STUDENTS’ EXPERIENCES OF DESIGN THINKING AND DISTRIBUTED SCAFFOLDING IN A MIDDLE SCHOOL SOCIAL STUDIES CLASSROOM

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ABSTRACT

Recently, design thinking as a method to solve ill-defined problems has increased in middle school curricula. In this qualitative case study consisting of 23 participants in seven middle school student groups, this study sought to understand how students experienced and responded to design thinking and distributed scaffolding as students navigated a design challenge of creating a public art installation honoring a person or group that promoted human rights. Additionally, this research sought to explain how the distributed scaffolding embedded within each phase of design thinking further aided students in their learning and work production. This study reported how design thinking promoted critical thinking and problem solving, how students experienced and responded to distributed scaffolds that were placed into curriculum units to help students reflect, how students demonstrated social studies skill and content knowledge, and how students worked through real-world human-centered problems towards a viable solution.

Keywords: Design thinking, Distributed scaffolding, Students’ experience, Social studies, Middle school
STUDENTS’ EXPERIENCES OF DESIGN THINKING AND DISTRIBUTED SCAFFOLDING IN A MIDDLE SCHOOL SOCIAL STUDIES CLASSROOM

by

TODD WASS

A Dissertation

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Degree of

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Curriculum and Instruction

in

Middle and Secondary Education

in

the College of Education and Human Development

Georgia State University

Atlanta, GA
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DEDICATION

This dissertation is dedicated to my wife, Yvonne Williams-Wass, my mom, Suella Jane Guthrie, and my son Dylan Williams Wass. Throughout my life, they have challenged me and helped keep me centered. I am indebted to them for their love and compassion.
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It has been a long and difficult journey, but it has been a fun one! One that has stretched me in ways that I could never have imagined.

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1 DESIGN THINKING: EDUCATIONAL POSSIBILITIES FOR STUDENTS

Thought leaders in the field of education continue to seek out innovative practices so that teachers and students learn content and develop skills while tackling authentic real-world problems. During the past decade, a small group of educators utilized design thinking to solve human-centered problems by incorporating an iterative, human-centered, and empathetic process that was popular in the fields of design and business into K-12 curriculum (Carroll, 2014; Carroll et al., 2010; Estrada & Goldman, 2016; Goldman et al., 2012; Goldman & Kabayadondo, 2016; Goldman, Kabayadondo, Royalty, Carroll, & Roth, 2014; Goldman, Zielezinki, Vea, Bachas-Daunert, & Kabayadondo, 2016a, 2016b; Koh, Chai, Wong, & Hong, 2015; Noweski et al., 2012). Design thinking, as incorporated into K-12 curricula, is rooted in student-centered learning (Wise, 2016). Figure 1 demonstrates how design thinking is incorporated into student-centered learning. This qualitative case study used design thinking to create curriculum, instruction, and assessment situated within the larger scope of problem-based learning (PBL) and the even larger arena of student-centered learning.

Schools continue to be nuanced environments that involve the complex interaction of people from a wide range of human experiences. The curriculum, instruction, and assessment that schools utilize continue to be complex because they aim to create learning environments (Puntambekar, 2015). Since no two classrooms were alike and the interactions between teachers and students were unique, the inclusion of curriculum, instruction, and assessment added to the overall complexity of the environment. Although not referring directly to education, Di Russo (2016), asserts that design thinking was effective at producing human-centered solutions in complex environments. An understanding of such complex student experiences extended Di Russo’s argument into the field of education.
Figure 1. Situating Design Thinking, Problem-based Learning, and Student-centered Learning.

While design thinking, PBL, and student-centered learning exist as components of a much larger field of education research, the focus of this dissertation was the experiences of a specific group of middle school social studies students as they used the design thinking process in the production of a public art installation on advances in human rights in a large southeastern city. Narrowing further, design thinking utilized distributed scaffolding (Hsu, Lai, & Hsu, 2014; Puntambekar, 2015; Puntambekar & Kolodner, 2005; Tabak, 2004) so that novice design thinkers were able to solve human-centered problems. Novices struggled to define and solve a problem without a process. Berger (2014) and Noweski et al. (2012) argued the importance of a process for students to follow when problem solving. Since students, in many cases were novice problem solvers, “[design thinking] may not provide any answers or solutions, but…having a process helps you to keep taking next steps— so that, as he [Bruce Mau] put it, ‘even when you don’t know what you’re doing, you still know what to do’” (Berger, 2014, pp. 32-33).
Before demonstrating how this study fills a gap in literature, I define design thinking, provide the context for the study, research questions, outline the significance of the study, and map the theoretical perspective. The literature review defines terms that are unique to design thinking, place design thinking within the framework of PBL and student-centered learning, and provide the relevant literature on design thinking. The third chapter provides the rationale for a qualitative case study. Chapter Four discusses the collected data and its implications to answer the research questions. Chapter Five highlights the importance of this study, limitations, and future research.

**Defining Design Thinking**

For the purposes of this dissertation, design thinking was defined as a set of phases or processes, a protocol, to identify and create solutions for human-centered problems. DtL (Wass, 2015), a design thinking framework for middle school, was structured as a seven-step process to create solutions for human-centered problems. Each of the phases of design thinking provided guidance for students in designing human-centered and empathetic solutions. These phases of DtL were: discovery, focus/direction, ideas, research, prototype, present, and reflect. These phases were informed by research and practice in design thinking (Brown, 2008; Brown & Wyatt, 2010; Carroll, 2014; Carroll et al., 2010; Cross, 2011; Goldman et al., 2012; Hasso Plattner Institute of Design at Stanford, 2007; Kelley & Kelley, 2013; Kelley & Littman, 2001; Saxe, 2008). Goldman et al. (2012) defined design thinking as:

a mode of inquiry that puts ‘doing’ and ‘innovating’ at the center of problem-solving, promises to address future needs of the globe. It has the potential to engage students in ways that are inclusive of their diversity, makes school learning relevant and real, pressing local and global issues which can enhance one’s motivation to learn. (p. 19)
Design thinking provided the necessary structure, process, empathy, and human-centeredness for students to solve ill-defined problems. Within each phase of design thinking there existed multiple scaffolds that further aided students in their learning and work production. Koh and colleagues (2015) posit, “design thinking can be used as a means to support interdisciplinary learning and to build their students dispositions for complex problem solving. Such experiences play an important part in preparing students for the twenty-first-century workplace” (Conclusion, For Students, para. 2). Thus, design thinking and PBL were complementary components of a learner-centered and human-centered paradigm.

This version of design thinking called DtL (see Figure 2), was an adaptation of various design thinking methodologies that I utilized in middle school curricula based on the work of leading design thinkers (Brown, 2008; Brown & Wyatt, 2010; Carroll, 2014; Carroll et al., 2010; Cross, 2011; Goldman et al., 2012; Hasso Plattner Institute of Design at Stanford, 2007; Kelley & Kelley, 2013; Kelley & Littman, 2001; Saxe, 2008).

![Diagram of DtL](image)

**Figure 2.** DtL The Woods School’s Design Thinking Process.
• Discovery: Explore different issues, events, and problems. Locate resources and interview experts. Build knowledge. Ask questions: What do you know? What questions do you still have?

• Focus and Direction: Go from a broad field to a specific set of questions. Look beneath the surface to develop deeper understanding. Choose a user/stakeholder and develop empathy for the user/stakeholder by observing and interviewing them. Synthesize information. Choose a direction for future work. Compose a “needs” or “point of view” statement.

• Ideas: Brainstorm ideas. Generate wild and crazy ideas and share them.

• Research: What does the research suggest? What other solutions exist? From whom and where else can you learn more?

• Prototype: Create an artistic representation through a physical or digital model which is low resolution for fast feedback and iteration. Identify problems with the current idea. Get feedback from peers, experts, and the user/stakeholder. Refine the original idea and adjust your prototype.

• Present: Demonstrate your expertise on the topic. Show how the solution, your idea and your prototype will solve the identified problem. Get feedback from the audience and the user/stakeholder.

• Reflect: What did you learn? Where did you succeed? Where could you improve? How will this experience change your actions in the future?

A significant amount of the design thinking was associated with the Hasso Plattner Institute of Design at Stanford, also known as the d.school. The design thinking method appears simplistic upon first glance, but full of many processes within each phase. The Woods School (a
pseudonym) my employer, used DtL to guide students through the design thinking process.

Taken together, the DtL method of inquiry provided a framework for students to work through ill-defined problems in an attempt to create a human-centered empathetic solution. Furthermore, DtL provided a process for novice design thinkers, and mid-level learners, to solve human-centered problems. As part of the design challenge, distributed scaffolding was purposefully implemented into each phase of DtL to help novice design thinkers navigate the process.

**Scaffolding in Design Thinking**

Scaffolds were first defined by Wood, Bruner, and Ross (1976) as a metaphor of how an expert (an adult) interacted with a novice (a child) during a difficult task. While commonly associated with Vygotsky (1978) zone of proximal development (ZPD), it was only after Cole and colleagues translated Vygotsky’s work from its original Russian that these two concepts were understood as explicitly connected (Belland, Kim, & Hannafin, 2013). Wood et al. (1976) described the six characteristics of the scaffolding process as: recruitment, reduction in degrees of freedom, direction maintenance, marking critical features, frustration control, and demonstration (p. 98). Distributed scaffolding builds off Woods and colleague’s definition by demonstrating that scaffolds take many forms: teacher, peers, activities, the environment, and various resources.

**Distributed Scaffolding**

Building on the work of Wood et al. (1976), Tabak (2004) articulated the use of multiple forms of scaffolding as a process she called *distributed scaffolding*. Tabak defined distributed scaffolding as three distinct forms of scaffolding: “differentiated scaffolds in which different needs are met by different supports, redundant scaffolds in which a collection of supports addresses the same need, and synergistic scaffolds in which a collection of supports is constituted to support the same need” (p. 330). The goal of distributed scaffolding was to help students
learn, perform, and discuss their experiences of the learning process to create defensible knowledge claims.

