcast what benefits them, they brainwash us with lies. The news is bias. I bet Elmhurst has had accomplishments, why don't they talk about that? Because if they do people would change the way they see Elmhurst.

Like Michaela, Eréndira places the blame squarely on the shoulders of the news media. She extends this point by arguing that broadcasters are only producing items for their self-interest and is predictably biased. She rhetorically questions why the news media rarely discusses the accomplishments of Elmhurst and imagines how profoundly different people would look at Elmhurst. Through these self-reflections, both Michaela and Eréndira demonstrates multiple aspects of critical literacy as they raise marginalized perspectives, questions commonly accepted beliefs, and deconstructs sociopolitical factors.

Since part of the homework assignment required students to interview people of varying backgrounds about their stereotypes of Elmhurst, the curriculum facilitated a direct questioning of commonly held beliefs by the general population. It was a deliberate attempt to generate additional views of the community of Elmhurst. Some reinforced the same stereotypical views, while others contradicted dominant deficit-oriented narratives of the community. The pedagogical purpose behind this was to generate a cross-section of views and extended learning beyond the classroom. By strategically structuring curriculum that included collecting original research, analyzing it, and forming conjectures, students developed personal allegiances to the work. It also gave them an opportunity to practice becoming producers of knowledge as well as critics of dominant ideologies. For a few students, they took the added step to revisit their

interviewees and/or engage new participants as a process of re-mediating stereotypes. Few students captured this better than Eréndira in her homework reflection.

I actually talked to my brother and my sister since they were the people i had interviewed about Elmhurst. I told them that Elmhurst isn't as bad as society makes it seem. I told them about the story of Elmhurst and how the gangs started, but they weren't really gangs it was just kids trying to have fun on their own since the police and all the white people didn't let them join small things such as the boycotts.

By sharing this information with her younger siblings, not only had she personally learned the sociopolitical root causes of gang formation in Elmhurst but she is beginning to take on an identity as a change agent and social justice advocate. Her willingness to share this also demonstrates the importance she places on this newfound knowledge. She further reflects and hypothesizes about the learnings from the films.

In reality the only people we have to blame for the formation of gangs are the white people and society. I talked to my mom about the video we saw. And she said that she never knew that Elmhurst had so much history behind the name Elmhurst. I even talked to her about the media and how they only show things like celebrity breaks up and the royal wedding. She said she rather know other things like the people in Haiti, or issues around the world that are actually important for us to know.

Although Eréndira blames the formation of gangs in Elmhurst on white people, she also acknowledges blame on society itself. This quote shows her developing critical literacy and emerging critical consciousness. In her attempt to explain the unequal power structures that governed the Black youth in Elmhurst in the 1960s, she equates the power structure with white people. By sharing her knowledge with other family members, Eréndira initiates ideological

change. She is planting the seed of inquiry against commonly accepted beliefs while maintaining a critical examination of various issues in and around her community. She even applied her developing sociohistorical local knowledge to macro-sociopolitical phenomenon in the media. Through this discussion, Eréndira's mom is introduced to critical literacy through relevant and accessible information, while making new meanings in the application of this concept to her own information source. This collective meaning making process furthers Eréndira's own understanding of critical literacy, as well as her mother's. Through the process of sharing this knowledge with others in her immediate family, Eréndira is internalizing critical consciousness to have real, genuine meanings to her.

This process contains no clear beginning nor ending, but finds value in the recursive nature of learning where students develop personal and meaningful connections through culturally relevant curriculum and pedagogy while concurrently analyzing and questioning content through a critical lens.

Choice and Voice

After examining the importance of a culturally relevant curriculum and pedagogy, let us now continue to the production of multimodal artifacts, where students have choice in the selection of their topic and voice in the distribution of their work in a public, multimodal medium. The movement towards outputs is important on several levels; it continues students' development of critical literacy, as they think deeply about how to effectively bring their personally meaningful message to light in the form of a video game and how their self-selected issue can be understood through a sociopolitical lens. The following section will outline findings that demonstrate students processing and application of culturally relevant information, critical consciousness, and academic success.

As students made the transition from teacher-guided and facilitated culturally relevant curriculum and pedagogy, students like Antonio utilized the various examples and models we showed to support the development of his topic and the structural design of his serious video game. As the following excerpt illustrates, Antonio discussed how playing and reflecting on Ayiti, a serious video game that documents the struggles of a typical Haitian family, supported the creation of his own game.

Cliff: Do you feel like, like that, playing that Ayiti game, helped you make your own game or not? Maybe even thinking, directly or indirectly, with anything by playing that game, it helped you?

Antonio: It helped me.

Cliff: How?

Antonio: Like just putting everything together to just... Like finding out what I needed to do to make a good game.

Cliff: What was it about the game that helped you?

Antonio: Like how organized it was.

Cliff: Okay. Like what ways?

Antonio: Like they did their research and like... They had all their correct facts with like how actual families living over there.

Cliff: Yea, yea. And how did they affect your game?

Antonio: ...Finding out tru- like real facts about how people live in the ghetto.

After playing the Ayiti game, the class engaged in a reflection and discussion about the meaning(s), purpose(s), design, and overall structure of the game. Students were also introduced to the fact that Ayiti came about as a collaboration between urban youth in South Shore High

School (Brooklyn, New York) and Gamelab, a game design company. We told students that these game designers first researched poverty issues surrounding the Haitian people. With this information, Antonio attempted to genuinely and sensitively reflect the realities of people living with gangs by incorporating additional research in his game. The following discussion between Antonio and I provides insight into his thinking in formulating his topic. He points to one particular moment in the Bloods and Crips: Made in America film as inspiration for his own project.

Cliff: What was like some of the real facts you looked up that you found out to include in your game?

Antonio: Like in the movie we saw, The Bloods and Crips how that one kid who grabbed that one lady just went and killed him right in front of his house, like things like that.

Cliff: So what did you do in your game that's kinda like that?

Antonio: It's just... Like a gang confronted these two thugs and just ended up, just beating him up.

Cliff: Ohh... So that part of the game when you, I remember you were talking about like, what was it like, two dudes, like what did they say, "Where are you from?"

Antonio: Yea.

Cliff: And so you said, what are the options you gave in your game?

Antonio: It was like, to like, just answer and say, you don't gangbang or runaway or tell them to leave you alone.

Cliff: And how did that part in the movie relate to your game?

Antonio: The movie, like made me think, like, like well it should be like, the affects of

what he does, and then, he ended up just getting jumped. Like how that kid died.

Coupled with his personal experiences with gangs, Antonio also used sociohistorical knowledge gained through the film. Attempting to mirror one particularly disturbing incident where a grandmother details the random shooting of her non-gang affiliated visiting grandson, Antonio thought carefully before ultimately creating the decision-making scene. In that scene, the player is confronted by two men. One of them asks, “Where you from?” The player has to decide whether to simply run away or say, “Leave me alone!” The outcome of these two decisions leads the player to either tell a friend or run away and get beaten up nonetheless. The inspiration for the content and design of Antonio’s video game is an amalgamation of personal experiences, relevant practices, culturally relevant curriculum and pedagogy, and a desire to share the challenges and struggles many young men of color face in materially-impooverished and opportunity-limited communities.

Having the choice to select their own topics proved to be an important and critical component of this curriculum and pedagogy. Numerous students spoke at length about the affordances and appreciations of this curricular model. As one student concisely stated, “I liked it because just the fact of making your own game and you got to choose the topic of your game.” Students expressed enjoyment and satisfaction in being able to represent and share their personal stories on important topics with an authentic audience. Armando explained it in this way, “I got the chance to let people know how I feel about smoking marijuana and make them feel that they shouldn't do it either.” Similarly, Mayra shared her satisfaction in being able to talk about an issue that affects her family. “What I enjoyed most about it was the final thing I felt like if I had created a game even though it's small and reflecting something about me about my family.” Over the course of the project, this student consistently provided reflective and insightful writings to

the pedagogy in her class journal. Her writing often provided a deeper sense of her thinking than one-on-one and group discussions. As a former English language learner, Mayra struggled to articulate her thoughts through English discourse, even when discussing what she had written in her journal. This quote from her final reflection highlights her sense of satisfaction and accomplishment in the creation and completion of her video game about an aspect of her and her family's life. Despite this, her humility and constant academic insecurity made her qualify this statement by acknowledging the simplicity of her work.

Other students described the importance of sharing their perspectives about various social issues, particularly issues that are often ignored or usurped by deficit-oriented, dominant narratives. As a result, they created video games about how to promote healthy lifestyles, the struggles of undocumented immigrants, navigating the high school to college pathway, gay marriage and more. In essence, students strengthened their voice to tell stories they felt were important to share. In that process, they developed greater insights about themselves, their friends, family, and community.

Developing Voice and Self-reflections about their place in the world

In the process of developing a game with the express purpose of teaching others a self-selected message to an authentic audience, students gained insights into their lives, friends, family, and communities. Through structured writing activities and discussions, they learned more about themselves, people they know, and formulated connections to their local and global community. When students internalized the classroom learning and externalized their personal thoughts and feelings, the line between schoolwork and personal life was blurred. The imaginary dichotomy often expressed between the classroom space and their personal worlds no longer existed in these overly simplistic binaries. By starting with the self, students create projects that

are personally meaningful while pushing themselves to examine things with their developing sociopolitical awareness. In the following section, I will show how several students directly addressed issues and situations that were especially painful and/or difficult from their past. In some cases, students reflected specific efforts they have made and continue to make toward ideological and behavioral changes in themselves and those around them.

For Esteban, what began as an often-used cliché about not judging others for their exterior qualities quickly manifested itself into a deeper self-reflection about himself and his ideology toward others. Throughout the development of his video game project, Esteban continually self-analyzed and reflected on his past, present, and future self.

Well I just really want to get the message out that people should only judge on how the person is on the inside not of how they look on the outside. My past was just on outer appearance, now I give a person a chance to show me how they are and I see what happens from there. I'm the type who is really big on a first impression so I changed for the better I guess. I just hope in the future I can just accept people for who they really are.

This quote, taken from his final reflection on the project, shows his still evolving sense of whom he is and who he would like to be. This tension is seen in the line, “so I changed for the better I guess” shows his awareness that he may still hold aspects of his judgmental thinking. Further, his expression of hope for his future self speaks to his continual struggle between his present self and his ideal self. Esteban’s reflection highlights how this project provided opportunities for students to develop personal meaning, ownership, and self-reflection through their own lives. With content and pedagogy in Computer Science that has proved to be particularly isolating to

historically marginalized groups (Margolis, 2008) the use of culturally relevant pedagogy is an imperative to supporting equitable opportunities and access.

Self-reflections to change

In choosing to create her project about the often turbulent and tumultuous relationship with her mother, Carolina dove into an issue she had been struggling with for the past several years. Through hesitant conversations with her after class, during lunch, and after school, Carolina tentatively described the difficulty she has had in earning the trust of her mom.

I think that before I made this game, it made me think about how lying to my mom a lot of times made me feel kind of guilty because either way if I told her the truth, I'd end up getting in trouble for doing things I wasn't suppose to do. After I made the game, I actually believe that it has made [me] change about lying to my mom because now that I've stopped lying to her, I've gained some of her trust back.

Over the month long process selecting one's topic, reflecting, writing, discussing, and planning their final project, Carolina's writing and small group discussions demonstrated her evolving view of the relationship between her and her mom. Her expression that she "actually believe that it [her video game] made [her] change about lying to her mom" shows her own incredulousness at reaching this monumental place, especially through the process of creating a game. Though she did not explicitly state it, Carolina's growth was clearly seen in her self-reflections and journal entries. The process of developing a finished multimodal artifact pushed her to synthesize her analyses into succinct and concise decisions in game design and game play that mirrored the challenges she experienced. Her conscientious attempt to stop lying to her mom and her perception that it's led to a developing trust shows enormous growth in the relatively

short length of the project. Carolina's reflection mirrors many of her classmates' expressions of fulfillment in recognizing "aha" moments through self-reflections of their life.

Many students shared this sentiment in their reflections when they described epiphanies about past decisions/actions, severed relationships, or recognitions of the struggles and complexities of people's circumstances.

Self-reflection leads to complex critically conscious understandings

Another female student, Mayra described her realization that her aunt's obesity was more complex than the over-simplistic notions of eating better and exercising more. She spoke at length about the intersections of her aunt's low-pay and low-flexibility job, high crime neighborhood, inaccessibility to healthy food options, and her family's material needs as contributing factors in her struggle towards a healthier lifestyle. What began as research into the challenges her aunt faced in her struggles with obesity, led Mayra to discover the underlying socioeconomic and sociopolitical factors that handicapped her aunt's improved health. Undoubtedly, the critical literacy lessons that preceded the selection of her topic very likely aided her research to discover these additional reasons.

Metacognitive awareness through game design

Overall, there was little evidence to show a significant gender difference in the level of enjoyment students described in relation to the games they created. Both female and male students echoed a strong satisfaction with the entire game project; out of fifty coded instances of enjoyment twelve different boys and ten different girls described why they enjoyed creating the game. There was a near balance between those citing enjoyment in creating the personally meaningful story and the technical aspects of game design. Kafai (2008) recognized this trend in her research that showed surprisingly fewer dissimilarities between male and female 4th grade

game designers than earlier research that showed distinct differences in gender-specific story development of adolescents (Goldstein, 1994; Provenzo, 1991). Both male and female students described feeling a sense of satisfaction in creating something that mirrored the experiences they've had or someone they know. They also talked about feel enjoyment that others can learn from more about a topic/issue they were unfamiliar with. Kundain expanded on this by describing her own growth through reflecting on a difficult family issue. She described her self-reflective process as she experiences her younger sister's journey through chemotherapy:

I've had thoughts about how am I planning to change people's life's through this game when I haven't even changed my own when I myself haven't actually realized just how hard it is being a part of the struggle till I recently began tagging along with my mom to see what the process is really like and just how excruciating it is to watch a child handle so much. I've learned that everything you ever do in life has a purpose whether it's studying to prove something you believe in or to find a cure for something like cancer that at some point took your life from you without you actually being dead... Just the thought of what if my sister passes what's next? Everything is just so clear now.

During the process of thinking, reflecting, designing, and creating her game, Kundain recognized her personal absence in genuinely processing and reflecting about her sister and her family's general suffering. Her recent meta-cognitive awareness led her to develop reflections about life and her own eventual coming-to-terms with the possibility of losing her sister. Kundain's personal awakening highlights the life-changing potential culturally relevant curriculum and pedagogy possess when it privileges the stories, lived experiences, and cultural practices that are meaningful to students. Through this process, not only are students engaged in a process of self-inquiry, but they are doing this within the confines of producing a product through class that has

real meaning and personal satisfaction while learning computational thinking skills and techniques.

Giving voice to a marginalized perspective

In following Kundain's reflections during and at the conclusion of the project, she expresses her deep desire to give voice to those who have struggled navigating the medical community as a cancer patient or as a family member. This is evident when she discusses the frustration she has felt as she's personally journeyed through the treatment process with her mom and six year old sister. Her classmate Maritza periodically interjects phrases to sustain the flow of ideas. When I asked what she hoped others learn from playing her video game, Kundain specifically addressed foundations that have helped her and her family in funding.

Kundain: [I] just want [them] to see what, like cancer patients go through cause there's like a lot of foundations... They do fundraisers and like fund for that but they don't really know what it is-

Maritza: Going on.

Kundain: Yea, what they go through or what like the treatments and all the stuff that actually happens... But it's like they're fundraising for her cause they know she has cancer but they don't really know like what she goes through, the process, everything that's behind, you know, curing her, making her feel better or whatever. They don't really know. They just kinda like, "Oh, she has cancer and she's fighting for her life." Pretty much.

Maritza: And how she feels too.

Kundain: Like they don't see the pain and how it is when she's at home. Everything we have to do... They don't really see how much treatment besides chemo, they have to get, like they don't just get chemo, they get-

Maritza: How they feel afterwards.

Kundain: Yea, like the after effects... the secondary effects. Or how, in general, when the doctor talks to you or tell you something, the way they say... They way they try to, not sugar-coat, but make it not seem as bad. Just the way they say it.

Despite the financial benefits of these various fundraising entities, Kundain feels frustrated with the superficial compassion of cancer patients' ordeal with treatment. Her perception is one marred by insensitivity and shallowness. Her mocking expression of the fundraisers' sound bites ("Oh, she has cancer and she's fighting for her life.") suggest her desire for them to share a more nuanced and complex representation of what her sister and her family goes through. In advocating for her preadolescent sister and family, she is speaking back to those that hold more power: foundation representatives, medical doctors, and other specialists. This unequal relationship is most glaringly seen in the last few lines, when Kundain describes the way in which the doctor speaks with a patient and their family. Although not fully able to articulate the exact linguistic phrasing and/or tonality doctors use to share information with the family, she recognizes something in "the way they say it" that leaves feelings of dissatisfaction and/or a lack of empathy. Kundain's perception of these individuals, in positions of power, echoes her desire for them to strengthen their awareness of their patients' plight and to express it in a more conscientious way.

In her final written reflection, she hopes that, "...For doctors to see and play my game and realize the other side of the table and the parents that they deal with, the patients, and their

families.” Additionally, Kundain hopes that her message of greater empathy will spread to other audiences, “I want the gamers to understand just how important it is, how much thinking goes into every one decision made during the cancer battle process because one wrong decision can be your last.” Again, she points to the importance for others to recognize the intricate, psychologically, and emotionally draining process of cancer treatment decision-making. Kundain’s desire to build a more intimate connection with others, including health care professionals treating their patients, is most evident in the following announcement. “The game is to teach the audience about the process of treatment for them to feel like their actually a part of the patient’s life and their actually there with them struggling and just not losing hope that one day everything will be okay.” Based on this statement, one might surmise that her earlier remark about “the way they [doctors] say it” might simply mean that it is her desire for doctors to personalize the treatment process so that it becomes a more humane struggle they share together. Instead of following these binary relationships of patient and doctor, Kundain is advocating for a more fluid and humane relationship with these “professionals.”

Kundain raises a perspective, from the side of patients and their families that doctors and even the larger medical community may not always receive. She highlights how the unequal power dynamics between medical support providers and recipients play out in the perceptions, feelings, and lived experiences of patients and family members. By focusing on the patient and their family’s point of view, she raises a valuable perspective that is often marginalized by the medical “experts” in charge. Through her video game, Kundain gives voice to those that have been and continue to be silenced by the professionals in the field. The mere expression of this perspective provides agency to her and her family, as well as those who suffer in silence.

More than a game: Initiating social change

Other students echoed a similar sentiment to Kundain as they described the importance of giving voice and perspective to those who have been historically marginalized in society. Many described their process of turning inward, through critical self-examinations, to led them to make purposeful changes in themselves and their lives. This, in turn, supported their developing agency to take action by educating others through their respective video game projects. Much like Freire's theory of conscientization, where individuals take action to change their reality after a process of critical self-reflection, students designed and programmed games with purposeful and mindful decisions to interrupt and present counter-narratives to the existing dominant narratives.

Franklin's reflection of his process in arriving to the topic of racial profiling points to his ability to recognize sociopolitical inequalities in his own lived experiences. This then led to his self-described ability to enact change in others.

Before I design this game my thoughts about racial profiling were something I can move on with but after making this game I got in touch with this topic closer and now I understand other races better... After playing this game I think they will change their minds and think differently on this topic because they will know how unfair people are getting treated and is not right. I feel like something I made can change people because they feel what I feel and make them change their mind about racial profiling in any case.

Like many students, Franklin's choice for his topic grew from self-reflections during the culturally relevant curriculum at the beginning of the unit. Shortly after viewing a 1960s video clip about the routine harassment of African-American residents at the hands of the Los Angeles Police Department, Fito reflected on the radically polarizing experiences he has personally

witnessed with the police while sitting with his father (dark-skinned) and his aunt (light-skinned). Despite their gender differences, Fito noted similarities between his racialized interactions with the police and those of Blacks growing up in Elmhurst. Through the process of designing, thinking, reflecting, and creating a video game about racial profiling, he realized the severity of this problem and aptly titled his game, “Crime finding or Race finding?”

Fito’s reflection demonstrates his growth over time during the tenure of this unit. From someone who, self-admittedly, could simply “move on” about the topic of racial profiling, he became empowered to speak against the injustices perpetrated by the police. Further, he claims that he is now able to better “understand other races” due to his work on this project. His lessons led to his self-confidence in being able to initiate change. When he described how his game could connect with others who may “feel what I [used to] feel about racial profiling,” he recognized his role in becoming an agent of change.

Change agent to Role Model

Students such as Garly took her role as an agent of change through her game creation to an even more heightened level as she described her place as the new role model in her family.

From the game creation, I liked that I get to show that my sister was the first one, from out of both sides of our family to graduate from a university. I look up to her the most.

So, she started to go to university to... inspire me and my brother, even though my

brother doesn’t want to go because of his son. And she inspired me the most. And I have two little kids that look up to me, so now it's my turn to show that.

Initially motivated by her sister, Garly soon recognized her place as the new inspiration for the next generation. Although this may have resulted regardless of the curriculum and pedagogy, the reality is that the open-ended structure of the project allowed Garly to select a topic that was

personal and meaningful for her. Over several weeks of self-reflection and analysis in the narrowing of topics, she found value in sharing the story of her sister's path from high school to college. Feeling satisfaction in exploring a topic of her choice, she describes being able to "show that my sister was the first one... to graduate from a university." From this, Garly was able to clearly see her place in her family as the new family person to inspire others.

Limitations

Even with of the general sense of empowerment and agency in sharing a message that may instill change, some students expressed frustrations and limitations in their ability to change others through their video games. Danny indicated this when reflecting on his game's ability to convince others to avoid gang life. "I hope they learn how to make the right decisions on life when it comes to join a gang and say no. I have the power to change people minds as long as they chose to fallow me." Although he holds out hope that his game can teach others about gangs, he also offers the qualification that it may include factors beyond his control. By saying that his power to change others is restrained by a willingness to "fallow me," he seems to be stating that those who are not open to ideological changes would be unlikely to be change.

Similarly, Dennis shared a similar argument when asked whether he felt he could influence others to change their behaviors, actions, and/or ideologies. He raised the possibility that video games are inherently inadequate in fully representing and generating the feelings in reality. He references the immensely popular genre of shoot-'em-up games to make his point.

There's other things that, you know, has feeling into it...When you play a game, you don't feel like you're in a war or something like that, cause you're not really there. The feeling like, "Oh, my gosh. They might actually kill me, you know." It's just a game... you survive anyway...

Despite the sophistication of graphics, multimodal medium, and research-based representations, Dennis focuses on ability for games to convey and elicit the feelings and emotions one would get when faced with this reality. In reflecting on his own design and creative process, Dennis attempted but failed at replicating the fear he felt in his life because “not everybody is gonna feel the same way.” During the same small group interview, Katy echoed a similar sentiment, “Cause you can't change a person by just one game, so people do change, but some people don't.” Dennis reinforced this notion when he described the difficulty of someone coming from a materially privileged background being able to empathize with someone struggling with basic material means to survive. “How can someone in Beverly Hills, having everything that they have... Feel something from somebody that made the game in Elmhurst that has hardly, absolutely nothing, that lives in a really terrible place, you know, you can't connect.” Dennis’s bleak juxtaposition between the “haves” and “have nots” may point his overall binary perspective of one’s choices in life. Unlike some of his classmates’ projects that featured multiple endings, Dennis’s overall design of his game led to one of two choices; go to school or end up drunk and high in your empty apartment (after friends had stolen everything). This dichotomous view may partly explain Dennis’s view that initiating change must be transformative. He did not express the possibility that incremental change may result over time.

Identifying with Computer Science

With limited evidence of students explicitly expressing identifications of being and/or becoming a computer scientist, it is important to note that these students only engaged in the work of computer science concepts and computational thinking at a basic level. Their expressions of satisfaction with the creation of a working video game through a culturally relevant pedagogy offers hope to diversify the field of computer science to future generations of

Black, Latino/a, and female students. However, one student did recognize her place in the male-dominated world of Computer Science, particularly game design. In an attempt to design a game that spoke against the reductive themes of many preadolescent, female-targeted, online games (i.e. makeup, fashion, cooking), Brenda created a game that allowed players to dress up and marry opposite sex and same sex couples. She stated, “The message I want people to see is that it’s not going be your typical boy and girl wedding, it can be boy and boy or girl and girl.” Perhaps because of her firm stance against the socialization of gender normative behaviors, she adamantly announced her burgeoning CS identity at the conclusion of the project: “What I learned about myself is that I’m a good game designer :)”

Taking students’ responses, reflections, and products together, there is evidence that the culturally relevant curriculum, coupled with pedagogy that supported student voice in directing their final product shaped their engagement and interest in the work of building their own serious video games. Students demonstrated academic success through high rates of completion, use of computer science concepts, and self-reported enjoyment from participation in the project. Additionally, students leveraged their backgrounds, lived experiences, and personal reflections to showcase their sociopolitical awareness throughout the process and final products. This research highlights the exigent need to continue the nearly twenty years of research and practice on culturally relevant pedagogy. Without placing academic success and critical consciousness on equal footing as cultural relevancy, we will simply reify the same opportunity gaps by isolating our Black, Latino/a, and female students from the field of Computer Science. Thus, further segregating those with the power to produce the tools of our future versus relegating others to simply becoming consumers of them.

CHAPTER 5

In 1986, Delpit published the often-cited, but controversial article, *Skills and Other Dilemmas of a Progressive Black Educator*, highlighting the debate between the skills versus process approach to writing instruction. In it, she reflects on her experience as a student of skills-oriented approach to writing while becoming a teacher of the process-oriented approach to writing. Reconciling both, she advocates for a hybrid approach that incorporates both to best serve historically marginalized urban youth of color in acquiring the necessary skills to access the “culture of power.” Delpit further expands on this topic with a five-points explanation that lays out the foundation of her belief that teachers must directly and explicitly address the issue of power with their students. For the sake of brevity and relevance, I will focus on the fourth point, as the first three have been well described in various literature in the sociology of education and the last one makes more conceptual connections to feminist standpoint theory that are beyond the purview of this chapter. Delpit’s fourth point of power argues that, “If you are not already a participant in the culture of power, being told explicitly the rules of that culture makes acquiring power easier” (Delpit, 1998, p. 282) Although Delpit focused more specifically around forms of communication (linguistic forms, strategies, presentation of self, ways of interacting, etc.), I have found her argument equally powerful in the field of Computer Science.

Computer Science college graduates have been and continue to be disproportionately white and male (Williams et al., 2009; Zweben, 2010), one can make the argument that the culture of power within Computer Science institutions – schools, workplaces, etc. – often favors the same homogenous groups of people coming through the pipeline. In disrupt this, opportunities and access must improve for underrepresented groups (Margolis, 2008). To do this, Delpit would argue, we must explicitly teach and operationalize the codes or rules of power

in these settings, while providing the concrete and tangible skills necessary to be successful in Computer Science.

Connection to computer science

Delpit argued that to effectively teach “other people’s children,” one must use both a process-oriented approach and skills-oriented approach to teaching writing. A process approach focuses on teaching familiar concepts related to the new information, while pushing for critical and higher-order thinking development. A skills approach concentrates on the direct acquisition of skills and knowledge, akin to focusing solely on decoding while learning to read with little attention on the actual content of the material. Her argument is the blending of these two often-dichotomized learning approaches, where urban student of colors’ cultural orientations are included, while real skills that support their access to the culture of power are concurrently developed. Delpit emphasizes that in order for this fusion to be successful, one must incorporate students’ experiences and prior knowledge into producing work that has real purpose and authentic audiences (Delpit, 1995). These, she points out, are vitally important to helping students see meaning in their learning.

From teaching writing to learning computer science

By leveraging the critical literacy¹¹ lessons nurtured in the first phase of the project, students had a developing critical conscious perspective to the world around them. Keeping this in mind, students were encouraged to select a topic that was meaningful and personal to them, while advocating for an alternative and often marginalized perspective. In this process, they applied issues that are familiar to them to the space of designing and constructing a computer

¹¹ Critical literacy will be defined as the ability to examine and write text while questioning commonly accepted beliefs, examining marginalized perspectives, deconstructing sociopolitical factors, and initiating/creating change (A. Luke, 2000; Shor, 1999).

program within the context of Scratch, an object-oriented, programming language. Students fused the skills-oriented approach of explicitly learning computer science concepts and strategies within the process-oriented approach of thinking about how to effectively represent, design, and create a program that utilizes personally meaningful topics.