Puntambekar and Kolodner (2005) extended the work of Tabak and distributed scaffolding. In complex learning environments, “scaffolding is no longer restricted to interactions among individuals; artifacts, resources, and environments themselves can also be designed as scaffolds” (p. 213). Thus, distributed scaffolding encompassed multiple forms of scaffolding: between individuals, computer software, activity structures, collaborative groups, artifacts, writing prompts, resources, and visualization tools. Hsu et al. (2014) suggested that distributed scaffolding be considered a separate system of scaffolding. Furthermore, Hsu and colleagues asserted that distributed scaffolding promoted “students’ formation and manipulation of multiple data representations through making sense of the meaning of representations, selecting the necessary information” to solve a problem (p. 242). By embedding distributed scaffolding into curriculum, which structures learning opportunities in various ways, students had multiple opportunities to learn. Additionally, diverse learners, “facing changing task demands and with growing abilities, skills, and background knowledge” (p. 242) had opportunities to acquire the necessary skills and content knowledge to leverage towards solving problems (Hsu et al., 2014; Snir & Smith, 1995; van der Pol, Volman, & Beishuzien, 2010; White, 1993). By including multiple scaffolding methods, students at various ability levels interacted and engaged with the curriculum with less struggle than in non-scaffolded environments. Additionally, when scaffolding was “distributed, integrated, and multiple” students had more chances to interact with and leverage scaffolding for their own learning (Puntambekar, 2015, p. 215).

Hsu et al. (2014) proposed a design model for distributed scaffolding (DMDS) with four functions (see Figure 4): navigating inquiry (Azevedo & Hadwin, 2005; Davis & Linn, 2000;
Puntambekar & Kolodner, 2005), structuring tasks (Fretz et al., 2002; Quintana et al., 2004; Reiser, 2004a), supporting communication (Choi, Land, & Turgeon, 2005; Ge & Land, 2003, 2004; Pifarre & Cobbs, 2010), and fostering reflection (Davis & Linn, 2000; Quintana, Zhang, & Krajcik, 2005; Sandoval & Reiser, 2004) (see Figure 3). Rather than a single scaffold, distributed scaffolding was a “suite of tools providing scaffolding to students” (Puntambekar, 2015, p. 217).

Lastly, Puntambaker also asserted the importance of a “system of scaffolding that is crucial for successful learning” (p. 218).

**Figure 3.** Design Model for Distributed Scaffolding (Hsu et al., 2014). AS = activity structure, WP = written prompts, VT = visualization tools.

**Distributed Scaffolding in Design Thinking**

Since design thinking was an extension of PBL, as I situated them for this dissertation,
students engaging in the design thinking process must also: “define the problem, determine what they already know, determine what they need to know, find information, synthesize found information to solve the problems, and build an argument in support of their solution” (Belland et al., 2013, p. 244). However, what makes design thinking different from PBL was the human-centered aspect of design thinking centered upon the development of empathy for the user/stakeholder. Additionally, the design thinking process was iterative, expecting that the design thinkers would fail fast and fail forward. In Chapter Two, I provide an in-depth explanation of the unique characteristics of design thinking. Because of the many characteristics of design thinking, multiple forms of scaffolding were necessary for students and novice design thinkers to navigate the design thinking process. Without scaffolding, students quickly became frustrated with ill-defined problems and struggled navigating the steps of problem solving.

While researchers of PBL suggest that scaffolds are necessary for students to enjoy greater success in PBL (Azevedo & Hadwin, 2005; Belland et al., 2013; Brush & Saye, 2002, 2013; Choo, Rotgans, Yew, & Schmidt, 2011; Doering & Veletsianos, 2007; Ertmer & Glazewski, 2015; Gallagher & Gallagher, 2013; Hmelo-Silver, 2004; Hmelo-Silver, Duncan, & Chinn, 2007; Hung, Jonassen, & Liu, 2008; Lee & Kolodner, 2011; Puntambekar, 2015; Puntambekar & Kolodner, 2005; Savery, 2006 2002; Saye & Brush, 2002), design thinking and distributed scaffolding provide multiple scaffolds needed for student processing. In each phase of the design thinking process, students experience multiple forms of scaffolds. Therefore, students experience distributed scaffolding as defined by Hsu et al. (2014) to navigate inquiry, structure tasks, support communication, and foster reflection.
Context

The context of this study had its genesis in questions surrounding student-centered learning. During my teaching career, I continually sought to implement student-centered learning opportunities. In the summer of 2011, I took a new teaching position at The Green School (pseudonym), an independent school. I was charged with creating a new curriculum for a seventh-grade social studies course entitled “Global Studies.” My first step was not to consult a set of standards, but to start instead with questions:

- What are the student outcomes for this course?
- How will students demonstrate their skills and content acquisition?
- What types of formative and summative assessments will best inform teachers of student progress with the learning journey?
- How can students take action outside the classroom?
- What problems do students want to solve?
- What process/framework will best foster creative, iterative, and collaborative solutions?
- How can students leverage technology to investigate the content of global issues?
- Will students have a capstone presentation in lieu of a final exam?

By starting with questions, and using backwards design (Wiggins & McTighe, 1998, 2005), possibilities arose for student achievement outside of a standards-based platform. Additionally, this gave me the freedom to look beyond a ready-made textbook and course materials to create a curriculum that put the students at the center of their learning and the teacher as the facilitator of the process. Over time, I reached outside of education and spoke to experts in the field of design and business who suggested using design thinking as a process/framework for curriculum creation.
Over the next four years, the course was prototyped and iterated many times. Student feedback was incorporated to make the curriculum stronger. The first year was incredibly difficult; however, with each successive design challenge unit, I found the design thinking process empowering to the practice of other Global Studies teachers. The next step was to situate a design challenge, a unit of study where students used the design thinking process, into the social studies curriculum using the *College, Career, and Civic Life (C3) Framework for Social Studies State Standards: Guidance for Enhancing the Rigor of K-12 Civics, Economics, Geography, and History* framework (National Council for the Social Studies, 2013) as a guide.

This unit of study was field tested by Global Studies teachers during the fall semester of 2015. While students completed the design challenge using the entire design thinking process, I made notes throughout the unit to improve the learning experience for students the following year. While there were no specific research questions for field testing the unit, the goal of field testing was to implement the design challenge within the social studies curriculum and identify the weaknesses and outcomes of the challenge as experienced by students to fulfill the C3 Framework (National Council for the Social Studies, 2013) for social studies content and student developmental needs. Additionally, concerns over the amount of time needed to complete the design challenge, how students were assessed throughout the unit, and the skills learned were observed and addressed amongst the teachers involved.

After finishing the design challenge, I made changes to journal questions, presentation requirements, the amount of time needed to complete the unit, student resources, and assessment rubrics. In particular, I revised journal questions to foster greater depth from student responses. I added video journals to the design challenge. I lengthened the presentation timeline and included
filming of each presentation and students watch their own presentation, allowing students to reflect on their group’s presentations and highlight changes between the quality of the two presentations. I added resources for student research so students had more research opportunities to further probe their selected topic. Lastly for clarity, I included additional directions on expectations for organizing work using Google Apps for Education.

Field testing allowed me and the social studies teachers to gauge the level of success that the students experienced during the design challenge and how the unit fit into the social studies curriculum. Based on the success of the unit, the teachers and I agreed to modify and improve the design challenge for the following year.

I crafted research questions after the conclusion of field testing based on my experience with the design challenge and cross referencing those experiences with the gaps in design thinking literature espoused by Koh et al. (2015) and Carroll et al. (2010).

Purpose

The purpose of this qualitative case study research was to understand how students experienced design thinking and distributed scaffolding during a design challenge in a middle-level social studies classroom. Based on the context of this study, the resounding question that leads to heart of this study is: how might we create curriculum, instruction, and assessment in such a way that students in a school environment are challenged to think critically, solve problems, and collaborate with others? If design thinking and problem-based learning are situated in student-centered learning (Davis & Littlejohn, 2016; Wise, 2016), then Koh and colleagues (2015) posit, “design thinking can be used as a means to support interdisciplinary learning and to build their students dispositions for complex problem solving. Such experiences play an important part in preparing students for the twenty-first-century workplace” (Conclusion, For Students, para. 2).
Koh and colleagues explicitly stated that a gap in the design thinking literature existed regarding students’ experiences with design scaffolds and how educators might use scaffolds within design thinking. And if design thinking utilizes distributed scaffolding, as I suggest, given that “more efforts need to be spent on understanding the particular design difficulties of teachers and students as well as the efficacy of different strategies for scaffolding design work in different content areas” (Koh et al., 2015, Conduct Research About Design Scaffolding, para. 1) then where is student voice about the entire process? How do students voice their experiences with the distributed scaffolding of design thinking?

**Research Questions**

- What role does distributed scaffolding play in students becoming design thinkers in a middle school social studies classroom?
- How does distributed scaffolding incorporated into design thinking allow students to demonstrate their understanding of social studies?
- What are students’ experiences of, and how do students respond to, distributed scaffolding in a design thinking unit?

**Significance of the Study**

This study addressed the gaps in design thinking research in education espoused by Carroll et al. (2010); Koh et al. (2015). Koh and her colleagues explicitly highlighted several areas for future research. One was to gain better understanding of how scaffolds are incorporated into design thinking units of study and their effects on both teacher and student. Carroll et al. (2010) proposed further research into the most effective ways to integrate design thinking and academic content. This study examined how students responded to distributed scaffolding within curriculum units that use design thinking to help students reflect, demonstrate their social studies
skills, content knowledge gained, and demonstrate how scaffolding aids students’ work through real-world human-centered problems towards a viable solution.