In this chapter, students demonstrate various facets of critical literacy in the development of their game. Then, I will share general findings of students' computational thinking from the Scratch analyzer program, highlighting specific examples from individual student projects. I will then introduce, define, and explain *critical computational literacy*, a concept that blends the critical consciousness of critical literacy and the skills and concepts behind computational thinking. Findings of critical computational literacy will be shared, analyzed, and discussed. Implications for this new theoretical framework will be explored and disconfirming evidence for this work will be introduced.

Critical literacy

Following the definition of critical literacy as the ability to examine and write text¹² while questioning commonly accepted beliefs, examining marginalized perspectives, deconstructing sociopolitical factors, and initiating/creating change (A. Luke, 2000; Shor, 1999), findings suggest students demonstrated different aspects of this through the creation of their serious video game project. From initial brainstorming discussions of possible topics, purpose(s) behind their message, explanations for their rationale, and the computational flow chart of their game, students spoke about various strategies they used to persuade audiences to their message. In this dissertation, initiating/creating change will move beyond traditional and commonly held notions of social change through collective action in the form of protests, strikes, or even public

¹² Includes non-traditional forms of text; multimodal artifacts that incorporates images, video, sound, movement, and user/program interaction independently or simultaneously.

presentations in the media and/or with public officials. Social change will be defined as an action/product/behavior with the purpose of initiating/creating change in others or one's own ideology, behavior, and/or actions. In this definition, initiating/creating change can occur with the creation of a video, multimodal artifact, or image, with the result of causing individuals and/or people to change or shift their thinking, actions, and/or behaviors. Thus, the view that social change must lead to large-scale systemic change will be challenged when we examine students' shifts in thinking as they create their serious video games. I will share examples that highlight myriad students' demonstration of critical literacy in the creation of their games. Some of these were described in greater detail in chapter four.

Questioning commonly accepted beliefs and initiating change.

In a reflection response about the meaning behind the message of her game, Sarita explicitly questions and challenges the commonly accepted view that “ghetto” or lower-socioeconomic areas are inherently unsafe or downright dangerous. She offers an alternative that is grounded in the reality for those living in these communities. “It’s important to show these issues because people need to be aware of their surroundings and to tell if it’s safe. I also hope to show people it’s ok to be outside and walk around but just be aware of your surroundings.” In selecting this topic, Sarita presents a more complex reality for the audience. Instead of simply painting the single story of the materially unprivileged communities as crime-ridden and dangerous, she offers a street-savvy and nuanced perspective that is absent from the mainstream news. She brings insightful personal knowledge into the creation of her game when she explains, “My grandparents always went for walks and they knew when it was okay to be in a certain street or liquor [store].” In addition to challenging overly simplistic narratives of her community, Sarita also offers solutions for those living in this environment, “...the game shows

them to see if it's okay to go into the liquor [store] or not. The assumptions people had before it 'I can't step outside my house.'" Through re-interpretations of her neighborhood and step-by-step decision-making in the game, Sarita teaches the audience to become street savvy by examining various signs in how one must act in different situations. She synthesizes this best, when she concludes, "When in reality it all depends on how you react to with them."

Sarita's reflection shows two major aspects of critical literacy: questioning commonly accepted beliefs and initiating/creating change. By highlighting specific ways in which one can effectively navigate around potentially dangerous situations, Sarita interrupts the belief that some neighborhoods are so hazardous, one must be fearful of stepping outside their home. She provides realistic suggestions on being "aware of your surroundings" and knowing which "street or liquor" store to go to and which to avoid. She provides wisdom from her grandparents' successful walks in the community as proof that one does not need to live in fear, but "react" in a smart way. Although her target audience is individuals who live in fear in similar communities, her point can easily transcend this group. In her attempt to offer real-world solutions to residents in materially unprivileged communities, she complexifies the nuances and daily struggles of people in these communities. She provides a counter-narrative to the one-dimensional identities of poor, disempowered, unsophisticated individual by showing how insightful, quick-witted, and resourceful one must be to negotiate your way to the local store. In this process, Sarita initiates change by changing the perceptions of those living in fear of their own neighborhoods and those who are naïve and uninformed of the realities lower-socioeconomic residents who struggle with this on a daily basis.

Examining marginalized viewpoints and initiating change.

In Kundain's reflection of her self-selected topic, she conjures up the hidden perspectives of cancer patients and their families' struggles in their management of care. Through the ordeal with her younger sister's battle with cancer, she gained first-hand experience of the various stakeholders involved in this process. She deliberately raises this concern when she emphatically states, "...there's many organizations for different cancers or just cancer in general but all these people that help don't really see the reality of having cancer, the hardships, the struggles, just how much it can change a persons life." Through personal experiences with different cancer-fundraising events for her sister, Kundain calls out these "advocates" to bring a more humane perspective to these campaigns. Additionally, she directly challenges the often echoed, but sometimes seemingly hollow cliché of being appreciative of possessing good health.

I hope that people learn, observe the value of having a healthy life, to understand that not everything in this life is great and that its not something to take for granted. This because many people don't realize just how much these patience hope to have what they have, the freedom, life without restriction. These people need to realize that theres always a kid with cancer or any disease fighting against all odds with everything against to have at least a glimpse of what they have. It challenges people to want to find out more about these cancer kids, to understand what their life is really like, and to simply realize everything they have.

Again, Kundain challenges individuals to be more mindful about our daily, moment-to-moment episodes in life and how differently we would think, feel, and act if we had cancer cells multiplying within our body. By alluding to living "life without restriction" and possessing "freedom" within their own skin, she compares cancer patients' feelings of being trapped within

their own bodies to images of prisoners being incarcerated. She reminds the audience of her sister when she invokes images of a child battling this disease while the disease-free population goes about their daily lives. Throughout her reflection of the message and her game design, Kundain attempts to complexify the notion that cancer is simply a disease one receives chemotherapy treatment and either survives or dies. She grounds this simple binary perspective on the fact that “there isn’t much out there explaining the process and not many people willing to learn about the topic in general.” Her frustration with the status quo is obvious in her tone, but her willingness and passion in raising this issue demonstrates her desire to raise awareness to a marginalized perspective.

By tackling this highly personal and meaningful topic, Kundain main goal, as she described, is to raise awareness of the painful struggles young cancer patients must endure. Kundain demonstrates her grasp of critical literacy in her ability to examine this marginalized perspective in great detail with thorough analysis. Far from sidestepping this difficult and complicated topic, she dives head first into various issues concerning young cancer patients: quality of life; psychosocial well-being; funding organizations’ genuine intentions and their representation and/or lack of agency of their patients; and the underlying rationale for the lack of information regarding this topic. By raising these issues, Kundain is initiating change in those that play her game. While they may not fully grasp the extent to which she described here, she presents a marginalized perspective they may never have previously heard. Her introduction of this topic may provide the impetus for them to learn more about this issue or simply gain deeper insight into the realities young cancer patient’s experience.

Deconstruct sociopolitical factors and initiating change.

In Juan's final reflection, he discusses how he drew knowledge from a maddening experience to self-discovery about the severity of the current policy against Latinos in Arizona. Not satisfied with this personal epiphany, Juan utilizes the tools of computer science to directly challenge the ideology of those who discriminated against him and his family. As demonstrated below, Juan's unwavering belief in his game to initiate change is seen in his empowered feelings he has as a game producer.

Despite the legal status of Jose and his family, he experienced the sting of racial profiling when they visited their sick cousin in Arizona. When they walked around in public, they often got stared at. "Doing that made me uncomfortable and made me realize the severity that racial profiling can cause." Upon reflecting on this experience, Jose came to the conclusion that, "...no matter what age you are, certain people believe that you don't belong here and should go back to where you came from." Despite this troubling and potentially dangerous situation, Jose turned these feelings of frustration into the premise for his serious video game. He described his rationale in the following quote:

I want those people who believe racial profiling is a good thing to realize what they are really causing and who it is hurting. I hope that a person like that will play my game and get a feel of what illegal immigrants go through just to get another chance at life but risk deportation just because of the color of their skin. I want them to learn what racial profiling really is and why it is a very inappropriate action to enforce and even legalize.

(22:4)

Recognizing this group as his targeted audience, he uses various techniques of persuasion in his game. Without directly conjuring up Aristotle's three pillars of persuasion, Jose has essentially

articulated how he plans on using each aspect of ethos, pathos, and logos to appeal to this partisan audience, all in an attempt to change their views on this topic. By first stating that he and his family are U.S. citizens, he provides the ethos or credibility of someone, like them, who was unfairly treated simply because of his outward appearance. By sharing the daily struggles of undocumented immigrants and their attempt at another chance in life, he appeals to the pathos or emotions of the audience. Finally, he makes clear that this policy has resurrected an environment of racial profiling and is simply an “inappropriate action to enforce and even legalize.” This appeal to the logos or logic of the audience is unmistakable. Jose’s explanation of the purposes for his video game is made all the more clear when we examine the various pieces that were mindfully constructed together to deliver this message.

It is not surprising then that he expresses such confidence that his game “will change people’s views on this topic for the better.” He seems to recognize that, although simple, his video game has the potential to create change. “I know that just doing something simple, such as a game, will get a lot of people thinking and taking action.”

Computational Thinking

Cuny, Snyder, and Wing (2010) defined Computational Thinking as “the thought processes involved in formulating problems and their solutions so that the solutions are represented in a form that can be effectively carried out by an information-processing agent.” By privileging the thinking process, they deliberately move attention from the narrow view of Computer Science as the accumulation of technical skills and strategies. By concentrating on the features of the human-computer interaction, they are pushing for a broader and more inclusive view of the computer as a more complex tool. While appreciative of this, the second aspect of

their definition still recognizes the realities of representing solutions through an information-processing agent, or some sort of computer-based device/program.

Harkening back to Delpit's explicit emphasis of teaching with both a skills and process approach to writing, I will likewise incorporate both in my definition of computational thinking. This is particularly salient for students who have been historically and systematically marginalized from the field of Computer Science. While developing a strong understanding of the thinking processes in Computer Science is critical to achieving success in the field, students must still be able to recognize, understand, and utilize computer science concepts as well. Thus, it is imperative that we examine both of these features, with equal weight, when analyzing and discussing the computer science learning from this project. This would be broken down in greater detail in chapter five.

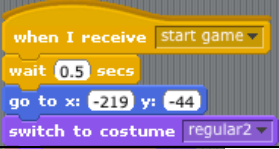

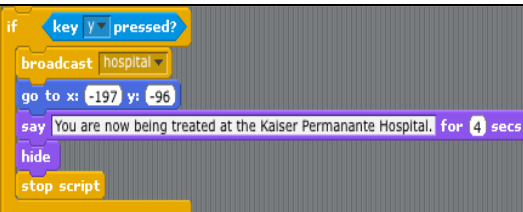
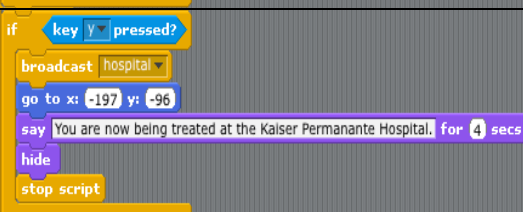
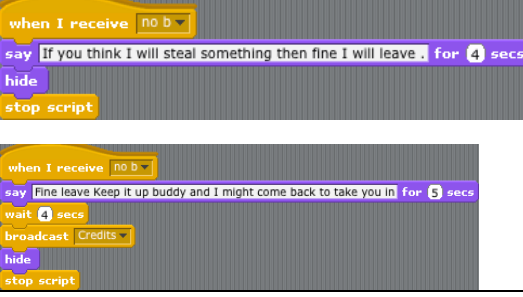
Computational thinking, in this context will be defined as *the thinking process involved in formulating problems and their solutions while utilizing fundamental computer science concepts and skills*. First, I will share findings that demonstrate students' use of various computer science concepts throughout their serious video games, including: sequence, iteration, conditionals, event handling, parallel execution, dynamic interaction, and synchronization and coordination. Since the thinking process involved in formulating problems and solutions are intrinsically woven into the fabric of how I have define Critical Computational Thinking, I will elaborate on this in greater detail during the last section of this chapter.

After conducting frequency counts of all thirty-three students' serious video game programs, the following table summarizes the results of this data. Following the name of each concept (first column), a brief explanation is provided (second column). This is followed by a screen capture of a student's example of this concept that I selected. Finally, the last column

shows the number and percentage of students that demonstrated this in their program. More detailed descriptions, analyses, and discussion of each concept will follow.

Table 5.1

Computer science concepts in video game programming

Computer Science (CS) concepts	Explanation	Student Example from Scratch	Number of students demonstrating CS concept / Total students (Percentage)
Sequence	Thinking systematically about the order of steps		33/33 (100%)
Iteration (looping)	Repeating a series of instructions a specified number of times or until a specific result is achieved		31/33 (94%)
Conditional statements	Perform different computations or actions depending on whether a programmer-specified condition is true or false		31/33 (94%)
Conditional statements	Perform different computations or actions depending on whether a programmer-specified condition is true or false		31/33 (94%)
Event handling	An action initiated outside the program, then handled by code within the program	Same as above.	31/33 (94%)
Threads (parallel execution)	When two or more independent threads (blocks of program) are executed concurrently with one another		29/33 (88%)
Coordination and	Coordinating multiple and simultaneous	Same as above.	33/33 (100%)

Synchronization	threads or processes to maintain coherence with one another		
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Sequence.

Sequence, thinking systematically about the order of steps, was demonstrated in different facets in all thirty-three students’ serious video game programs. As Armando’s example in Table 5.1 illustrates, to produce the sequence of code required him produce a broadcast signal for “start game,” determine the timing, move the main character or sprite¹³ to the appropriate x and y coordinate so that it would begin at the same location each time, and place the character with the right costume based on the background setting. This complex string of code requires a strong grasp of the multiple facets of the Scratch interface (scripts, costumes, control, motion, looks, and stage), as well as the order or sequence of the code. This small thread of code only represents four of the 492 blocks of Arturo’s entire video game program. This minute segment merely tells the main character when and where to appear and what costume to where. In order to produce a functioning program in Scratch, where instructions (code) work in coherence with one another, one must possess a strong grasp of the programming concept of sequence. Further detailed explanations of the numerous skills required to produce these student-generated video games will be elaborated under each subheading below.

Iteration.