In addition to the significance of distributed scaffolding to design thinking, there were several other unique qualities of this study. This study took place within a 6th grade social studies course. Rather than just a unit of study added into the curriculum, the social studies curriculum was created using the socio-constructivist learning theory of Vygotsky (1978) with the problem-based learning foundation of Barrows (1996), PBHI of Brush and Saye (2013) and the design thinking methodology informed by multiple scholars (Brown, 2008, 2009; Buchanan, 1992; Carroll, 2014; Carroll et al., 2010; Cross, 2006, 2011; Goldman & Kabayadondo, 2016 2001; Hasso Plattner Institute of Design at Stanford, 2007; Kelley & Kelley, 2013; Kelley & Littman, 2001; Noweski et al., 2012; Saxe, 2008; Simon, 1969) that was further adapted to a middle school population (DtL). Thus, the course was created with a socio-constructivist learning environment in mind, with the curriculum foundation of PBL and PBHI, design thinking that scaffolds the design process, and the content of social studies – specifically human rights.

Overview of the Study

Chapter One provided the rationale for this study based on teacher experience and gaps espoused by Koh et al. (2015) in design thinking literature and the research questions. Chapter Two explains the theoretical framework that guides this study, nests design thinking and PBL in student-centered learning and defines some of the unique terminology of design thinking and PBL. Additionally, Chapter Two provides a literature review of design thinking, PBL, and the C3 Framework. Chapter Three describes the rationale for using a case study to answer the research questions and includes data collection, data analysis, and information on the authenticity
of research. Chapter Four describes analysis of collected data and themes. Chapter Five discusses the findings and implications for future research.
2 REVIEW OF THE LITERATURE

The goal of this literature review is to present my theoretical framework and connect the research of student-centered learning, problem-based learning (PBL), design thinking, and the C3 Framework. Additionally, this literature review demonstrates that a pedagogical foundation of student-centered learning and distributed scaffolding in the design thinking process are within the scope of PBL and have the potential to create classroom environments and curricula where students engage in and solve human-centered problems in social studies.

Theoretical Perspective

For this study, there are three lenses that situate my theoretical framework: Vygotsky’s (1978) sociocultural theory, Dewey’s (1934, 1938) experiential education and art as experience, and design as discussed by Buchanan (1992), Cross (2006, 2011), Schön (1983), and Simon (1969). Using this framework helped me to interpret the data and answer the research questions.

As a social studies teacher with fifteen years of experience, I have come to understand that there is no objective truth. Conversely, truth, I have also come to conclude, is not completely subjective. Therefore, the truth, and my perspective were somewhere in between. For too many years, I was fed one version of history and mandated to memorize the “facts” for a test as the measure of success. However, as I grew older, I am more aware that history was a story wherein the author(s) placed meaning on a specific event in time. Thus, there are many stories and many interpretations of events that contradict each other and therefore, there was no absolute truth, only multiple interpretations of the world. As my education and teaching career continue, I recognized that I am by nature a constructionist. As a design thinker and constructionist, I know that my students need to make meaning of the world around them.
Constructionism, according to Crotty (1998) is a view that “all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within essentially social context” (p. 42). Constructionism provided an ideal way to approach social studies because it allowed for individuals to discover how they interpret the world around them and the events of the past. By introducing several opposing interpretations of a concept, students choose interpretations of events in history they believe to be accurate and well-supported.

Design thinking fits neatly into the constructionist paradigm because the process allowed students to construct their own complex view of history. One aspect unique to design thinking was developing empathy for the user/stakeholder and demands a human-centered solution to a problem (Brown, 2009; Carroll et al., 2010; Cross, 2006, 2011; Davis & Littlejohn, 2016; Estrada & Goldman, 2016; Goldman et al., 2012; Goldman & Kabayadondo, 2016; Goldman et al., 2016a, 2016b; Kelley & Kelley, 2013; Kelley & Littman, 2001; Patnaik, 2009; Zielezinki, 2016). Based on the interpretations of a particular problem, individuals using design thinking hone in on a human-centered problem and attempt to solve the problem for the user/stakeholder. Crotty (1998) asserts that:

constructionism drives home unambiguously that there is no true or valid interpretation. There are useful interpretations, to be sure, and these stand over against interpretations that appear to serve no useful purpose. There are liberating forms of interpretations too; they contrast sharply with interpretations that prove oppressive. (p. 47-48)

As students work through a design challenge using the design thinking process, their interpretation of truth changes over time. More importantly, students realized that uncovering the “truth”
according to the user/stakeholder (developing empathy) was always more important to the design thinking process than their own “truth.”

As individuals interact with the problem and as the problem changes and evolves so does the solution. Participants who used the design thinking process constructed meaning based on their experiences and interactions with the world. Additionally, student design thinkers worked to find the human-centered problem by observing an individual or group as they interact with the problem itself (Brown, 2009). Interviews played a powerful role in uncovering the problem. The keen interviewer must ask the right questions and listen/interpret carefully to obtain the information necessary to create a human-centered solution. My job was to expose them to as many different interpretations of a single event so that students could place their own meaning on a particular event in history and understand others’ meanings too. They need to learn these skills so they can develop empathy for a user/stakeholder and then create a human-centered solution.

**Sociocultural Theory**

Vygotsky’s (1978) sociocultural theory, part of a larger construct, is defined as how people make meaning of the world around them. While constructivism, and socioconstructivism are commonly lumped together, each are different. More importantly, socioconstructivism acknowledges that culture and context were important in meaning making and learning. Thus, learning and meaning creation were social acts according to this theory, instead of an individualistic experience. The center of Vygotsky’s (1978) theory consists of two components: language and tools.

The specifically human capacity for language enables children to provide for auxiliary tools in the solution of difficult tasks, to overcome impulsive action, to plan a solution to a problem prior to its execution, and to master their own behavior. Signs and words serve children first and foremost as a means of social contact with other people. The cognitive
and communicative functions of language then become the basis of a new and superior form of activity in children, distinguishing them from animals. (pp. 28-29)

At the heart of Vygotsky’s sociocultural theory was the zone of proximal development (ZPD). The ZPD was defined as the “distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (p. 86). The primary notion of Vygotsky, regarding children’s development, was that the development of the child came first and learning came second. However, through ZPD, Vygotsky argued that learning came before the development of the child:

We propose that an essential feature of learning is that it creates the zone of proximal development; that is, learning awakens a variety of internal developmental processes that are able to operate only when the child is interacting with people in his environment and in cooperation with his peers. Once these processes are internalized, they become part of the child’s independent developmental achievement. (p. 90)

Moreover, play, according to Vygotsky, provides children with spaces to try, create, and fail. During play children enter into the ZPD, where children could behave above their developmental age, thus learning and the child’s developmental age improves as a natural byproduct of the process. A student-centered curriculum where students take meaningful ownership of their own learning incorporates play, rigor, and learning. Arguably, design thinking and PBL as part of a student-centered curriculum can definitely occur. Thus, this approach to education finds a better balance between play and rigor where teachers acts as facilitators instead of gatekeepers of knowledge (Thornton, 1991).
Sociocultural theory elucidates how students make meaning of the design thinking process and how they interact with the tools/scaffolds that design thinking affords. Because the work necessary for students to accomplish tasks should be slightly above their developmental level, the ZPD, by using language, tools, mediation and design thinking, students learn and solve design challenges in a middle school social studies curriculum. Additionally, the design challenge in this study was comprised of student groups where students worked towards a common goal and learn from each other, “learning [is] as a profoundly social process, emphasizes dialogue and the varied roles that language plays in instruction and in mediated cognitive growth” (Vygotsky, 1978, p. 131).

Extending Vygotsky’s ZPD, there exist multiple ZPD (Brown et al., 1993; Brown & Campione, 1994; Puntambekar, 2015; Puntambekar & Kolodner, 2005; Tsai, Chai, Wong, Hong, & Tan, 2014). Based on the complex environments of classrooms (Di Russo, 2016; Puntambekar, 2015), one zone of proximal development for all students does not exist. Instead, there exist multiple zones of proximal development and multiple levels of scaffolding in the same classroom. “A zone of proximal development can include people, adults and children with varying expertise, but it can also include artifacts such as books, videos, wall displays, scientific equipment, and a computer environment intended to support intentional learning” (Brown & Campione, 1994, p. 236). As different scaffolds exist in multiple formats, students have multiple opportunities to utilize the scaffolds for their learning (Puntambekar, 2015, p. 217). Students should have:

multiple forms of support, distributed across available tools, activities, and agents in the classroom and integrated in ways that admit redundancy, can enhance the learning and performance of a wide variety of students in the classroom….When support is distributed
across tools and agents in the environment in a systematic way, such difficulties can be
dealt with from a variety of perspectives. Multiple opportunities are important too”
(Puntambekar & Kolodner, 2005, p. 211).

Thus, by collecting data that demonstrates how students navigate their multiple ZPD with the use
of tools, scaffolds, and collaboration, I came to better understand how students experienced de-
sign thinking.

**Experiential Education**

While Vygotsky’s ZPD explains how students grapple with constructing knowledge,
Dewey, as a philosopher of education and learning, believed that experience was paramount for
learning to occur (Dewey, 1910, 1934, 1938, 1944). As was evident in his work, *My Pedagogic
Creed*, Dewey (1897) expressed his views of education:

- I believe that the only true education comes through the stimulation of the child’s
  powers by the demands of the social situations in which he finds himself.
- Education, therefore, must begin with a psychological insight into the child’s ca-
  pacities, interests, and habits.
- The teacher is not in the school to impose certain ideas or to form certain habits in
  the child, but is there as a member of the community to select the influences
  which shall affect the child and to assist him in properly responding to these influ-
  ences.
- I believe, finally, that education must be conceived as a continuing reconstruction
  of experience; that the process and goal of education are one and the same thing.
- I believe that the question of method is ultimately reducible to the question of the
  order of development of the child’s powers and interests.
I believe that education is the fundamental method of social progress and reform. (pp. 77-80)

The work of Dewey and Vygotsky were connected by the ZPD. For Dewey, education occurred when an individual reflected on an experience. In the ZPD, a student had an experience that was just above their developmental aptitude but was mediated with tools, language, or collaborative groups. Dewey (1938) asserted that it was the teacher’s responsibility to engage the student and to find the right level of rigor, based on the teacher’s assessment of the child’s developmental level (1938). Furthermore, Dewey suggested that instruction was a “co-operative enterprise not a dictation” between the teacher and student; maintaining that “development occurs though reciprocal give-and-take” (Chapter 6, The Meaning of Purpose, para. 8). While Dewey asserted that the teacher must know their students and create experiences that leverage the students’ previous experiences with upcoming experiences, “hence the central problem of an education based upon experience is to select the kind of present experiences that live fruitfully and creatively in subsequent experiences” (Chapter 2, The Need of a Theory of Experience, para. 4). He argued that the teacher takes on a leader role rather than dictator; thus, giving students the ability to drive their own experiences. The design thinking process provided such experiences for students to follow a process when they are not sure what was next, to collaborate and talk with their peers, reflect on their experiences, and iterate on the process/experience itself.

Using Dewey’s (1938) experiential education and experience as a lens allowed me to see how educators put students at the center of their own education and sought out opportunities to create meaningful and connective experiences. As students have meaningful experiences, they are more likely to learn and build on their experiences, which led to even more meaningful experience.
Origins of Design and Design Thinking

Adding a third lens to ZPD and experience, design. The ways in which experienced designers think about their work is referred to as designerly ways of thinking (Cross, 2006). The major authors of designerly ways of thinking, ways in which designers think about their work and design thinking come from different disciplines – economics, computer science, artificial intelligence, and design (Simon, 1969); philosophy and music (Schön, 1983); art history and design (Buchanan, 1992); and architecture and practical ways designers think (Cross, 2006, 2011). Each of these foundational thinkers came from a different discipline, providing a different lens and adding to the design thinking literature.

Kimbell (2011) suggests that design thinking evolved over time from a philosophical understanding of how designers think and act (Cross, 2006, 2011; Dorst, 2006; Lawson, 1997; Rowe, 1998; Schön, 1983), to solving wicked problems (Buchanan, 1992). Some researchers call it an organizational way of conceptualizing the creation process (Bauer & Eagan, 2008; Brown, 2009; Dunne & Martin, 2006; Martin, 2009). Brown and Wyatt (2010) suggested that design thinking was used in a variety of fields to solve societal problems. Over time, design thinking incorporated new foci in areas such as innovation, empathy, human-centeredness, and prototyping (Kimbell, 2011).

The Palo Alto based design firm IDEO and Stanford’s Hasso Plattner Design Institute, commonly known as the d.School, capitalized on the work of these foundational thinkers in design thinking to utilize the method in the fields of creation, management, and organization with an eye towards innovation (Johansson-Skoldberg, Woodilla, & Cetinkaya, 2013). As IDEO and the d.School began to receive popular press about their work and their innovative methods (Brown, 2008; Cohen, 2014; Tischler, 2009), businesses, business schools, non-profits and
schools began to incorporate design thinking as a process.

Design and design thinking continues to be a powerful lens for investigating students’ ability to solve real-world problems. Whereas in traditional industrial-based instruction which “put[s] a premium on compliancy and rote memorization of basic knowledge – excellent qualities in an industrial worker” (Berger, 2014, p. 48) students typically ask “when am I going to use this?” compared to design thinking in which students’ problem solve real-world problems that affect real people (Brown, 2009; Koh et al., 2015; Long, 2012).

**Situating Sociocultural Theory, Experiential Education, Design and Design Thinking Lenses**

To situate the lenses properly, as to fit and priority, and to truly shed light on student experiences of distributed scaffolding in design thinking, lenses must be placed in the following order: design and design thinking, experiential education, and sociocultural theory. Goldman and Kabayadondo (2016) asserted “Design thinking encompasses active problem-solving by engaging with and changing the world (Dewey, 1916). Design thinking relies on deep collaborations and teamwork, and the opportunities to interact are generally considered an essential environment for learning (Vygotsky, 1986)” (Taking Design Thinking to School, A Short History of Design Thinking With an Eye, para. 14).
Figure 4. Situating the lenses for the theoretical perspective.

Because the design thinking process puts the designer in a frame of mind where they solve human-centered problems, the teacher must create a student-centered classroom where the experiences were sufficiently profound for the student to engage in the task at hand. As students continue to engage in solving human-centered problems, they surpass their developmental age and level of knowledge and enter into the ZPD. The mediating tools and language used by students in the multiple ZPD was the process of design thinking. Therefore, to understand the scaffolding that design thinking affords middle school students while attempting to solve human-centered problems I started with elements of design and design thinking, followed by experiential education, and then sociocultural theory.

Using these lenses shapes how students experienced student-centered learning, PBL, and
design thinking. PBL (Barrows, 1996; Barrows & Tamblyn, 1980; Hmelo-Silver, 2004) and the disciplinary extension of PBL into social studies, problem-based historical inquiry (PBHI) (Brush & Saye, 2013; Saye & Brush, 2002 2007; 2006 2007), and design thinking (Buchanan, 1992; Carroll et al., 2010; Cross, 2006; Estrada & Goldman, 2016; Goldman et al., 2012; Goldman & Kabayadondo, 2016; Goldman et al., 2016a, 2016b; Koh et al., 2015; Noweski et al., 2012; Scheer, Noweski, & Meinel, 2012) are three methods that hold promise for student-centered learning and authentic problem solving.

**Design Thinking**

Before connecting student-centered learning, PBL, and design thinking, defining the unique qualities of design thinking will help frame how the design thinking process is part of PBL and student-centered learning curricula. Design thinking is a human-centered problem-identifying and problem-solving process where design thinkers develop empathy for the user/stakeholder and solve an ill-structured problem. Additionally, the design thinking process is iterative with the expectation that design thinkers will fail fast and fail forward.

**Well-structured and Ill-structured Problems**

Building off the work of Rittel and Webber (1973) and Jonassen (1997, 2000) who identified the characteristics of well and ill-structured problems. Well-structured problems are prevalent in schools. Typically found at the end of textbook chapters and on tests, well-structured problems require a small set of skills and content knowledge to produce a singular answer. Jonassen (2000) suggests that well-structured problems:

- Present all elements of the problem to the learners.
- Require the application of a limited number of regular and well-structured rules and principles that are organized in predictive and prescriptive ways.
• Have knowable, comprehensible solutions where the relationship between decision choices and all problem states is known or probabilistic. (p. 67).

Conversely, ill-structured problems are typically found in real-world situations, in professional practice, and “typically emerge” organically. Because ill-structured problems are not typically found in the classroom, they generally have multiple answers, are interdisciplinary, and involve human understanding in identifying the problem and its solution. Jonassen (2000) asserts ill-structured problems:

• Possess problem elements that are unknown or not known with any degree of confidence.

• Possess multiple solutions, solutions paths, or no solutions at all.

• Possess multiple criteria for evaluating solutions, so there is uncertainty about which concepts, rules and principles are necessary for the solution and how they are organized.

• Often require learners to make judgments and express personal opinions or beliefs about the problem, so ill-structured problems are uniquely human interpersonal activities. (p. 67).

**Human-centered**

One of the cornerstones of design thinking is creating solutions for other people (Brown, 2008, 2009; Brown & Wyatt, 2010; Carroll, 2014; Carroll et al., 2010; Cross, 2011; Goldman et al., 2012; Goldman & Kabayadondo, 2016; Goldman et al., 2014; Hasso Plattner Institute of Design at Stanford, 2007; Kangas, Seitamaa-Hakkarainen, & Hakkarainen, 2013; Kelley & Kelley, 2013; Kelley & Littman, 2001; Kimbell, 2011; Koh et al., 2015; Kolko, 2015; Long, 2012; Noweski et al., 2012; Patnaik, 2009; Plattner, Meinel, & Leifer, 2011; Spencer & Juliani,
When design thinking students create solutions for others, based on the needs others exhibit and discuss, design thinkers create human-centered solutions. “By learning to observe human behaviors and needs in the context of real life, design thinking participants discover human-centered questions and problems worth trying to solve” (Long, 2012, p. 19). As students continue their work with design thinking, “they begin to move beyond egocentric views of the world and no longer design based on their own needs, desires, experiences or preferences” (Goldman et al., 2012, p. 17). Additionally, students develop the “capacity for judgment and reflection” through the human-centered nature of design thinking (Koh et al., 2015, Design Thinking in Education, Situating Design Thinking in a Provisional Conceptual Framework, para. 6). Design thinking fits well in middle level education because as students develop during this time, they begin to move from concrete to abstract thinking.

**Failing Fast and Failing Forward**

Kelley and Littman (2001), Zielezinki (2016), and Kwek (2016) assert that mini-failure early in the prototyping process, is at the heart of design thinking, leads to better ideas and eventually a better solution. Failing fast and failing forward is defined as trying out an idea, getting feedback, using the feedback to improve the idea, and learning from the experience. While failing fast and failing forward seem counterintuitive in the current educational climate riddled as it is with high-stakes testing, design thinking produces more successes in terms of the final solution/design than coming up with one solution and not deviating (Long, 2012). “Leaders [teachers] should encourage experimentation and accept that there is nothing wrong with failure as long as it happens early and becomes a source of learning” (Brown, 2009, p. 230). When students create an idea and prototype, they are doing so quickly with the hopes of getting feedback on shortcomings; thus learning from their work. The best feedback does not take place in the
classroom, rather it takes place in the real world where students test their ideas for the user/stakeholder in the intended context. If students do not get feedback before they create their finished design/solution, they are more likely to have serious flaws in their idea.