Based on my analysis, with the exception of two students, the concept of *iteration* was demonstrated in 94% of the students’ programs. In its simplest form, it is essentially repeating a set of instructions, but in Computer Science and Mathematics, it is a powerful tool used to solve complex problems by harnessing the computational power of machines. This concept of looping

¹³ A two-dimensional image or animation in computer graphics. In most cases, these were characters in student projects.

is conceptualized in Antonio's game on negotiating violence in his community. In the opening scene of his game two individuals confront the main character. As Figure 5.1 and 5.2 illustrate below, in order to convey the sudden appearance of unwanted strangers, Antonio wanted to create the illusion that the sprites quickly came from the back alley to the foreground. In order to create this, the Scratch block of "repeat" was employed (Figure 5.2). By changing the size by 1, the y-axis by -1, and repeating this process 80 times, the boy in the gray sweatshirt incrementally grows in size and moves from a positive y-axis position to a negative one (the foreground of the screen).

Figure 5.1. Screenshots of opening scene of background seven in Antonio's game.

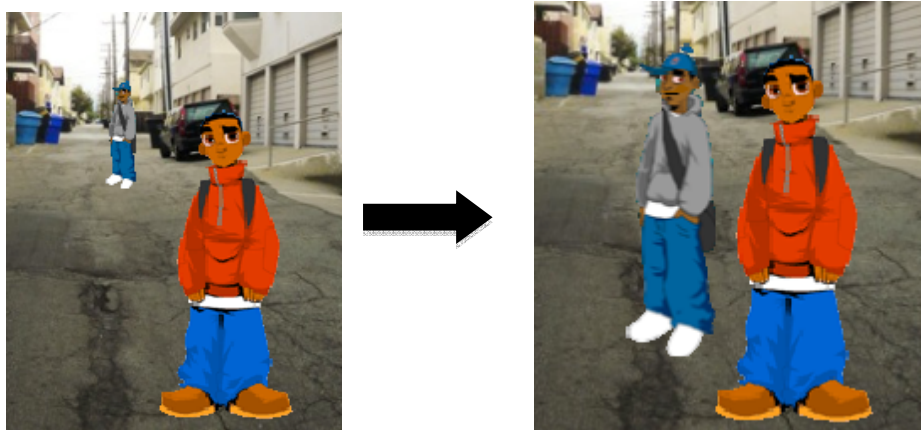
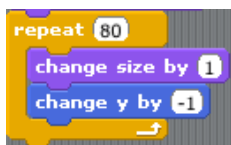


Figure 5.2. Programming blocks demonstrating iteration.



Antonio engaged in numerous trial and error attempts before getting the result he wanted. Through this problem-solving process, he received real-time feedback after each attempt at using different blocks, tweaking the numerical value of the size and y coordinate. Though far from the only way to create this outcome, Antonio must understand the correlation between x and y-coordinates on the screen, iteration, and perception of two-dimensional images. By using the

repeat and/or *forever* block, Antonio is developing the conceptual understandings of how iteration can be used to efficiently shorten the process of moving an object from one location to another and changing sizes without dictating every step in the program. This will lay the foundation of Computational Thinking, where he will be asked to solve more complex problems by thinking about the most efficient process in solving problems with large datasets. Iteration provides one tool to address those issues.

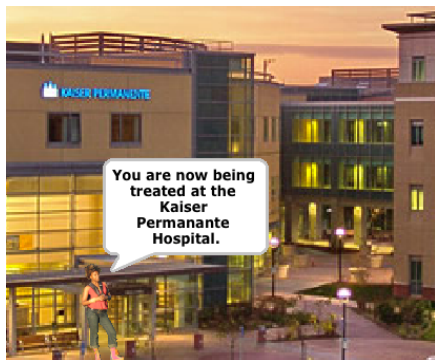
Conditional statements and Event handling.

The concept of conditional statements was also readily seen in nearly all of the students' projects (94%). In fact, there was an average of 6.42 conditional statements per student project (including the two students with no evidence of it). The concept of *conditionals* is fundamental to Computer Science and programming. In order to command a computer to execute a specific action, under precise conditions, students must be able to use the "if" or "if-else" blocks effectively.

Similarly, the concept of event handling, an action initiated outside the program, then "handled" by code within the program, was repeatedly found in nearly all students' projects (94%), with an average of six programming blocks per student. Event handling symbolizes the importance of the human-computer interaction. By allowing the video game player to determine the next step in the game, it creates the critical interactive and distinctive component to video games. Unlike other media like videos, images, and text, the video game invites and incorporates the audience into a unique performative aspect of this medium. To accomplish this, students must incorporate programming blocks that allow the player to press specific keys to determine the actions of the sprites.

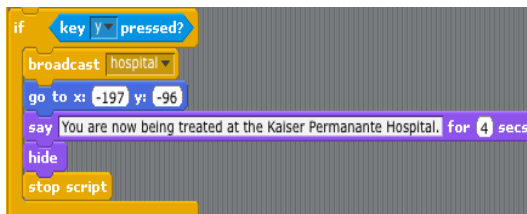
In the example provided in Figure 5.4, we see a block of code taken from Jackie’s project on cancer patients’ decision-making process for treatment. In it, she gives the player the option to choose between getting treatment at a specialized cancer treatment facility that is far away from the patient’s home or a general, local alternative, “Kaiser Permanente Hospital.” After choosing Kaiser, an image appears of the hospital and the character moves to the entrance. Then, it tells the audience, through a dialogue box that they are now being treated at Kaiser. Figure 5.3 shows the outcome of this programming operation.

Figure 5.3. Screenshot after electing to be treated at “Kaiser Permanente” Hospital.



The image of the programming block shows what happens when you select Kaiser as your option. “If – key y pressed?” then the program is taught to broadcast a signal for “hospital”, then it tells the character to “go to x: -197 and y: -96,” and “say You are now being treated at the Kaiser Permanente Hospital for 4 secs.” Finally, the main character is instructed to “hide” and “stop script.”

Figure 5.4. Programming code of a conditional statement in Jackie’s game.



Essentially, this set of instructions directs the computer to do five things. If the condition of the y button is pressed, then (1) broadcast a signal, which then gets received by another part of the program to show an image of Kaiser hospital, (2) move the main character to a certain location, (3) say a creator-determined line in a dialogue box, (4) hide the character after four seconds, and (5) stop running this program when it reaches this point.

By creating this sequence of programming blocks, Jackie demonstrates her awareness that computer programs operate based on actions the programmer instructs it to perform. This is one of four conditional statements she illustrates in her program where she directs the player to determine the next step in her game. By instructing the computer to broadcast a signal, move, speak, hide, and stop script, she shows her knowledge of sequence in programming as well as how conditional statements and event handling can drive the action of her program.

Threads (parallel execution) and Coordination and Synchronization.

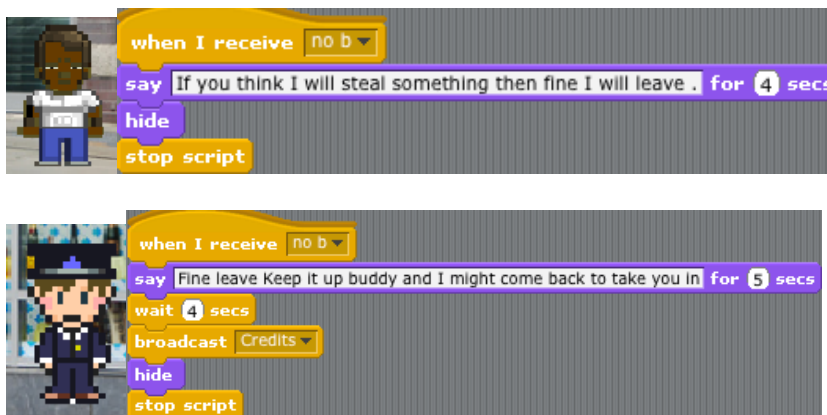
Threads, parallel execution, or parallel computing, as is most commonly known is when two or more independent threads (blocks of program) are executed concurrently with one another. This follows under the larger principle in computing that large problems can be broken into smaller parts and thus, become easier to solve. This concept was seen in most student projects. Twenty-nine of thirty-three students (88%) demonstrated at least one instance of this, with seventeen students (52%) using parallel execution four times or more in their video game program. Understandably, coordinating large numbers of threads within one program becomes increasingly challenging to manage and maintain.

Following this logic, coordination and synchronization is another integral aspect of computer programming. In making sure multiple and simultaneous threads or processes are operating in coherence with one another, detailed planning, coordination, and debugging efforts

must be continuously and conscientiously observed. One minute flaw between two threads would severely hamper the functionality of the program. This principle was evident through the “broadcast ---” and “When I receive ---” blocks in all thirty-three students’ projects.

Fito’s program on racial profiling demonstrates this concept in two of his sprites’ threads below. In this video game program, a white police officer accuses a Black pedestrian of stealing something from a store. As the player, you have a choice to confront the police of racism. The following two images represent the programming behind a “no” response.

Figure 5.5. Programming blocks and corresponding sprites in Fito’s racial profiling game.



Although placed adjacent to one another above, the actual programming scripts are located in each respective sprite’s programming interface. Thus, to create this conversation, one must be attentive to each respective thread. When both the Black pedestrian and the white police officer received the “no b” broadcast, they are instructed by the program to say different things. The Black pedestrian sprite is instructed to “hide” (or disappear from view) after saying his line for four seconds. The white police officer sprite is programmed to speak for five seconds, then wait an additional four seconds, before it sends a “broadcast Credits” signal, then “hide,” and “stop script” (cease all programming functions). In coordinating these functions, Fito must conscientiously move back and forth between two interfaces in order to keep the dialogue and

actions in synchronization with one another. One must be able to visualize the outcome while maintaining detailed understanding of the various blocks in correct sequence to reach the desired result.

When executed in the game, upon pressing of “n” for no (not confronting the police officer of his racism), both dialogue boxes appear simultaneously on the screen, with the police officer’s comment remaining one second longer than the pedestrian’s. This makes it difficult for a player to read and follow the flow of the conversation. This example was purposely selected because it is representative of some students’ demonstration of synchronization and coordination concept. As the data indicates, nearly all students used parallel execution with multiple threads, there were varying degrees of fluidity in synchronizing and coordinating all scenes, actions, sprites, etc. As novices of programming, students were exploring and beginning to develop expertise in how to utilize these tools. Some demonstrated highly nuanced understandings of the program during the three weeks of actual programming, while others showed the basic foundations of utilizing these tools. Fito’s example is representative of both; demonstrating parallel execution with some inconsistencies in the execution of synchronizing and coordinating of sprites’ dialogue and/or actions.

This example highlights an important point that was alluded to earlier in the Computational Thinking definition, “*the thinking process involved in formulating problems and their solutions.*” In order to better conceptualize students’ thinking process, we must engage in a deeper analysis of the processes that students undertook to reach the outcomes in their final serious video games. By simply looking at Fito’s final execution of the “no” response, we may have easily dismissed his work as shoddy or poorly executed. It ignores and fails to consider the learning and thinking process involved in this complex endeavor.

Debugging or Troubleshooting.

Another foundational aspect of computational thinking is the process involved in debugging or troubleshooting a computer program. This often involves a systematic analysis of their computer program that is causing a “glitch” or problem to occur. This practice can involve some or all aspects of the computer programming concepts described previously in this section. In attempting to figure out the root of a problem, students must engage in a systematic process of reading, re-reading, testing, and re-testing different parts of code. They must have a firm grasp of sequencing, iteration, conditional statements, event handling, parallel execution, and coordination and synchronization to fully understand why one or more aspects of these things are causing their program to malfunction. This was evident throughout the students’ creation of their serious video games. The following quote describes Juan’s debugging process.

The problems I came across were that when I would answer a question in the game it wouldn't broadcast the right scene it would broadcast a scene from another question.

What I did was ask Erendira and she said she had the same problem so then she asked Mr. Perez then she found out what was the problem [was] then she helped me... We had to put stop script after every decision-making thing. (P30:8)

Juan describes a challenge he and Erendira faced in coordinating and synchronizing events and multiple threads in their respective games. After attempting to resolve the problem on his own, Juan sought the help of Erendira, who explained that she faced a similar problem and received a resolution through the teacher. In this situation, Juan learned that iterations go on forever and the programmer must explicitly direct the computer to stop. This debugging process taught Erendira and Juan the importance of sequencing all aspects of the program so that it has coherence between different sprites’ scripts. In this same written reflection, Juan also discussed the place

where he resolved his own problem. "...My sprite would move all of a sudden or it would flip over so I had to change costume or I had to use that one thing that makes the sprite in a certain place wit x and y axis." His reference to change costume demonstrates his recognition of using programming tools to mirror the movements of people in his video game. He also describes an alternative method of replicating the same action sequence, by using x and y coordinates. His explanation of this shows his understanding of a fundamental axiom in computer programming; there are myriad ways to create the same outcome. Juan's description of placing the sprite in a specific location by using the x and y-axis also shows his understanding of mathematical concepts woven into Scratch. Other students expressed similar debugging process throughout the project.

Critical computational literacy

Just like the many different paths one can take to reach a specific destination, computer programming similarly allows the creator to take different routes to create the same desired outcome. By examining a student's creative vision, design, rationale, and reflections throughout the game production process, we gain insight into understanding students' learning process. Findings showed that most students engaged in metacognitive awareness at multiple phases of their video game development. This has tremendous potential for interdisciplinary learning in fields as dissimilar as Computer Science and the English Language Arts. The implications of this will be discussed in greater detail in the Conclusion.

As Wing, Synder, and Cuny (2010) alluded to in their definition of Computational Thinking, the field of CS should not simply be confined to the rote processes and other fixed computer science strategies, but an emphasis should be placed on the "*thought processes involved in formulating problems and their solutions so that the solutions are represented in a*

form that can be effectively carried out by an information-processing agent.” Historically, problems and solutions in the field of CS have often been restricted to mathematical and/or quantifiable dilemmas. In today’s interconnected and convergent world of people and technology, we must redefine problems to include real-world challenges that are not so easily defined by numbers. At the same time, these problems can still use computational thinking to help us better understand them. In applying the logical and systems thinking of this tradition, with the real world knowledge people bring with them, we can better merge the worlds of computer science and the social sciences.