For example, one aspect of failing fast and failing forward goes as follows: Students are expected to edit and update drafts of written work to create a polished final draft. Teachers do not expect students to produce a perfect first draft; furthermore, if teachers did, the anxiety level of students to produce perfection is more likely to cripple their work. Thus, creating a climate where mini-failures are accepted and celebrated helps students create better solutions, the true goal of the design thinking process (Brown, 2009; Cross, 2011; Kelley & Kelley, 2013; Kelley & Littman, 2001).

**User/Stakeholder**

The user/stakeholder in design thinking denotes the person who is experiencing a problem. People who use design thinking are attempting to solve a problem for someone else, solving an existing user/stakeholder problem.

**Variations of the Design Thinking Process**

While considerable literature exists regarding the discipline of design and *designerly ways of thinking*, less research exists regarding these methods in K-12 education. Currently Stanford University’s d.School, and the design firm IDEO are the recognized thought-leaders and practice leaders respectively on design thinking in the fields of design, business, organization, and self-help (Gobble, 2014; Kolko, 2015). There are differences in how design thinking is defined within these groups, how the process is visualized, and how the design thinking process occurs (Kimbell, 2011; Koh et al., 2015; Razzouk & Shute, 2012b). Davis and Littlejohn (2016) further express the ambiguity when defining design thinking:
With nearly 155 million search engine entries, the term design thinking has been used to describe concepts as varied as creativity, spatial thinking, innovation processes, and managerial strategy. It has been contrasted with the scientific method and analytical thinking on one hand, and described as “design science” on the other. Under other definitions, design thinking is all about the “a-ha” moment, the creative leap, or divergent thinking.

Even in the year-to-year programming by the same organization, the definition of design thinking often fluctuates among these differing missions and views, or embraces them all, confusing novices about what truly distinguishes the practice. And there is almost no discussion nationally of what these radically different identities mean to the audiences whom proponents seek to persuade. (Davis & Littlejohn, 2016)

In addition, design thinking is not a new methodology – to the contrary, design thinking has been used extensively from the early 1970s for design, industrial design, architecture, and engineering (Gobble, 2014); more recently, business schools have begun to incorporate design thinking in Master of Business Administration (MBA) course work (Gillespie, 2013). However, there is a definite rift between designers, the business world, and educators on how design thinking and its phases are defined (Johansson-Skoldberg et al., 2013).

In education, there exists different design thinking methodologies based on the process itself, wording, visualization, and the importance given to different steps. Koh et al. (2015) asserted that a firm definition of design thinking, its methodology, and its process to solve problems did not exist. Excellent examples of this difference are Carroll et al. (2010) (see Figure 5), Carroll (2014) (see Figure 6), and Saxe (2008) (see Figure 7). The design thinking process by Saxe is most closely related to DtL.
Figure 5. Design Thinking Process (Carroll et al., 2010).

Figure 6. Design Thinking Process (Carroll, 2014).
While each of the design thinking methodologies were presented as effective in education, there exist differences in the level of detail for each process. Noting the differences between design thinking methodologies, it confirms the Koh et al. (2015) argument that more research needs to take place to understand how different variations of design thinking affect different ages of students and how different disciplines utilize the methods.

Two Camps of Design Thinking Research in Education

In addition to differences in definition, there exists a distinct difference in how design
thinking was previously incorporated into education. While the work of IDEO and the d.School provided a framework to incorporate design thinking into education, much of the work and research coming from these two entities was rooted in design for paying customers (Brown, 2008, 2009; Brown & Wyatt, 2010; Kelley & Kelley, 2013; Kelley & Littman, 2001; Patnaik, 2009). In addition to the research and work on design thinking coming out of the d.School, REDlab, Stanford University’s research lab in design and education produced research on design thinking in education (Carroll, 2014; Carroll et al., 2010; Davis & Littlejohn, 2016; Estrada & Goldman, 2016; Goldman et al., 2012; Goldman & Kabayadondo, 2016; Goldman et al., 2016a, 2016b; Wise, 2016; Zielezinski, 2016).

Separately from the work of the d.School, REDlab, and IDEO, Koh et al. (2015) produced an in-depth analysis and implications of design thinking in education with the expressed goal of understanding “the potential applications of design thinking in educational settings” (Preface, para. 1). Koh and her colleagues attempted to bridge the gap between the fields of engineering, architecture, business, and how those applications apply to education:

In recent years, professional fields such as engineering, architecture and business are recognizing that design thinking can be more effective for solving the complex and ill-defined problems than systematic problem-solving processes. Yet, in the field of education, design thinking has not yet seen widespread permeation into the pedagogical vocabularies of students and teachers. There is a need to better understand the potential applications of design thinking in educational settings. (Preface, para. 1-2)

The most profound difference between the design thinking methodologies of the other fields compared to the field of education is a longer introductory phase and building of empathy. Adults tend to be experts in one or several fields. Children generally are not. Therefore, there is
significant lead time necessary to teach background information, history, social and cultural connections and the building of empathy. Thus, there is a difference of opinion of the design thinking process as it pertains to education verses other professional fields. The d.School and Koh colleague differences are also apparent.

The difference between these two camps and their respective work suggests a rift between the major disciplines driving their respective research – design versus education. While Koh and her colleagues situate design thinking within educational contexts, the d.School and IDEO situate design thinking within designing products and experiences. IDEO designed the first Apple mouse in the 1980s and redesigned school desks for Steelcase, and the TiVo remote (Brown, 2009; Kelley & Littman, 2001).

Both camps and their research provide valuable context for the implications of design thinking in education; yet there existed little cross referencing of research between the two. Additionally, both camps reference the work of Cross (2006), Rowe (1998); Schön (1983), and Simon (1969) as the foundational thinkers of design thinking. Furthermore, Koh et al. (2015) work was written after the work of Carroll et al. (2010), Carroll (2014) and Goldman et al. (2012), which were considered strong findings for design thinking in education, Koh and her colleagues only mention (Carroll et al., 2010) this work once. Additionally, Koh et al.’s (2015) mentioned IDEO once, but do not mention the d.School or REDlab. The absence of work coming from the d.School and REDlab might suggest competing research interests and funding opportunities or a different approach to situating design thinking in education as stated above. Therefore, this literature review uses the framework set forth by Koh et al. (2015) while also incorporating the work of the d.School and REDlab regarding design thinking in education.

Using current findings by Koh et al. (2015), the research in design thinking is categorized
as follows: critical perspectives on design and design thinking, 21st century skills, children, pre-service teachers, in-service teachers, and evaluation and assessment of design thinking. For this review of the design thinking literature, critical perspectives on design and design thinking, 21st century skills, children, and evaluation and assessment of design thinking are discussed in this section of the literature review.

**Design Thinking in Education**

Design thinking as a method to create curriculum, instruction, and assessment is a relatively new field. With design thinking catching hold with early adaptors in the late 2000s and early 2010s, it was prototyped and its creators questioned how they might implement design thinking into curricula. Educators began to see connections between this method and other educational frameworks: Dewey’s (1938, 1910) student-directed education and reflection, Vygotsky (1978) zone of proximal development (ZPD), and Barrows and Tamblyn (1980) problem-based learning. However, to better understand the connection between design thinking, student-centered learning, ZPD, and PBL, design thinking research must be elaborated upon further.

**Critical Perspectives on Design and Design Thinking**

Literature on design thinking in education was previously limited to sporadic entries in academic journals, which, while helpful, made it difficult to piece together a complete picture of research on design thinking in an educational context. The work of Koh et al. (2015) provided a comprehensive analysis of the design thinking research regarding implications for teaching and learning. This portion of the literature review utilizes the framework laid out by Koh and her colleagues to address the current design thinking research, its limitations, and gaps in the current literature.
While relying on the groundwork of the three prominent thinkers in design thinking, (Cross, 2006, 2011; Rowe, 1998; Schön, 1983; Simon, 1969), Koh and her colleagues (2015) argued that an industrial education format was marginally successful in the 20th century. Additionally, they asserted that a system of curriculum, instruction, and assessment that positioned students for gains in “knowledge, skills, and attributes needed for collaborative problem solving of complex problems” (Design Thinking and Education, Education: The Old Design and Its Problems, para. 6) was more impactful than traditional models of education. Furthermore, the development of skills and problem solving abilities position adolescents to become adult change-agents for themselves and others by utilizing a central tenet of design thinking – human-centered design. This argument was extended further to apply to students in K-12 education. In addition to advocating for a more effective education system, Koh et al. suggested the adaptation of a design epistemology (Tsai et al., 2014) as a way to approach design thinking in education as beneficial to promoting designerly ways of thinking which could lead to better student outcomes. The design epistemology of Tsai et al. focused on generating solutions for real-world problems, which fits neatly into the argument of Koh et al. (2015). It is important to note that Koh and her colleagues did not suggest that knowledge and mathematical understanding in a traditional format are outdated, instead, they posited that these fields, along with the empathic and problem-solving nature of a design epistemology, allow students to take risks, fail forward (Brown & Wyatt, 2010; Buchanan, 1992; Carroll et al., 2010; Goldman et al., 2012; Tsai et al., 2014), and learn/create simultaneously.

Learning and creation happen best together rather than the learn first, create second model that is prevalent in traditional models of education (Anderman, Sinatra, & Gray, 2012; Resnick, 2010). Furthermore, Koh et al. (2015) see the necessity of interdisciplinary work
(Estrada & Goldman, 2016; Goldman et al., 2016b; Jonassen, 1997, 2000; Kelley & Littman, 2001; Rittel & Webber, 1973), collaboration (Brown, 2008; Carroll et al., 2010; Goldman et al., 2014; Goldman et al., 2016b; Kangas et al., 2013), empathy (Patnaik, 2009; Rowland, 2004), and 21st century competencies (P21, 2007; Voogt & Roblin, 2012) as important components of best practices in education – all of which are central tenets of design thinking. While Koh and colleagues (2015) argue that design thinking in schools was successful because “design thinking thrives on ambiguity and uncertainty; thus, it broadens students’ educational experience by encouraging innovative and reflexive thinking, self-awareness, and social consciousness” (Design Thinking and Education, Conclusion, para. 1), they also recognize the need for grounding of a discipline and method within curriculum, instruction, and assessment.

**Design Thinking and 21st Century Skills**

In the long-standing debate on how best to educate children in the United States, a considerable body of literature argues that students do not gain the necessary skills to be successful critical thinkers and problem solvers in current models of K-12 education (Gao, Choy, Wong, & Wu, 2009; Hayes, 2007; Lim & Chai, 2008; Macdonald & Hursh, 2006; Ruthven, Hennessy, & Brindley, 2004; Smeets, 2005; Smeets & Mooij, 2001; Wagner, 2010; Ward & Parr, 2010). Furthermore, the literature suggests that students entering the workforce have not gained the necessary skills to be critical thinkers and problem solvers (Brown, 2008, 2009; Brown & Wyatt, 2010; Kelley & Kelley, 2013; Kelley & Littman, 2001; Patnaik, 2009; Pink, 2006; Wagner, 2010). A traditional industrial model of teaching may have produced successful high school graduates in the 19th and 20th centuries, but students, university professors, and employers are demanding more from K-12 education.
While the work for K-12 educators continues to grow and the need for institutional accountability increases accordingly through high-stakes testing and teacher evaluations, Anderson (2012) asserted, “national testing of basic learning in schools threatens to diminish the importance of learning tasks that require young people to develop imagination, creativity and innovative mindsets” (p. 46). By rejecting a current environment that adds additional testing, different research can be utilized that has the potential to help students gain the skills necessary for college and workforce. The research focuses on how to create student-centered learning environments where students can solve real-world problems while gaining the necessary skills and content knowledge to be successful in school and in the real world. There is a need for continued research in how design thinking can be better utilized in middle school curricula to foster 21st century learning competencies (Voogt & Roblin, 2012) and scaffolding a student and human-centered learning process (Patnaik, 2009; Puntambekar, 2015).

Design Thinking and Students

Koh and colleagues (2015) recognized that models for this kind of education were not widespread and were therefore difficult to integrate into curriculum, instruction, and assessment. In agreement with du Plessis and Webb (2011) and Sawyer (2012), Koh et al. (2015) asserted that “design has the pedagogical affordances of facilitating students’ learning of interdisciplinary knowledge as well as cultivating students’ creative capacities for improving on their learned knowledge rather than accepting these as mere facts” (Design Thinking and Children, Literature Review, para. 1). Koh and colleagues cited various studies in designing digital artifacts with programming (Baytak & Land, 2011; Brennan & Resnick, 2013; Harel & Papert, 1990; Ke, 2014; Maloney, Resnick, Rusk, Silverman, & Eastmond, 2010; Resnick, 1998), learning science by design (Apeddoe & Schunn, 2013; Dabbagh & Dass, 2013; Doppelt, Mehalik, Schunn, Silk, & Kyrsinski, 2008; Lee & Kolodner, 2011; Levy, 2013; Puntambekar & Kolodner, 2005; Wendell & Rogers, 2013), design and technology studies, (Benson & Lunt, 2011; Hill & Anning, 2001; Kangas et al., 2013), and theory building as human design (Bereiter & Scardamalia, 2006; de Jong et al., 2012; Dolenc & Abersek, 2012; Howland, Jonassen, & Marra, 2012; Scardamalia & Bereiter, 2006, 2010; Wendell & Rogers, 2013) to suggest that design thinking was an effective strategy to create a climate where students were engaged with and learned 21st century competencies.

As important as these methods of design mentioned above, students must have the opportunities for multiple iterations of a designed solution, reflective activities, and instructional strategies for teachers to engage students in the design thinking process (Carroll et al., 2010; Estrada & Goldman, 2016; Goldman & Kabayadondo, 2016; Goldman et al., 2016a, 2016b; Koh et al.,
When students are engaged in design thinking in the classroom they are “engaged in designing solutions for open-ended real-world problems, they are being challenged to integrate disciplinary knowledge, think critically to analyze problems, and engage in metacognitive evaluation to determine how their work processes could be improved” (Koh et al., 2015, pp. Conclusion, For Students, para. 1). When students are engaged with design thinking in the classroom, students are front and center of their own education while gaining the necessary skills and content knowledge to be successful outside of a school setting.

**Design Thinking Evaluation and Assessment**

Without agreement on how design thinking is defined, it is difficult to develop research tools to test the level of success with students, preservice teachers, in service teachers, and curriculum (Koh et al., 2015). According to Hoadley and Cox (2009) and Razzouk and Shute (2012b), what made design thinking difficult to evaluate and assess its success in education was a lack of set definition for design thinking. If no set definition exists, Koh et al. (2015) suggested that it is difficult for researchers to test the effects of design thinking in education since the operating definition and the process itself tends to shift with the discipline. While Hoadley and Cox (2009) and Razzouk and Shute (2012b) suggested such design thinking competencies are: locating resources, undertaking iterative design cycles, and design for innovation, they concluded that educators had a tendency to pick and choose the areas of design thinking and their competencies to focus and assess in a classroom setting.

A component of evaluating and assessing design thinking in education is first to recognize the difference between novice and expert designers as they often engage and react differently to the design thinking process. Novices perform a narrow-field approach, focusing on the small details while easily getting bogged down in the entirety of the process, while experts take a
broad-field approach and are less frustrated by the ambiguity of solving human-centered problems (Cross, 2006; Schön, 1983). It is important for novices to experience design thinking multiple times. Additionally, Zielezinki (2016) asserted of novice design thinkers need “ongoing coaching and frequent check-ins are important for keeping novice design groups focused on the user throughout the process (Finding Your Fit Empathy, Authenticity, and Ambiguity in the Design Thinking Classroom, No. 3 Empathy is Not Just the First Step, para. 4). In education, many students come to design challenges and the design thinking process as novice designers and must be afforded opportunities to go through the design thinking cycle multiple times before they are comfortable with the structure and ambiguity of the process.

Student designer’s reflections continue to be an area for assessing the growth of students and teachers as design thinkers. However, the majority of the research that exists on reflection and design thinking focuses on teacher’s reflections of their work in developing design thinking units (Conway, 2001). While reflection creates opportunities for growth and learning (Dewey, 1910; Schön, 1983), reflection cannot be the only area assessed. What continued to create ambiguity for the evaluation and assessment of design thinking in education is how teachers assessed their students. Teachers must make decisions on what to assess: content, solving the problem, skills, meeting of the standards, or design thinking skills.

**Limitations of Design Thinking in Social Studies Curriculum**

As powerful and effective as design thinking is in a social studies curriculum, some limitations exist. Koh et al. (2015) asserted that more research was needed to understand how design thinking is effective across different disciplines in education. Currently, little research exists on how design thinking positively or negatively affects students in the discipline of social studies (Carroll et al., 2010).
While design thinking can work as a tool for studying past events, such as in a traditional history course, it is more effective in a current issues course; this is in agreement with PCK (Shulman, 1986). Courses such as economics, geography, law, political science, global issues, contemporary issues, and civics deal with current issues or events, a process which allowed for the human-centered empathic solution oriented nature of design thinking to be successful. However, many courses under the umbrella of social studies are history courses and it is difficult to use the design thinking process as a method of inquiry for these courses – in those instances, using PBHI (Brush & Saye, 2002, 2013; Saye & Brush, 2002, 2006, 2007) alone is a more effective methodology.

In addition to the difficulties of using design thinking in a history course that deals with past events, historical empathy (Barton & Levstik, 2004; Foster & Yeager, 1998; Saye & Brush, 2007; Seixas, 1993; VanSledright, 2004) and the empathy in design thinking (Brown, 2008, 2009; Kelley & Kelley, 2013; Kelley & Littman, 2001; Koh et al., 2015; Patnaik, 2009) are different. Foster and Yeager (1998) contend that historical empathy consists of four interrelated phases that students contend with to obtain historical empathy:

1. the introduction of an historical event necessitating the analysis of human action, the understanding of historical context and chronology, the analysis of a variety of historical evidence and interpretations, and the construction of a narrative framework though which historical conclusions are reached. (p.1)

When students develop historical empathy, they are engaged in critically analyzing and synthesizing the data available to them on an event that occurred in history. In turn, this helps students gain a better understanding of why people acted in the way they did.
The importance of past historical events is important in developing historical empathy, whereas the empathy utilized in design thinking centers upon understanding the user/stakeholder’s true needs. The user/stakeholder is the person that the problem is being solved for – in this case by students. Empathy in design thinking helps students create solutions to make the user/stakeholder’s lives better, “the mission of design thinking is to translate observations into insights and insights into products and services that will improve lives” (Brown, 2009, p. 40).

The biggest difference between historical empathy and the empathy of design thinking is that historical empathy is a way to understand the thoughts, feelings, and motivations of a person or group people in the past, whereas empathy in design thinking is concerned with understanding how people are dealing with a current problem with the hopes of leveraging the empathy to create a human-centered solution for that specific user/stakeholder (Brown, 2009; Carroll et al., 2010; Goldman & Kabayadondo, 2016; Goldman et al., 2016a, 2016b; Kelley & Kelley, 2013; Patnaik, 2009; Zielezinki, 2016). While learning from past events is part of the design thinking process, current issues and problems of the user/stakeholder are strongly emphasized. However, successful design challenges in the discipline of social studies must bridge the gap between the past and present. Understanding the history of the problem in the ideas/focus and direction and research phases of DtL helps students connect past historical events and current issues relating to the problem so that students can properly solve the human-centered problem.