It is precisely from this location where computational thinking and critical literacy intersect. While little explicit emphasis is placed on analyzing and evaluating the role of power through computational thinking, critical literacy offers the potential to add this critical conscious perspective to the problem-solving processes in computer science. By unifying the sociopolitical analysis of critical literacy to the thinking processes involved in problematizing issues and the solution-oriented development of computational thinking, Critical Computational Literacy provides the real-world application of critical literacy in tools that are revolutionizing our present and future worlds.

Thus, Critical Computational Literacy is *the process in formulating problems and their solutions while utilizing fundamental computer science concepts and skills, with the explicit purpose of creating sociopolitical awareness and ideological change by examining marginal perspectives and questioning commonly accepted beliefs.* Findings showed that students utilized and recognized the affordances and limitations of the programming tool, Scratch, in representing the complex realities of their world, while producing counter-narratives to pre-existing dominant

narratives of their lives. This was demonstrated in two main themes that will be discussed below: systems thinking and representation.

Systems Thinking.

In order to create a highly persuasive text, an author must consider their purpose, their target audience, and the tools at their disposal to influence others. These points were made more emphatically through the process of creating, designing, and executing it in a serious video game medium. I argue that the inherent game design process forces the designer to consider systems thinking elements that reinforced and nurtured students' critical literacy practices when synthesized together. Recognizing that these students are novices in the field of game design, greater emphasis was placed on the processes they undertook to create these artifacts. Their technical skills will increase with added experience, knowledge, sophistication, and the benefits of more professional tools. With that said, students demonstrated systems thinking, especially in the early stages of brainstorming, planning, and designing their programs.

Systems thinking is the general process of thinking about relationships between things and understanding how they influence one another within a larger whole. It is found in nature with ecosystems; in institutions with how organizations function; in Computer Science with examining how a computer system works together; and in Sociology with understanding how various people relate to each other and other systems. In this context, students thought deeply about how to create and deliver a personally meaningful message to an audience, through various player-driven decision-making points and their respective outcomes. Although the audience may feel as though they have autonomy in directing the outcome of the game, the designer pre-selected all game decisions, scenarios, and outcomes for the player. To media experts, it's widely acknowledged that the process of selecting and creating various aesthetics, game design,

and game play has tremendous sway over the response of the audience toward a message in the game.

After selecting the topic and message, students brainstormed key decision-making situations to mirror the experience to the audience. Next, they created computational flow charts or decision trees that served as the programming outline for their game. Through the voice of the student and their artifacts, I will highlight their systems thinking, and thus their Critical Computational Literacy.

Choosing, designing, and controlling decision-making options and outcomes.

Jocelyn’s serious game on bringing awareness for those who have experienced the struggles of cancer treatment comes from her personal experience with several family members who have fought this illness. Her explanations, coupled with the game play, demonstrate her awareness of a systems thinking approach in persuading others. As she explains, “I want them to feel the happiness of when your life’s going fine and then the hopelessness of when you get a check up and the doctor tells you, you have a tumor in your neck and you have cancer.” The opening five images of her introductory story in her game (Figure 5.6) direct the audience’s attention to this message.

Figure 5.6. Opening scenes from cancer project.



By using a young female student as the main character of her game, she not only gives voice to her family member, but also targets a teenage audience. The selection of the first picture

reinforces the happy, normal of life of a young person, while the second and third pictures prime the audience for the unavoidable bad news. The fourth picture shows the reaction of the patient to the news and the fifth picture brings the reality full circle when treatment has begun.

Like many of her classmates, Jackie designed multiple iterations of her computational flow chart in order to effectively solicit a specific response from her audience. In the following quote, Jackie demonstrates her systems thinking approach to program design as she decides how to navigate her audience towards specific and distinct outcome.

As was described in an earlier section on conditional statements, Jackie programmed the first decision of the game to ask the player where they want to be treated for their cancer. Although the actual game simply asks the audience which facility that would like to be treated and the resulting outcomes only direct the player to where they are currently at, her rationale here speaks to her deliberate attempts to highlight a complex reality.

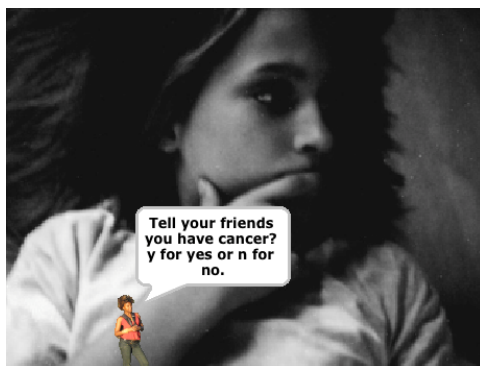
The first option is a regular hospital and the second is a special facility. I showed the player that if they picked the first option, they'd have to travel far from where they live to get to a hospital that treats cancer because not many do. I also showed that if they chose the second option, their parents needed to get a second job because the insurance wasn't enough to pay the medical bills. Both outcomes are negative because I want the audience to see the reality of how cancer can completely change a persons' life for the worst. P21: 9-15

Jackie leverages her intimate knowledge of the cancer treatment process while utilizing her computational thinking skills to design and create a product to educate her audience of the complexities financially unprivileged cancer patients and their family must navigate. Although she did not end up including the realities of sending the daughter to the Cancer Treatment Center

of America, mainly due to time limitations, she clearly conveyed her intent when she explained the rationale for these outcomes. Her purpose in providing only these “negative” outcomes situates the audience to the realities for a cancer patient. This point is reinforced with the second decision in the game. Jackie explains:

The player’s gonna have to decide wether to tell his/her friends. The outcome of telling your friends is that you’ll become the main topic of conversation. The outcome of not telling your friends is that you won’t be able to talk to anybody about how you feel besides your family.

Figure 5.7. Decision scene on cancer project.



Without explaining the rationale for the decision, Figure 5.7 shows a screenshot of the decision-making scene. Again, both options are fraught with the complex realities of life without oversimplifications into false binaries of positive versus negative. By presenting these options, the player is forced to stop and weigh the costs-benefits of both outcomes. Without a clear “correct” answer, the player may be more motivated to replay the game to learn the outcomes of the opposing decision. After making a selection, Figure 5.8 presents the player with the result of their decision.

Figure 5.8. Outcomes of decision in cancer project.



By electing to tell your friends, “you’ll become the main topic of conversation.” This outcome does not necessarily provide the positive relief and socio-emotional nourishment one may hope in sharing the painful realities of this illness. Conversely, keeping it within your family leaves one feeling isolated and depressed, as indicated by the second picture (Figure 5.8).

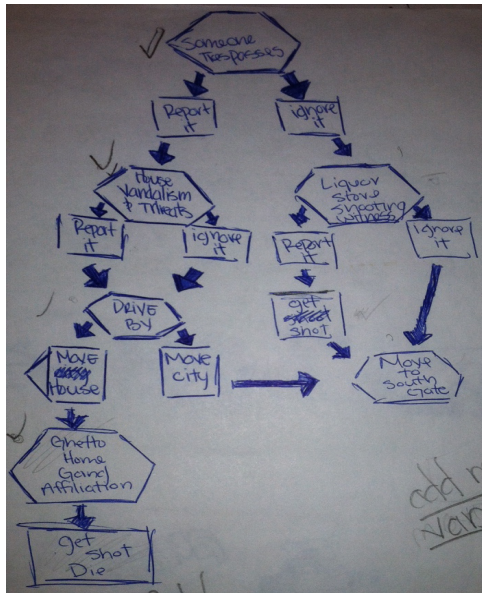
By carefully choosing, designing, and controlling the decision-making options and outcomes, Jackie methodically shapes the audiences’ reaction and feelings toward this topic. Keeping her message of cancer treatment awareness in mind, Jackie has taken a highly complex issue, synthesized it into several, manageable and essential parts, and created an effective message utilizing her computational thinking skills. In the process of creating her game, Jackie demonstrates her faculty with numerous Computer Science concepts: sequence, iteration (looping), conditional statements, threads (parallel execution), event handling, and coordination and synchronization (broadcasts). The game medium enabled her to think deeply about how to accurately represent this story, while educating others of marginalized topic, raising sociopolitical awareness, and initiating social change.

Computational flow charts in Systems Thinking.

Andrés's project on facing violence in your community exhibits similar points that Sarita raised, but his journey also highlights the role of the computational flow chart in the development of Critical Computational Literacy. According to Andrés, the message of his program is to teach others that "not all environments are safe and it is very hard for someone to move out [of their neighborhood]." In the process of teaching this, he points to several conditions that provide the sociopolitical explanations behind his message. As with all students, his story is a personal one. It describes his family's experience living in South Central Los Angeles and the challenges they faced when they tried to move out. The other goals for his project is to challenge people's assumptions that those living in high-crime, lower socioeconomic areas choose to stay there and "don't move because of their desire [to stay]." Instead, his game design seems to point to certain institutional impediments that prevent thwart their ability to move.

Figure 5.9 represents Andrés's computational flow chart or the outline for his serious video game. It shows the various decisions that a player has to make, its respective outcomes, and the next step on the program. In the flow chart, notice that Andrés provides the player with four different scenarios or decision points: someone trespasses; house vandalism & threats; liquor store shooting witness; and drive by. Each decision is followed by an outcome that leads to another decision (with the exception of the last ones). Each decision forces the player to choose one of two options presented in front of her. At the bottom of the flow chart, the two final outcomes are: "move to South Gate" or "get shot die."

Figure 5.9. Computational flow chart.



During the course of several weeks, Andrés narrowed and refined his topic and selected the most pertinent facts of his prior experience into the game. By outlining and synthesizing the realities of his lived experiences into a computational flow chart, Andrés sharpened the focus of his message and its effective delivery. By presenting multiple examples of criminal activities, all of which he and his family personally experienced, he thrusts the player into the unsavory situation of choosing from two undesirable options. It also draws attention to the myriad and varied types of criminal activities one may face in a high-crime community. This continual exposure to petty, “victimless,” and violent crime underscores the psychological impact it has on its residents. Andrés is keenly aware of this when he blatantly discusses the feelings he hopes to conjure up in his audience, “I want them to be afraid they might get caught up in violence and I want them to feel the fear that many people have while living in a ghetto environment.”

Figure 5.10. Screenshot of violence in your community.



In three of the criminal situations, the player is given the choice to decide whether to “report it [to the police]” or “ignore it.” Figure 5.10 shows a screenshot of a decision-making scene, following the vandalism of protagonist’s home. Upon making the decision, a new scenario presents itself. In Andrés’s game, whether one chooses to report or ignore the crime, the result is nearly negligible as both options yield a similar result. In the game, if one chooses to ignore reporting any of the crimes, it still results in a random gang shooting. If one chooses to follow the commonly held belief of reporting crime to the police, many of the outcomes result in retaliatory violent backlash against the main character and/or his family.

Andrés’s social critique of the inadequacy of the police highlights the frustrations many community members in high-crime, materially unprivileged communities. The mentality that one is “damned if you, damned if you don’t” is poignantly pervasive as residents have personally experienced the real, physical harm of “snitching” to the police, as well as allowing crime to happen in their neighborhoods. Andrés captures this point well by showcasing the ordeal him and his family witnessed as they repeatedly experience criminal activity, yet felt compelled to

stay silent, for fear of retaliation. Caught in this bind, Andrés summarizes it best when he reflects on what he hopes others will gain from playing his game. "...People will learn the struggle and fear people go through when living in a bad environment. It will show the struggle to move out... People will also see what happens when they stay."

Through the process of crafting his serious video game, Andrés develops his systems thinking to appropriately and effectively elicits emotions out of his audience for maximum affect. By using the tools of Computer Science, Andrés synthesizes, clarifies, and focuses his message and intentions. The use of the computational flow chart facilitates the movement of the player from scene to scene, while individual decisions, and outcomes reinforce his message. By utilizing his computational thinking to re-create the real life scenarios he experienced, he is questioning and critiquing several commonly held assumptions: report crime to the police because something will be done about it; poor people choose to live under the duress of their communities; people in high-crime neighborhoods do not snitch out of allegiance to their friends/family/neighbors; and poor people lack self-initiative or else they would move. In the process of questioning these ideologies, Andrés is also deconstructing larger sociopolitical factors that influence the lives of people in these communities. Through these progressions, he is initiating change through his game by challenging the assumptions one may possess about people from a community distinct from their own.

Fito's demonstration of systems thinking.

Fito took a different approach in his computational design to interrupt deficit-oriented ideologies. Instead of amplifying his point by limiting the decision-making process and subsequent outcomes, he chose to create distinct paths that mirror the varied experiences of racial profiling by the police. This process encourages the player to play the game multiple

times to fully immerse themselves in the experiences of Black, Asian, Latino, and white pedestrians.

Although Fito's impetus for creating his game on racial profiling may have been stimulated by the documentary, Bloods and Crips: Made in America, his rationale was also highly personal.

Through first-hand experiences, he explains,

My topic is important because before my dad is being stop just because he is dark. They tel[l] him that he look[s] suspicious and my dad is a really caution driver but cops just seem to think he looks suspicious. My aunt in the other hand was gotten stop but because she is whiter they just give her warnings and they say that anyone could make that mistake. Cops depending on your race they go easier on you.

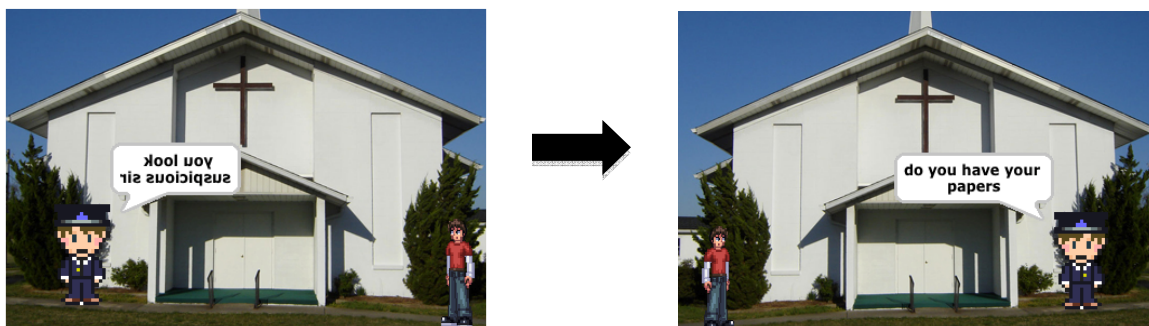
Clearly, distinct differences in gender, context, and individual markers may influence outcomes, but Fito's perception of these noticeable differences and research on police stops tend to favor his claim and line of reasoning. Fito hopes to educate others about the severity of racial profiling by specifically targeting his game to audiences who have never experienced the sting of police discrimination. The opening decision-making scene immediately forces the player to choose the experience they will face (Figure 5.11). Each "choice" will offer significantly different scenarios and interactions with the police officer and distinct outcomes.

Figure 5.11. Opening decision scene from racial profiling project.



Fito makes his purpose clear when he definitively states, “It challenges people to think because it make[s] them wonder how it will be if it ever happen to them. They would think how there is no choice to pick your race.” By forcing the player to select a specific race, the player is placed in unenviable circumstances for the Black and Latino options. This forces the player to confront the common and unique realities for many Black and Latino Americans. Unlike a police stop that a white or Asian person might experience, Fito highlights the potentially dangerous and life-altering stop experienced by Mexican and Black men. “I want the player to be aware of what will happen next and choose carefully what they will choose.” This point is made resoundingly clear in the scenario for the Mexican character in Figure 5.12. Within a second of changing to the church scene, the Mexican player is immediately confronted by the police as “suspicious” looking. This is directly followed by a question about his legal status in this country. The sprite answers “Yes, sir.”

Figure 5.12. Latino decision-making scene from racial profiling project.



You are now confronted with a decision, “should I lie and say I was to church or just say speak the truth and ask to leave?” If you lie, the police officer challenges your assertion, “If your going to church were is your bible lying you must be hiding something im taking you downtown.” If you state the truth, “I was not doing anything bad sir is it ok if i leave now?” The police officer

answers, “sure why not have a nice day sir.” The outcome of this decision either places you in jail or is left alone.

Fito recognizes the politically charged climate many Latinos/as currently face. By asking the player whether they have their papers references Arizona’s Senate Bill 1070 where a provision gives legal authority to police to determine an individual’s immigration status during stops, detentions, or arrests, when there is reasonable suspicion they may be undocumented. Although the player is provided an option to leave without incident, the audience may develop greater awareness of the stereotype threat encountered by Latinos/as in these habitual circumstances.

If the player chooses to be African-American, the immediate circumstances are similarly confrontational. While standing on the sidewalk, in front of J’s Wine & Spirits, the police officer instantaneously inquires, “What are you doing?” Moments later, he becomes accusatory, “Thinking of stealing from the nice store?” The African-American sprite replies, “acourse no sir just waiting for a friend.” The police officer continues, “Its something wrong sir you looked troubled?” Now the player is presented with a thought bubble, “ This cop is being racist. Should I confront his racism?” Depending on your response, two different outcomes result.

Table 5.2

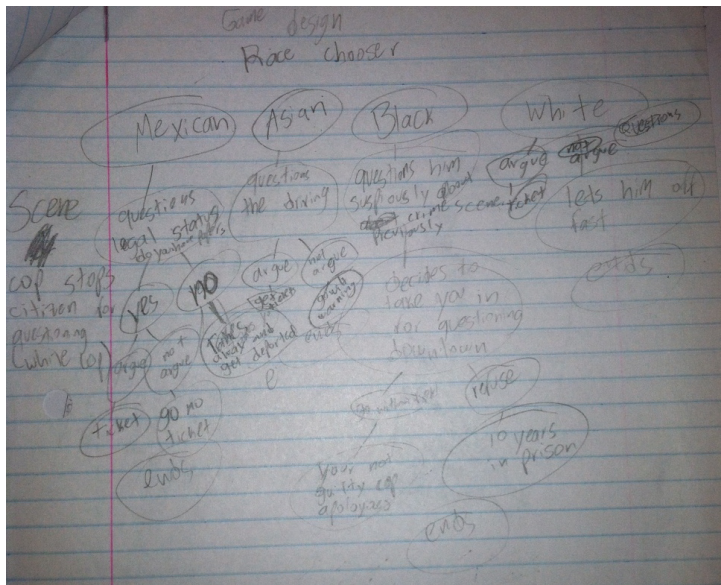
Player and Police Response to Racial Profiling Project

	Yes	No
Player response	Your being racist can you stop I don't want hurt anyone	If you think I will steal something then fine I will leave.
Police response	Im taking you downtown you will be put away for good. Not so tough now are you?	Fine leave Keep it up buddy and I might come back to take you in

Unlike the Latino character's corresponding police response, both outcomes result in varying levels of disrespect and contempt. Though not jailed for naming the police officer's accusations and explaining your next action, the accusatory tone is clear when the officer threatens to "come back to take you in" despite the fact that the Black sprite did nothing to receive this treatment. However, by calling out the police officer's racist tactics, the police response by taking you to jail. Notice that the Black sprite's experience with the police provides no outcome without a certain level of humiliation and/or loss of dignity. This may be Fito's intention to highlight the nuanced experiences with the police between a Latino and a Black pedestrian.

Fito attempts to develop empathy for those experiencing racial profiling as is indicated from his reflections on his game. "I want them to have a negative feeling on racist people or cops. I want them to feel bad for other races that have it hard... Equality is what the person that plays my game should be taught and learn..." By creating scenarios that mirror the common realities for many African-American and Latino men and boys, and juxtaposing it against the experiences of their Asian and white counterparts, Fito leverages the computer science skills he has developed to garner a compassionate response to the sociopolitical unjust actions of the police. He exploits the curiosity and desire of the player to learn about the varying interactions and response of the police to play the game multiple times. In this process, Fito had to design a more complex structure of his game in order to account for these diverse experiences. His computational flow chart (Figure 5.13) showcases the unique outline he used to turn his idea into reality.

Figure 5.13. Computational flow chart from racial profiling project.



Instead of a singular based decision-making option at the top of the flow chart, the player is immediately forced to choose between one of four options. Then, it branches out into more decision options. Fito's planning artifact captures the complexity and organizational requirements to engineer systems thinking effectively. Although he did not complete all the decision-making options described in the flow chart, he created a complex game that provided eight unique outcomes for the audience.

Representations.

Cuny, Snyder, Wing's (2010) definition of computational thinking includes a more expansive notion of what a good computer program looks like: "It is judging a program not just for correctness and efficiency but for aesthetics, and a system's design for simplicity and elegance." By this account, we too must examine the way in which students are representing

their messages through the aesthetics of their game. In the same way students demonstrated systems thinking to conceptualize their game to deliver a message for maximum effect, they similarly used various representations to influence the audience's feeling and thinking towards the selected topic. Here, representations are defined as any text, image, color, and sound, or any amalgamation of the four. As we described in the previous section, the designer is forced to make decisions in how they want to represent, mirror, portray, and synthesize real people and their experiences. This process inherently evokes memories, reflections, and analyses of their self-selected topic, thus deepening their reflexivity for the purpose of educating others. Through a combination of student reflections, think alouds, and artifacts, students articulated their deliberate and conscientious decisions to select specific aesthetics to enhance the game play for their audience.

Since Kress' (2010) multimodal social semiotic approach focuses on uncovering the meaning making process of a multimodal text, how the creator assesses the environment of communication (who will participate [audience-game player], for what occasion [serious video game], what objects will I use [representations]), the resources available, and the interest of the creator. Following this approach, I must begin with students' rationalizations and reflections of their work (p. 209). Even in this teacher-initiated, institutional-based, and resource-constrained project, individual agency is found in the students' selection, transformation, transduction, and arrangement of modes (images, text, color, sounds) within their game. By privileging students' rationale for their creations, it changes the power dynamics of research and analysis. It places students' voices ahead of my researchers' agenda. I will now highlight several student examples that demonstrate how they were able to increase the effectiveness of their serious video game message with these representations.

Representation through Images and Text: Real Life versus Cartoon caricatures.

Samuel, a student whose game depicted the daily struggles of undocumented workers, epitomizes the metacognitive processes necessary in the creation of multimodal artifacts. In a reflection, he explained that he purposely chose real pictures to represent undocumented workers' struggles: "I wanted people to see that it's real people that it's affecting. Cause like maybe if you put like fake characters, maybe it wouldn't appeal to them as much [as] if I used the real picture." His allusion to "fake characters" describes the cartoon-like images typically found in entertainment video games. Figure 5.14 shows several screenshots taken from the introductory story and the game itself.

Figure 5.14. Introduction images from undocumented workers' struggles project.



Of the fourteen background images he used in his game, thirteen of them consist of pictures of real people and settings accompanied by text. The first image shows four undocumented workers standing and sitting in front of McDonald's with the words, "They just want a better life for themselves and their families." The second image shows a man handcuffed by a Police ICE agent on the street, with the line, "Imagine your dad or uncle get arrested when walking down on

the street. The third image shows a woman in a hooded sweatshirt being led from a blue van to a warehouse looking building with the words, “Imagine your parents or family members being taken away from work.” Finally, the last image shows a woman, two children, and possibly an aunt or grandma gazing at the camera with muted and gloomy expressions from the staircase. IT is accompanied by a question, “Yor family is very sad now cause you were deported!!! These are the hardships that immigrants have to live with what kind of hearts do people have to split families APART??!!!!!!”

As Samuel described, his purpose was to show how these immigration policies affect “real people” and his goal is to “appeal to them.” The combination of the images with the text provides a clear persuasive argument to the audience. His argument that these workers are simply striving for a better life builds on the concept of the American Dream; if given the opportunity to work hard, perhaps they too will succeed in life. The next two images tears at the emotional heartstrings of the audience through personal appeal. In asking the game player to “imagine” these individuals as there father, uncle, or other family member walking on the street or on their way to work, it forces them to reconceptualize their definition of criminal activity and/or behavior. Finally, the image of sullen faces of the family absent of a father, accompanied by text that reinforces their depressive expressions creates the inevitable reality of these government policies. The final question leads the audience to soul-search one’s moral standing in being complicit to the break up of families.

Samuel’s reflection on his deliberate use of images and text demonstrates the deep thinking involved in addressing an issue that is important to him and his family. By leveraging the aesthetics of image and text representations, along with game play, he pushes for an ideological change in those who play his serious video game.

Even though Samuel used real images to represent the struggles of undocumented workers to the public as his rationale to persuade others, Andrés conversely felt that by modifying real images to cartoon caricatures, his game would result in a more universal appeal. Through one-on-one discussions, he explained that cartoon caricatures would appeal to a more youthful audience. Despite the varying rationales for their respective aesthetics, the similarity is that they both engaged in deep metacognitive processes to think about how to effectively express their ideas and representations.

In this process, they provided a glimpse into their meaning making and learning process as they selected, transformed, transduced, and arranged modes for clear purposes (G. R. Kress, 2010). In this way, they are demonstrating their critical computational literacy by deliberately manipulating the aesthetics of their game, while leveraging specific computer science concepts and skills to powerfully influence players' feelings, attitudes, and beliefs toward their topic. The concerted attention to these details demonstrates these novice designers developing recognition of sign making in the overall process of multimodal production for social change.

Representations through Images, Text, and Music.

Like Samuel, Andrew's topic also depicted the challenges that undocumented immigrants go through in the United States. One of his explicit goals was to generate sympathy for the hardships they endure. One of the methods he employed to convey this was through the combination of images, text, and music. Andrew explains,

I want to make these emotions by having the backgrounds of certain things gloomy when the immigrant is depressed when there are too many bad choices. Some of the text that will be included is thoughts of suicide or a scene where he commits suicide. Maybe playing sad music in the suicidal part will make the player feel sad.

Andrew's mix of images, text, and music to create a particularly uncertain and depressing moment is evident in the scene immediately after the player chooses to forgo getting an education, despite a previous scene when the protagonist thinks to himself, "I never had a good education back in Mexico. And i heard that it is important to have an education in America." Once the player selects "n" for no education, an eerily muted, melodic sound comes on. It is reminiscent of the introduction to a particularly scary moment in a film. As the song develops, the faint sound of traditional female church hymn-like voices creep in from the distance. Once the selection is made, you are immediately transported to the front door of a white, single story house. The facial expression on the main character has changed. Instead of the bright eyed, smiling expression in the previous scene, the protagonist has a concerned expression on his face. His eyebrows are furrowed and the smile has transformed into a downward grim expression. He thinks, "I dont need an education to make it in this country. I wonder if my cousin is home?" After entering the home and conversing with your cousin briefly, he suggests that you try looking for work at Home Depot. The character leaves the home and decides what to do next. Figure 5.15 shows a screenshot of the protagonist deliberating on the front porch of the home. As this is happening, the music grows louder. Forty seconds into the music, drumbeats and single note piano playing enter into melody.

Figure 5.15. Decision-making scene from struggles of an undocumented immigrant project.



If you choose to work, you are transported to a Home Depot parking lot. You wait there until a security guard approaches you and begins to question your status. If you chose not to work, you are transported to a street and you begin to question your whole purpose in coming to the United States. At approximately one minute into the music, a male singer's voice becomes audible.

The song is called, Resistance by the band Muse. The first verse of the song is as follows:

Is our secret safe tonight?

And are we out of sight?

Will our world come tumbling down?

Will they find our hiding place?

Is this our last embrace?

Or will the world stop caving in?

As the lyrics seem to suggest, the singer projects a self-reflective, drawn out sound for each word of every line. Andrew's selection of this song matches the mood and feeling he described. At a critical juncture for the protagonist in the game, Andrew wanted to intensify these feelings with lyrics and musicality that matched the feelings an undocumented immigrant may feel. Wrestling between seeking work at Home Depot and risk getting caught by Immigration officials, the audience is left with this rhetorical question: "My cousin said to go to Home Depot to look for a

job but it may also be dangerous.” This scene encapsulates a balance between text, the expression of doubt on the face of the protagonist in the game, and the melody and lyrics in Resistance. Andrew is able to create a multimodal artifact that weaves together several layers of rich modalities to synthesize a powerful message. Andrew showcases his ability to utilize various computer science concepts and techniques to produce a multimodal game with the purpose of creating change in others.

These examples reveal how creating multimodal artifacts compel the creator to engage in a purposeful and mindful sign-making process. Similar to the production of an effective text, it places demand on the author to clearly identify the following: What is the message I want to convey? Who is the audience? How do I position them to empathize with my viewpoint? What signs will I use and how will I use them to influence them towards my point-of-view?