A second limitation of design thinking in social studies curriculum is that using design thinking works best when utilizing the full process and not choosing, a la carte, from various phases to execute in a unit of study. While brainstorming is an important component of design thinking, brainstorming alone during a unit of study is not effective utilization of the design
thinking methodology. Teachers can say they have used aspects, one or more of the steps, of design thinking, but in reality, they have used a component of design thinking in a standalone process thereby negating the design thinking process. Design thinking works best when students have enough time to work through the entire design thinking process. When given the opportunity to complete the entire design thinking process, a student’s work is superior in terms of the overall solution, the empathetic understanding of the situation, and solving the human-centered need compared to students using only select phases of the design thinking process.

In many respects the outcomes of design thinking in social studies, which result in students reaching different solutions to various problems, are strengths. When students utilize the design thinking process, they are not working towards finding the right answer for the test or producing the same project as their peers. The human-centered nature of the process necessitates solving problems for unique individuals and groups – one solution does not work for all users/stakeholders. As student groups create different solutions for the problems they choose to solve, groups will produce different solutions. Some educators deem the lack of clear, consistent outcomes among students as a limitation and a hindrance in the ability to assess students. In many instances teachers have difficulty in assessing a design thinking based unit of study because there are multiple aspects to assess – content, innovation, 21st century skills, empathy, research, prototype, the human-centered solution, and the design process (Koh et al., 2015). Additionally, assessing design thinking and the process itself can be difficult for teachers who are not yet familiar with the process. If teachers are not comfortable with facilitating the learning process instead of directing what is learned and ultimately deciding the right or wrong answer, professional development is necessary to make the shift from a teacher-directed, content driven curriculum to a student-centered design thinking curriculum.
Lastly, the most common assumption and uninformed complaint by educators is that implementing design thinking in social studies curriculum takes away from the required course content. Educators assume design thinking lacks necessary academic rigor because of the novel prototyped solutions students create and the time and believe the effort needed to implement the methodology into the curriculum does not outweigh its strengths. Without proper professional development to understand how design thinking and PBHI elevate the social studies curriculum, some educators believe that design thinking creates novel solutions that take time away from the necessary content that must be learned by the students. When educators intentionally use design thinking in a unit of study, where proper planning is paramount to create the design challenge, question, and the climate for design thinking to be successful, educators find that students learn more than the content they would have learned in a traditional format, engage in higher level of thinking and learning, utilize 21st century skills, and are more engaged in their own learning (Koh et al., 2015).

An example of using design thinking and PBHI in middle school social studies is a unit of study where students learn about the refugee crisis in Syria and Iraq. During this unit of study, students learned the content, engaged in higher level of thinking and learning, and utilized 21st century skills. Additionally, while students learned about severity of the issue, they role-played planning how they would leave their homeland in the hopes of finding a new life. Students had to research the routes refugees were taking, the time, travel, money, and supplies needed and created a video journal of their trip to Europe.

To summarize, design thinking in middle school social studies is relatively new, with research into this field starting in the early 2010s. However, the promise of design thinking in social studies creates a student-centered class where student seek out human-centered problems and
creates human-centered solutions while learning content, developing social studies skills, and developing 21st century competencies. The strengths of design thinking outweigh the limitations in many disciplines of social studies.

Gaps in Design Thinking Literature

In the design thinking literature in education, there exist several gaps. Although studies demonstrate how students and teachers benefit from using design thinking, teachers and curriculum workers struggle with fitting design thinking into an educational context bogged down with mandated standards and standardized tests. Questions arise about how students will acquire content mastery to be successful on end of year exams. Parallel to this concern over content mastery, design thinking creates opportunities for students to engage in and extend their 21st century competencies; yet, these competencies are not tested on statewide end of year exams or standardized tests and are therefore not often deemed necessary for passing the standardized test. There continues to be a disconnect between what is taught and tested in schools and what students need to be successful outside of school (The Assessment and Teaching of 21st Century Skills, EnGauge 21st Century Skills, 2001; OECD’s Key Competencies for Education, 2005; and The Partnership for 21st Century Learning, 2007).

In conjunction with gaps regarding the fit of design thinking into curricula, more investigation is needed on the various scaffolding used during design thinking units. Scaffolding in this context was shown to be twofold, which scaffolds teachers chose to incorporate into design challenges for students and the efficacy of students experiencing the scaffolds Koh et al. (2015).

While design projects are being used as a means for learning, the processes to effectively scaffold these design activities remain unclear. We suggest that this could be developed through the purposive design of design problems and how these are being experienced,
the overt guidance of teachers and students to reflect and articulate their design reasoning, as well as the incorporation of instructor modeling to develop confidence and dispositions for undertaking design work....Yet, much work remains in articulating how these guidelines can be implemented within specific disciplines and subject areas. The methods for developing design thinking as well as its methods for evaluation are intricately related. (Developing and Evaluating Design Thinking, Issues and Challenges, para. 2)

Additionally, it is unclear which scaffolds and at what time during the design process are most helpful to students. While Koh and colleagues suggested a multi-prong approach of “designer perceptions, design processes, [and] design outcomes” to be measured in the form of “surveys, rubrics, [and] indices for assessing the different aspects of the design chain” (Conclusion, Conduct Multi-prong Design Evaluation, para. 1), the crux of measuring the success of design thinking in education is the connection between the context of study and the application of design thinking. According to Koh and colleagues, “for design thinking to be more deeply entrenched within the field of education, the relevance of design as an epistemology and ethical practice for both students and teachers need to be established for different subject areas” (Conclusion, Educators to Reflect on the Norms and Ethics of Design, para. 6). While the connection between curricula and design thinking is an awareness that the evaluation and assessment of design thinking are worthy areas of research, the gaps in the literature suggest that the scaffolding embedded in a design thinking unit of study and how students use these scaffolding to better understand the design thinking process are in need of further in-depth research.
Problem-based learning

Hmelo-Silver (2004) and Dochy, Segers, Van dan Bossche, and Gijbels (2003) agree that PBL, although relatively new in the field of K-12 education, has a long history of being “nur- tured by different researchers” (p. 535). Educational researchers (Bruner, 1959, 1961; Dewey, 1910, 1944; Piaget, 1954; Rogers, 1969) work in student-centered learning experiences, and the belief that learning should be based upon practical learning experiences (Dewey, 1938; Kilpatrick, 1918, 1921) provided the foundation for the work of Barrows and Tamblyn (1980) in PBL. Hung et al. (2008) argued that PBL was developed in the 1950s for use in medical educa- tion, gained broad popularity in the late 1970s and early 1980s due to unsatisfactory clinical performance of medical students. Gradually, PBL garnered attention outside of medical education because the method was learner-centered and was believed to create better opportunities to learn than traditional teacher-directed forms of education. K-12 education began to experiment with PBL starting in the mid-1980s (Barrows, 1996; Hung et al., 2008).

What is Problem-Based Learning?

While several variations of PBL and its characteristics exist (Barrows, 1986, 1996; Brush & Saye, 2013; Hmelo-Silver, 2004), Savery (2006) suggests that problem-based learning is an “instructional (and curricular) learner-centered approach that empowers learners to conduct re- search, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem” (p. 9). PBL is often considered as having six characteristics: it is problem focused, student-centered, self-directed, self-reflective, has teachers act as facilitators, and work is conducted in collaborative groups (Leary, Walker, Shelton, & Fitt, 2015).

Among researchers in the field of PBL there exist a sense of flexibility in the characteris-
of the characteristics of PBL posed by Barrows (1996). While Barrows began to bridge the research of PBL in the field of medical education to K-12 and higher education, other researchers have used the characteristics of PBL as a guide and not a strict definition.

Savery (2006) suggests that problem-based learning is an “instructional (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem” (p. 9). Because of the flexibility in the characteristics of PBL, Savery posits that it can cause confusion in the execution of PBL based on the unique qualities, content, needed skills, and assessed outcomes of different disciplines.

According to Hung et al. (2008), problem-based learning is defined as “an instructional solution to learning problems” (p. 488). Barrows (1996) asserts “the curricular linchpin in PBL…is the collection of problems in any given course or curriculum with each problem designed to stimulate student learning in areas relevant to the curriculum” (p. 8). Hmelo-Silver (2004) asserts that the goals of PBL are: “(1) construct an extensive and flexible knowledge base, (2) develop effective problem-solving skills, (3) develop self-directed, lifelong learning skills, (4) become effective collaborators, and (5) become intrinsically motivated to learn” (p. 240). Through the tutorial process that “begins with the presentation of a problem and ends with student reflection” (p. 242), students develop the skills and knowledge needed through a structured process to solve the problem and ultimately reach the goals of PBL.

While there are variations in how researchers define PBL (Barrows, 1996; Dochy et al., 2003; Hmelo-Silver & Barrows, 2006; Hung et al., 2008; Leary et al., 2015), for this research study PBL is defined as an approach consisting of the following six characteristics:

- problem focused
- student-centered
- self-directed
- self-reflective
- teachers act as facilitators
- work is conducted in collaborative groups. (Leary et al., 2015)

**Learner Outcomes of PBL**

Problem-based learning has shown to be successful in multiple academic contexts and environments. PBL is effective in a wide array of K-12 disciplines (Hung et al., 2008). Moreover, implementation of PBL has been demonstrated as successful in rural, suburban, and urban school communities (Delisle, 1997; Fogarty, 1997), and has been used to identify and support low-income students who have unseen academic potential (Gallagher & Gallagher, 2013).

Walker and Leary (2009) study agreed with Hung et al. (2008) and Dochy et al. (2003) that “PBL students either did as well as or better than their lecture-based counterparts” (p. 24). While students who experienced PBL often felt that they had not learned the material sufficiently, Hung et al. (2008) posited that students often do not fully recognize all of the learning that is needed to solve a problem. They further claimed that students in PBL classrooms, compared to those students in more traditional models of education, “consistently outperform traditional students on long-term retention assessments” (p. 490) – such as multiple choice, true/false, matching, and fill in the blank tests. They asserted that as teachers shifted their paradigm away from a teacher-directed model towards one which utilized the teacher as facilitator, PBL students gained problem-solving skills, higher order thinking, became more self-directed in their learning, and were more confident in their academic abilities. Students became “initiators of their own learning…and they are no longer passive information receivers” (p. 493), whereas teachers
shifted their role from transmitting all knowledge to facilitating the learning process (Doolittle & Hicks, 2003).