Limitations or an aspect of Critical Computational Literacy

Although a significant part of Critical Computational Literacy is focused on the thought process involved in formulating problems and their solutions in a form that leverages computer science concepts and skills, this framework also encourages one to question, critique, and interrupt dominant practices and ideologies. It is with the critical phrasing that pushes back against *technophilia*, the unyielding belief that technology can single-handedly improve life and combat social ills. Even within this relatively brief curriculum project, students offered critiques and limitations to this tool. They recognized the difficulty in replicating the complex social realities of their worlds in the restricted and simplified abstractions of the Scratch language. Some explicitly argued against the ability of these tools to genuinely initiate change. Struggling to convey specific feelings and/or emotions in the games that an audience could experience, Dennis noted:

When you play a game, you don't feel like you're in a war or something like that, cause you're not really there. The feeling like, "Oh, my gosh. They might actually kill me, you know." It's just a game... You survive anyway... Even with my game, the decisions, I was scared sometimes and I tried to put that in there but you know, not everybody is gonna feel the same way.

As a game consumer, Dennis makes a clear demarcation between the fictional world of game play and the actual experience. As a game designer, he attempted to conjure up the feelings he experienced in his game, but felt incapable of replicating it in a way that others would understand. Building on Dennis' point, Esteban explored how the limitations of technology were amplified by audience positionality, "Honestly, I don't believe that... you could actually feel in a game, cause... how can someone in Beverly Hills, having everything that they have... feel something from somebody that made the game in Elmhurst?" By highlighting these distinct experiences and positions in life, Esteban points to the inability for these technological tools to fully address the vast socioeconomic divide amongst different groups. In the process of applying their personal lenses and experiences to video game design, these students began practicing critical literacy skills while addressing technological and sociopolitical limitations directly.

Concluding Thoughts

Findings suggest that leveraging critical literacy while building the technical know-how and conceptual thinking behind computational thinking offers the possibility of strengthening students' literacies and thinking in both arenas. Rosaline's experience captures the fusion of these two worlds. Although only some of her ambitious plans came to fruition in her final video game project, the process of thinking, designing, and reflecting about the process shows her awareness and engagement with Critical Computational Literacy. She created a game that

demonstrated the numerous obstacles her aunt faced in developing a healthy and physically active lifestyle in the face of family financial hardships and the socioeconomic realities of living in a high crime neighborhood. In her final reflection, she describes her overall experience with the project.

What I learned on computer programming from designing my game is that you have to patins and imagination to see what you want. It might get complicated but you could do anything in their you just have to keep on trying and trying to figure out a better or more effective way to do everything. I now knew how to create a game even thought it's really simple but you have to go step by step. Later on I might get better and create something better or more fancy. The most difficult part for me was putting the same background and for them not to start at the same time I had to change mores so they could work.

What I enjoyed most about it was the final thing I felt like if I had created a game even though it's small and reflecting something about me about my family.

Rosaline expresses her recognition that computer programming and game design requires myriad complex steps, persistence, and resourcefulness. In her explanation, she highlights several aspects of computational thinking: efficiency (“trying to figure out a better or more effective way to do everything”), conditionals (“same background and not to start at the same time”), and sequencing (“you have to go step by step”). Though not entirely familiar with the technical computer science vocabulary, she speaks fluently about the concepts behind foundational aspects of computer programming.

She also highlights the importance of imagination to computer science because one must visualize or dream about how one would like their game to play, look, sound, move, etc. The characteristics of persistence, patience, and resourcefulness are all critical aspects of

troubleshooting and debugging. Though she qualifies her sense of satisfaction in creating the game with the statement, “even though it’s really simple,” this speaks more to her new awareness of the complexity of game design and programming than an admonishment for her program.

Rosaline’s computational thinking is complemented by her critical literacy. It is through a desire to initiate social change in others that she developed her computational thinking. As Rosaline described, “The emotions I want people to feel are good and accomplished for themselves. I want them to have a high self-esteem about themselves and to be and feel accomplished.” In a mere three weeks, this self-admitted gaming novice designed and produced a video game that gives voice and a platform to a complex issue close to her and her family.

Critical literacy engages students to question, challenge, and interrupt the inequitable conditions in their communities while computational thinking provides the skills to access the culture of power and the concepts to re-imagine the discipline. Combined together, they offer students critical computational literacy, the physical and ideological tools to dream, transform, and give voice to the lives for marginalized peoples and their communities.

CHAPTER 6

Conclusion

With enlarged pupils and bloodshot watery eyes, I flick on the light switch. The majority white female audience gingerly wipes away lingering tears from their cheeks. I have just finished playing a digital storytelling project describing one of my former high school student's step mom's journey to the United States. This is the ninth time I have presented variations of this topic to teachers, administrators, researchers, or preservice candidates. On nearly every occasion, at least a third of the audience is moved to tears. The power of these multimodal creations to communicate is undeniable.

From conference presentations to professional development workshops, I have advocated for the use of these multimodal tools as a means to develop the multiliteracies of youth. My argument has remained steadfast throughout these sessions, "Look at what urban youth of color can do! They have untapped skills and abilities we are not leveraging!" Responses from audience members have been equally warm in return. "You can really tell they thought about how to communicate this to us." or "The right mixture of images, narration, and music can really created

a powerful message.” What these teachers have intuitively recognized is the untapped power of young people to effectively and powerfully communicate a message through multimodal texts. Beyond the attractiveness of these products are the learning processes that led to their creation. As a hectic, urban secondary teacher, I had little time to reflect deeply about the power of this work, but as an educational researcher, I learned first hand the cognitive potential and promise of these multimodal texts.

Since 2005, when my colleague and I first began introducing this tool to our students, digital storytelling and other student-produced multimodal work have exploded in the English language arts classroom. This came at a time when usage rates of various digital technologies have grown exponentially. In 1998, when I first began working with materially unprivileged, urban students of color, only a handful owned a cell phone and even fewer possessed an Internet-enabled computer at home. In 2011, 77% of 12-17 year olds have cell phones (Lenhart, 2012) and in 2010, 76% of Americans own a computer (Smith, 2010). Despite the seemingly ubiquitous nature of these technological devices and the willingness of some educators to adopt them into their classrooms, as researchers and educators, we must move past the “sexiness” of these multimodal artifacts and seriously investigate the learning that is involved in producing these products, how we are preparing students for their future, and the affordance these tools provide over traditional text. Answers to these questions were found in the findings of this research.

In addition to better understanding the learning that’s involved in the production of these multimodal communication artifacts, we must collectively investigate, with our students, the generally accepted notion that these tools are benefiting society and people as a whole, particularly those who have been historically marginalized by dominant groups. In this vein, we must ask, “What are the technological tools being created, and by whom? And for whom? Who

benefits from these technological innovations? How are these technological tools shaping people and our society? Why are the voices of females, Blacks, and Latinas/os absent in the creation of these tools?"

Despite technophiles' push to see to these innovations as the putty to patch the myriad cracks and gaping holes in our dysfunctional public education system, we must learn from past technological advancements and its subsequent research that technology by itself, is not a panacea to the inequities that persists in society and too often simply gets reified in the schooling system (Darder, 1991; Tyack & Cuban, 1995). Without adequate funding for material resources and more importantly, conscientious efforts to train teachers on the effective use of technologies to complement strong pedagogical practices and curriculum, much of these modernization efforts will simply be reduced to glorified textbooks. With that said, the possibilities are undeniable, if we are able to successfully leverage the wealth of these technologies, we can strengthen student engagement, intrinsic motivation, and customized learning opportunities (Collins & Halverson, 2009). If the Common Core State Standards Initiative ("Common Core State Standards Initiative: Preparing American's students for college & career," 2011) and the Partnership for 21st Century Skills ("Framework for 21st Century Learning," 2011) are an indicator of the future direction of schooling, the shift from content specific standards to more robust views of skills and content-oriented approaches are well underway. Instead of simply relying on rote memorization of standards and learning discipline-specific content and skills, then early indicators suggest that future students must engage in real critical thinking skills, creative problem-solving processes, team work, and being able to effectively communicate in myriad ways (Collins & Halverson, 2009). The serious video game project described in this research study targets all of these future workplace skills and recognizes the fluid and interdisciplinary

approaches seen in critical computational literacy.

As Delpit (1986, 1995) first outlined twenty-five years ago, these process-oriented approaches to teaching and learning are fundamental, but we must not leave the explicit teaching of skills as an after thought, particularly when preparing materially unprivileged, urban students of color. Students must be able to learn and build the concrete academic skills still valued as the social, economic, and political currency in schools and society, while developing and expanding on their critical processes and conceptual approaches to learning. Without addressing both, technological innovations in schooling will simply exacerbate the current opportunity gaps that continue to persist.

In the Computer Science discipline, with some of the fastest rates of growth and the most hard-to-fulfill employment openings, current percentages of bachelor degree recipients among women (11.3%) and underrepresented minorities (Blacks, 3.4% and Latinos, 5.8%) continue to lag behind white males (Zweben, 2010). To effectively address the underrepresentation of these populations in this field, the development of 21st century skills, computational thinking, and critical consciousness must be effectively woven into the foundational Computer Science courses and other disciplines in urban secondary schools. This can be done by using the critical computational literacy framework.

Despite commonly held beliefs that certain populations are incapable of learning high-level computational thinking processes (Margolis, 2008), findings from this research study demonstrate that materially unprivileged, Latino/a secondary students can learn high-level computational concepts *and* use these tools to interrupt, challenge, and change the dominant and deficit-oriented narratives that currently exist about them and their community. In many ways, they are challenging these prevailing ideologies by changing the tools itself. Students are re-

conceptualizing these tools; who is using them, how they are used, and for what purpose(s) they being used.

The True Life Remixed project demonstrated that students are developing the technical know-how of computational thinking, as well as re-envisioning how these tools can be used. Instead of considering video games solely as the engines of entertainment and profit making, students are recognizing the potential of these technologies as tools of intellect, social justice, and interrupters of dominant narratives. They are seeing themselves as reality changers and innovators with empowered voices to transform others.

As Audre Lorde rationalized nearly three decades ago by arguing against white feminists' use of the same patriarchal frameworks to analyze their oppression, "It is learning how to take our differences and make them strengths. For the master's tools will never dismantle the master's house" (Lorde, 2003). In the same way she argued that "genuine social change" could not occur with the same tools of oppression, I am arguing that these technological tools can, but *must* be re-engineered to create the realities we want to see for our children and our communities. In order to do this, we must re-envision and repurpose how these tools can be used in critical and computational ways for the benefit of our community. As teachers and researchers, we can take the omnipresent nature of these devices and use it for making critical transformations in the lives of marginalized and dispossessed youth. Students showed this propensity to take a personally meaningful sociocultural message and transform it through computational concepts to produce a powerful multimodal, serious video game. To do this, students were explicitly taught to critically examine these tools; how they are currently used, for what purpose(s), and how they can re-conceptualize and repurpose them for real, transformative change.

The implications for this are wide reaching and profound. Critical computational literacy provides historically and contemporarily marginalized students (female, Latino/a, Black) access to traditional computer science concepts and skills, while concurrently developing their critical literacies. Critical computational literacy offers the ability to integrate two seemingly divergent fields. By using these new media tools, students are developing a more expansive and sophisticated way to communicate their ideas. This has significant possibilities for the English Language Arts, where most K-12 state standards still relegate students' literacies to over-indulgence of traditional means of reading and writing of text. In an ever-evolving culture that increasingly places more significance on visual, auditory, and textual stimuli through multimodal media on computers and mobile devices, schools are doing a disservice to our youth by not educating them to critically "read" these messages in media, and in turn become effective producers of these tools of communication. This is an exigent call to action to policy makers, state superintendents, boards of education, parents, and teachers to recognize our limited, antiquated, and myopic English Language Arts standards that does little to leverage, expand, and develop the varied and complex communication repertoires of our youth. Sociolinguistic research has begun to explore the fluid, expansive, and dexterous nature of urban youth of colors' repertoires of linguistic practices (Orellana, Lee, & Martinez, 2010), but what about verbal and non-verbal, multimodal forms of digital communication?

With the rapid expansion of new technological tools, the production of these multimodal artifacts have also been under-theorized and under-researched. As chapter five demonstrated, students engage in deep, reflective processes in the production of these tools. As anyone who has created a film can attest, the process of selecting, cutting, transforming, mixing, and adding involved in the editing process requires one to consistently and conscientiously make decisions

to strengthen the message of the film. The process of designing and building serious video games incorporate these aspects of filmmaking in addition to the problem-solving and strategizing of computer science concepts of sequencing, parallel processing, iteration, conditionals, and etc. The cognitive processes involved in this necessitates one to be organized, detail-oriented, and think systematically, mathematically, and sequentially. These computational functions merge with such traditional language arts elements in writing as persuasion (soliciting emotion), purpose, and audience.

For teachers who already use these multimodal artifacts, this brings into question of assessing and evaluating this work. As my description of analyzing students' video game projects illustrated, examining these multi-layered, interactive tools is anything but straightforward. In order to fully capture, understand, and recognize the various nuances of their final products, one must enter into a recursive process of examining the various parts that went into producing the video game, as well as systematically disaggregating the various layers of the final product. This requires diligence and a close and careful analysis of the learning and thinking involved in the design and building of their final project. The breaking down of the various modes in conjunction with their reflections during the design process helps to better understand students' metacognitive processes in selecting pieces that builds toward their overall message. This allows the teacher and researcher to better understand students' rationale, goals, purposes, and thinking involved in the creation of their games, instead of simply forcing their conceptions on students' work. This process-oriented approach of assessment privileges student agency in articulating their learning, as opposed to our standard outcome-oriented evaluation rubrics. This changes the focus from "standardizing" students' multiliteracies to appreciating, fostering, and strengthening different forms of communication. Though time consuming, this

process offers the possibility of professionalizing the role of the teacher as the research expert of student learning. By doing this, it blurs the line between teacher and researcher.

Furthermore, this work builds on previous research on the value of portfolio assessments. By favoring student learning and growth-over-time through student self-reflections and explicit articulations of their thinking process, students develop meta-cognition and agency towards their own learning. Instead of assessments and evaluations coming from the instructor, students now become accountable to themselves and thus, take greater ownership over their own learning and growth.

Equally important to understanding the affordances of these multimodal artifacts are learning how teachers can create spaces and structures that foster personally meaningful work that builds on students' capacities for critical literacy, computational thinking, and academic success. As it currently stands, many policies at the local, state, and federal level are directly attacking the very sanctities of this type of curriculum. If the Arizona House Bill 2281, popularly known as the "Ethnic Studies Ban," is any indication, then there is little hope for those outside of the purview of white, monolingual, middle-class America. However, if we, as a nation genuinely desire to embrace an ever-expanding pluralistic society, we must re-examine the ideologies, curriculum, pedagogy, and policies in our public education system that ultimately decides our country's future.

We do not have to look much further than the recent pedagogical movements in our past to serve as a barometer on eradicating the opportunity gap. Since the deficit approaches of curriculum and instruction in the 1960s and earlier, teachers and educational leaders have viewed materially unprivileged students of color as those without the appropriate, legitimized dominant language, literacy, and cultural practices necessary to achieve (Paris, 2012). Without these,

proponents argue, these children will be forever lost in a quagmire of hopelessness and despair. Moving away from this deficit view, difference pedagogies sought to emphasize the unique but different practices these students came into the classroom with. Unfortunately, it continued to delegitimize the various languages, literacies, and cultural practices minoritized student's use. Not until the resource pedagogies of the 1970s and 1980s did educators begin to value the richness and wealth non-dominant groups bring (Paris, 2012). By recognizing, valuing, and building on these students' practices along with dominant schooling discourses of white, middle-class cultural norms demanded by schools and other institutions, can we finally begin to genuinely address the issue of the opportunity gap.

It is with this lens that I argue a re-conceptualizing of what Ladson-Billings laid out in her germinal work seventeen years ago. We must re-examine what the tenets of culturally relevant pedagogy (CRP) actually means and how it looks for students today. Like Paris' (2012) redefinition of CRP to a culturally sustaining pedagogy, we need to continue to value, foster, and help flourish the tenets from the past. In order to do this, we must continue to build on the work of Au & Jordan (1981), Moll, Amanti, Neff, & Gonzalez (1992), Villegas & Lucas (2002), but not become overly deterministic and myopic to more expansive notions in the fluidity of culture and its practices. It is from this lens that we must continue to construct new narratives of the intersectionalities of myriad youth practices, cultures, and norms. In our multilingual and multiethnic classrooms, we need to learn to leverage the widespread use of technology while being conscious of historic, communal traditions and practices.

For this work to have the personal meaning, relevance, and impact that will motivate and engage students, CRP cannot become another pre-packaged, scripted, brought-to-scale curriculum that views minoritized students' cultures as fixed commodities. Findings from my

research demonstrate that in order to effectively facilitate cultural competency and critical consciousness, curriculum and pedagogy must be locally based and historicized to offer greater meaning for students. The work of Gonzales & Moll (1994) showed us the promise of curriculum that incorporates the “historically accumulated and culturally developed bodies of knowledge and skills essential for household and individual functioning and well-being” (p. 133). By building on this, students’ critical consciousness thrived in producing work that gave voice to their experience and their community, while developing agency to initiate change through the dissemination of their serious video games.

This point was particularly salient in reflecting upon my presuppositions as I entered the research site. With a decade of experience working and living in urban schools and communities in California, I erred in assuming similar sociocultural and ecological practices and ideologies among the students. Demographics alone showed that the research school mirrored my students in Oakland (high rates of free-reduced lunch, majority Latino population), but in attempting to apply similar pedagogical strategies to these students, their reactions were quite dissimilar. In order to genuinely apply culturally relevant pedagogical practices effectively, I had to first research and learn more about these students, their community, and their history. I soon discovered that unlike the mostly Mexican youth I had previously worked with in Oakland, few if any of these students were undocumented or first-generation immigrants, thus highlighting the importance of recognizing the breadth of variation amongst communities (Rogoff, 1995). At the same time, there were deep cultural structures and processes that occurred between these groups (Boykin, 1994). Like Lee’s (2002) argument that points to the heterogeneity within the community of people of African descent living in the U.S., variations abound based on immigration history, generational cohorts, region, gender, and socioeconomic status. The same

point can be made for these communities of students of Mexican descent living in California. While recognizing this, we also need to pay attention to differences in geographical variations in language use, hobbies, and interests among these youth. What my experience offers is another explicit empirical study that reinforces the notion that educators must be cognizant of both the cultural processes and practices that occur with regularity in cultural communities, while recognizing the tremendous variation as people participate in myriad, with sometimes overlapping, occasionally complementary, and sometimes conflicting community practices (Rogoff, 1995). This highlights the need for culturally relevant pedagogy that adequately support these unique and multiple practices and processes of our students.

This work has major implications for the advancement of academic skills, particularly in Computer Science. In a discipline that has been traditionally unwelcoming, devoid of, and occasionally hostile to female, Latino/a, and Black students, the use of culturally relevant pedagogical strategies has the potential to fundamentally transform the face of future computer scientists. In addition to constructing a pipeline for these underrepresented populations, the additional layer of critical literacy enables these young people to see their world with a sociocultural awareness that allows them to dream of new possibilities with these technological tools. Only then can they begin to take hold of these tools and “remaster” them for their purposes. Their presence, experiences, critical consciousness, and voice provides future generations a vision of a society where technological tools are not limited to entertainment and profit-generation, but pathways to raise awareness, challenge ideologies, and improve the inequalities that continue to persist in society.

APPENDIX A

Designing your True Life Remixed Video Game

1. What is the *message/purpose* you want to teach others when they play your game?

2. Who is your target audience for this game? Who do you want to play your game? Why?

3. What do you want the player to feel? How do you want them to react when they play your game?

4. What *rules* (constraints) will the player have in the game? These rules should support the emotional response you get from the player.

5. What types of backgrounds will you need? Draw them out. More space in the back if you like.

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6. What types of sprites will you need? Include moving objects & text, characters, etc.

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7. Design your game on the back of this page. What will people do in the game? How will it look like? Feel free to use images, objects, arrows, etc.

APPENDIX B

Video Game Design Template

Introductory Story.

- ★ What images and text will you show to set your mood for your “game”?
- ★ You do NOT have to use all of the boxes.
- ★ This is a guide.

Title Screen <i>Game name</i> <i>Your first name</i> <i>or nom de</i> <i>plume (pen</i> <i>name)</i>					

Background Info <i>Explain why you</i> <i>chose this topic/</i> <i>why is it</i> <i>important. Can</i>			Instructions <i>Give directions</i> <i>on how to play</i> <i>your game.</i>		
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<i>use images.</i>					
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Game Design.

- ★ *What type of game is it?*
- ★ *Draw out how game will be played...*

APPENDIX C

Final Reflection for True Life Remixed Project

Now that you have finished your project, please spend the next 25-30 minutes reflecting about what you have learned, experienced, and gained from this work.

- ★ *Please answer each of the following questions in your reflection.*
- ★ *This should be a minimum of two pages on regular lined paper or you can type it on one and a half full pages.*
- ★ *Remember that this is your final opportunity to convince us of your learning and can influence your overall grade for the project.*

Introductory story

- 1. Explain how each of the different parts (background scenes, sprites, actions, dialogue, etc.) of your introductory story supports the message of the game.**
e.g.) I chose the image of the girl looking behind her because I want the audience to feel nervous and scared. This way the person playing will begin to know what it might feel like to be an undocumented immigrant.

Video game

- 2. Explain how the different parts (background scenes, sprites, actions, dialogue, decision-making, outcomes) of your video game support the message of the game.**
e.g.) The first decision asks the player to decide whether to help the family by getting a job after school. I showed what was going on in the head of the character (could help family with rent and bills and parents would respect you more, but it could affect your grades and playing Basketball since you'll have less time for extracurricular activities). Both outcomes are somewhat negative because I want people to know that it's not easy being a teenager. I want people to learn that being a teenager is not as easy as it seems.

Knowledge of Yourself

- 3. After journaling, sharing, planning, designing and creating your video game, what new thoughts have you had about yourself in relation to your message/topic?**
 - a. What about the decisions you have made in the past and present?*
 - b. What new thoughts and/or hopes do you have for your future?*

Dissemination

4. **What do you hope people will learn about you when they play your video game?**
 - a. *Do you think it may change people's views on your topic?*
 - b. *After doing this project, do you feel that you have the power to change people's minds from something you created?*

Problem-Solving

5. **When you came across a problem in Scratch (glitches, broadcasts not working properly, etc.) What did you do?**
 - a. *Name all the different ways you tried to solve problem(s) and explain it step by step.*
 - b. *If this problem solving strategy did not work, what else did you try?*
 - c. *Which one(s) was the most effective? Why?*

Reflection

6. **What did you learn about computer programming from designing your own game?**
 - a. *What was most difficult for you?*
 - b. *What did you enjoy most about it?*
7. **What suggestions do you have for Mr. Perez and Mr. Lee when we do this project again next time?**

APPENDIX D

Small Group Interview Question Prompts

In class announcement...

- ★ We have been learning so much from the small group discussions, we wanted to capture everyone's learning on video.
- ★ So today, during class, we will call 4 ppl at a time to come talk about their experience of the project in the library.
- ★ There are no right/wrong answers, just talk about what you learned

I. Logistics (5)

- ★ Don't look at the camera
- ★ Remember that this is a conversation, so you can jump right in after someone talks, don't need to raise your hand or wait till I call on you.
- ★ Just talk to me or each other
- ★ Just talk like normal, don't feel the need to use certain vocabulary words or be hella proper

- ★ This video clip will mainly be for just me, but I may use a part of a clip at a conference and/or a workshop for people that work in education
 - If I decide to use a clip of it, I'll definitely let you know beforehand
 - This video is part of my research, so thank you again for helping me with my work

- ★ Try to be as honest as you can be
- ★ You can say anything you want but just remember that anytime you say something that might put you in danger, we (as teachers and mandatory reporters) are required to report it, otherwise your confidentiality is safe.
- ★ Do you have any questions before we get started?
- ★ I'm going to go through a lot of the questions I asked in the Final Reflection and the surveys but we'll go further in-depth
 - So please use examples from your game to explain...

II. Videotape Interview Questions (20)






1. First, can you say your name and what grade you're in
2. Tell me about some of the things you've learned during this project?
3. What were some interesting things you learned in the first part of this unit (during the critical literacy section)?
 - a. Has any of our class activities (videos, discussions, readings, write-ups) got you to look at things from different perspectives? The motives/hidden messages?
 - i. Egypt's revolution – using Facebook, Youtube, Twitter
 - ii. Advertising industry – product placement, Seventeen/50 cent, Children's commercials, Nike, Sweatshops
 - iii. Analyzing Lupe Fiasco's Words I Never Said – critical literacy
 - iv. Stereotypes of South Gate, Watts - Sociocultural and Sociohistorical Explanations of Watts, Bloods & Crips video
 - v. Racial & Gender stereotyping in video games
 - vi. Creating Games for Change – Ayiti, Iced, Free Rice, Pokemon, Wildfire
4. How did any of those lessons influence the topic you chose for your game?
5. Do you feel like you try to understand the sociocultural/sociohistorical factors that influences things?
6. Honestly, have you thought differently about yourself, others, you community, or the media?
7. Do you feel like you have changed how you view your past/current situation?
8. Do you think you have the power to change people's views on different topics? How?
9. What have you learned about programming?
10. What was particularly challenging in the project?










III. Thank you!

APPENDIX E

Scratch Programming Concepts v.14

SPECIFIC PROGRAMMING CONCEPTS

Concept	Explanation	Example
sequence	To create a program in Scratch, you need to think systematically about the order of steps.	
iteration (looping)	forever and repeat can be used for iteration (repeating a series of instructions)	
conditional statements	if and if-else check for a condition.	
variables	The variable blocks allow you to create variables and use them in a program. The variables can store numbers or strings. Scratch supports both global and object-specific variables.	
lists (arrays)	The list blocks allow for storing and accessing a list of numbers and strings. This kind of data structure can be considered a “dynamic array.”	

Concept	Explanation	Example
event handling	when key pressed and when sprite clicked are examples of event handling – responding to events triggered by the user or another part of the program.	
threads (parallel execution)	Launching two stacks at the same time creates two independent threads that execute in parallel.	
coordination and synchronization	broadcast and when I receive can coordinate the actions of multiple sprites. Using broadcast and wait allows synchronization.	For example, Sprite1 sends the message winner when this condition is met:  This script in Sprite2 is triggered when the message is received: 
keyboard input	ask and wait prompts users to type. answer stores the keyboard input.	
random numbers	pick random selects random integers within a given range.	
boolean logic	and, or, not are examples of boolean logic.	
dynamic interaction	mouse_x, mouse_y, and loudness can be used as dynamic input for real-time interaction	
user interface design	You can design interactive user interfaces in Scratch – for example, using clickable sprites to create buttons.	

PROGRAMMING CONCEPTS NOT CURRENTLY INTRODUCED IN SCRATCH:

- procedures and functions
- recursion
- exception handling
- parameter passing and return values
- defining classes of objects
- file input/output
- inheritance

APPENDIX F

Frequency chart of student demonstrated CS concepts

Sequence	<i>To create a program in Scratch, you need to think systematically about the order of steps.</i>	33/33 (100%)	Numerous						
Iteration (looping)	<i>forever and repeat can be used for iteration (repeating a series of instructions)</i>	31/33 (94%)	11	6	6	2	2	6	
Conditional statements	<i>if and if-else</i>	31/33 (94%)	8	13	13	4	4	8	
Event handling	<i>when key pressed/when sprite clicked</i>	31/33 (94%)	8	12	10	4	4	8	
Threads (parallel execution)	<i>When green flag clicked - Launching 2 stacks at the same time - Creates 2 independent threads that execute in parallel</i>	29/33 (88%)	7	6	5	1	13	9	
Coordination and synchronization	<i>broadcast and when I receive broadcast and wait</i>	33/33 (100%)	16/35=51	14/14 = 28	28/75=103	24/23 = 47	16/36=4	35/54=8	9
Dynamic interaction	<i>mouse_x, mouse_y, and loudness</i>	6/33 (18%)			3 - play sound				
keyboard input	ask and wait and/or answer	N/A - Did not teach		0	0	0	0	0	0
user interface design	design interactive user interfaces - clickable sprites to create buttons	N/A - Did not teach			0	0	0	0	0
random numbers	pick random	N/A - Did not teach							
boolean logic	and, or, not	N/A - Did not teach							
variables		N/A - Did not teach							
lists (arrays)		N/A - Did not teach							
		Total	289	173	492	131	172	350	

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