Researchers recognized that there are instances where students have misunderstandings of some content while in a PBL setting (Chi, DeLeeuw, Chiu, & LaVancher, 1994; Dochy et al., 2003; Hmelo-Silver, 2004; Walker & Leary, 2009); however, initial “errors [in a PBL setting] are a necessary step in learning to apply new knowledge” (Hmelo-Silver, 2004, p. 250). A strategy that has minimized some of the confusion and frustration by students and facilitated critical thinking and reflection in a PBL setting was the presence of scaffolds (Brush & Saye, 2013; Gallagher & Gallagher, 2013; Hmelo-Silver et al., 2007).

Hmelo-Silver et al. (2007) posit that PBL’s “extensive scaffolding and guidance to facilitate student learning” (p. 99) and reject the Kirschner, Sweller, and Clark (2006) argument that PBL is unguided discovery learning. Brush and Saye (2013), Gallagher and Gallagher (2013), and Hmelo-Silver et al. (2007) suggested that PBL utilizes scaffolds for students to follow during the learning process and “presents learners with opportunities to engage in complex tasks that would otherwise be beyond the their current abilities” (p. 100). Additionally, scaffolding makes disciplinary thinking and strategies explicit, embeds expert guidance, structures complex tasks, and reduces cognitive load.

Hmelo-Silver et al. (2007) agreed with Schwartz and Martin (2004) that PBL does support student learning, cognition, and reflection while providing the necessary guidance and structure for students to work through areas of little content knowledge. In addition, PBL is “effective at preparing students for future learning” (Hmelo-Silver et al., 2007, p. 103). While research on PBL in K-12 education does exist, researchers readily acknowledge that few studies exist that test problem-based learning against traditional instruction in K-12 education (Dochy et al., 2003;
Hmelo-Silver et al., 2007; Hung et al., 2008). Therefore, the biggest weakness is the lack of research regarding placing PBL in direct opposition to traditional lectured-based instruction.

**PBL and PBHI in Social Studies**

Taking the foundation of PBL one step further in terms of the discipline of social studies, Brush and Saye (2013) assert that problem-based historical inquiry has principles (authenticity, multiple intelligences, collaboration, and scaffolded instruction) and components (central question, culminating activity, grabber, content resources, and scaffolding.)

Problem-based historical inquiry (PBHI) is a disciplinary extension of PBL in the field of history. “PBHI centers history instruction on decision-making about persistent societal problems as they occur in particular historical periods” (Brush & Saye, 2013, p. 1). Since many of the courses offered in the social studies are history courses, Brush and Saye (2013) focused on problem-based learning in history, referred to as problem-based historical inquiry (PBHI). Building off the standards of problem-based learning (Barrows, 2002; Hmelo-Silver, 2004), Brush and Saye (2013) extend the standards of PBL to better define courses in history which include hard and soft skills (Brush & Saye, 2002; Saye & Brush, 2002).

Brush and Saye (2013) recognized that teachers have not adopted problem-based curricula extensively enough into their classrooms even though there is a “growing body of research [in social studies] that suggests PBL is more effective than traditional instruction in increasing student achievement” (p. 1). The findings of Brush and Saye regarding PBHI agree with other researchers in the field of PBL (Hmelo-Silver, 2004; Ravitz, 2009; Strobel & van Barneveld, 2009; Walker & Leary, 2009; Wirkala & Kuhn, 2011). Many social studies educators have pushed for instruction to move away from lecture-based instruction towards more student-centered learning though there is little adoption in this field (Brush & Saye, 2013).
Ioannou, Brown, Hannafin, and Boyer (2009) in a quasi-experimental method using pre- and post-tests, investigated how “multimedia-based instructional material in a problem-based social studies simulation enhances student learning about world issues, increases interest in social studies, and generates positive attitudes toward the instruction” (p. 63). Although differences did exist between the two groups, Ioannou et al. found that both groups had an increased interest in social studies and that the multimedia group had slightly larger knowledge gains over the text-based group.

Brush and Saye (2013) identified a meaningful lack of knowledge regarding PBHI implementation into secondary social studies curriculum; thus, the purpose of their research was to provide an overview of how they included PBHI teacher education. The findings of the research suggest, “pre-service teachers are able to articulate the core curricular framework of PBHI, and are able to incorporate that framework into the design of instructional activities” (p. 11). Thus, by exposing pre-service teachers to the framework of PBHI, they could develop curricula and lessons that utilized the framework.

In each of the three research studies that focused on incorporating PBL into social studies or history curricula, each asserted that the PBL method was as or more successful than traditional, teacher-centered methods. In addition, researchers Brush and Saye (2013), Ioannou et al. (2009), and Wieseman and Cadwell (2005) concluded that there are efforts to incorporate PBL into more social studies curricula (Brush & Saye, 2013; Ioannou et al., 2009; Wieseman & Cadwell, 2005). Unfortunately, research studies on PBL in K-12 education with respect to student outcomes, reflection, problem-solving skills, and motivation are limited.
Gaps in the PBL Literature

Overall, PBL as a method of teaching and learning has shown to be as effective or more effective than traditional lecture-based instruction in student learning, metacognition, engagement, long-term recall, collaboration, critical thinking and analysis, and problem-solving (Dochy et al., 2003; Hmelo-Silver, 2004; Hmelo-Silver et al., 2007; Hung et al., 2008; Savery, 2006; Walker & Leary, 2009). Moreover, PBL has demonstrated the ability for teachers to identify low-income students with unseen academic potential at a higher rate than teacher perception or standardized tests (Gallagher & Gallagher, 2013). What is not completely clear, based on the relatively small number of studies in K-12 education in social studies, is how much more effective is PBL or PBHI verses traditional lecture-based instruction for student success.

Social Studies and the C3 Framework

The C3 Framework, *College, Career, and Civic Life (C3) Framework for Social Studies State Standards: Guidance for Enhancing the Rigor of K-12 Civics, Economics, Geography, and History* framework (National Council for the Social Studies, 2013), provides social studies educators a framework to create inquiries for students to engage in authentic work in social studies. With the overarching goal of creating “knowledgeable, thinking, and active citizens” (p. 82), the C3 Framework and subsequent Inquiry Design Model (IDM) (Grant, Lee, & Swan, 2015) marks a departure from past social studies initiatives motivated by flat scores on National Assessment of Educational Progress (NAEP) in Civics/Government, Economics, Geography, and U.S. History.

Divided into four dimensions: 1. Developing questions and planning inquiries; 2. Applying disciplinary concepts and tools; 3. Evaluating sources and using evidence; and 4. Communicating conclusions and taking informed action, the C3 Framework provides enough structure for
educators to engage with and create inquiry based projects but allows sufficient flexibility for teachers-based on their students’ needs and interests. According to researchers and practitioners, there is one dimension that perplexes educators the most: Dimension 4, communicating conclusions and taking informed action (Kulmer & Vosburg-Bluem, 2014; Middleton, 2016).

**C3 Framework**

The C3 Framework was designed in response to the Common Core (National Council for the Social Studies, 2013) work in other subject disciplines such as literacy and mathematics. As the Common Core and the associated high-stakes testing took hold in schools, it became apparent that the social studies could be marginalized if no rationale existed for its importance (Nelson, 2016). The C3 Framework promotes the necessary skills, thinking, and action associated with 21st century skills, engaged citizens, and a democratic society (Croddy & Levine, 2014; National Council for the Social Studies, 2013). Profoundly, the C3 marks a notable departure from traditional models of teaching social studies based on best practices in teaching, learning, and assessment (National Council for the Social Studies, 2013; VanSledright, 2013), and recognition of flat standardized test scores in social studies. Instead of starting from a subject, civics or geography as an example, the framework asks teachers and students to develop questions that drive the entire inquiry. As the four dimensions indicate, much of the change focuses on compelling inquiries and related questions. Additionally, teachers take on a facilitator role instead of a classic teacher-directed model so stereotyped and overused in the social studies.
### Dimension 1: Developing questions and planning inquiries

Questions take on two forms: compelling questions and supporting questions. Compelling questions were defined as “meaty” and the questions that “reflect an enduring issue, concern, or debate in social studies and it has to draw on multiple disciplines” (Grant, 2013, p. 325). Supporting questions were defined as questions “intended to contribute knowledge and insights to the inquiry behind a compelling question; they focus on descriptions, definitions, and processes on which there is general agreement” (National Council for the Social Studies, 2013). Grant (2013) adds, “supporting questions help scaffold students’ investigations into the ideas and issues behind a compelling question (p. 326). In early elementary, teachers craft or help craft many of these compelling questions; however, as students practice developing compelling and supporting questions, students should be gradually responsible for the entire inquiry (National Council for the Social Studies, 2013). Together, compelling and supporting questions provide a balance of the enduring questions and the nuts and bolts questions that good social studies education demands (Wiggins & McTighe, 2005).

### Dimension 2: Applying disciplinary tools and concepts

While compelling and supporting questions drive an inquiry, it is natural that these kinds of questions are not confined to

---

**Figure 8.** C3 Framework (Gardner, 2016, p. 11; National Council for the Social Studies, 2013).
one discipline within the social studies. “The C3 Framework in general, and Dimension 2 in particular, is intended to serve as a frame for organizing curricular content, rather than a prescription for the specific content to be taught” (National Council for the Social Studies, 2013, p. 29). This is an important shift from traditional social studies models where the discipline, such as history, civics, geography, and economics drove the questions posed to students. However, the kinds of big meaty questions that are posed in dimension one demand interdisciplinary responses and understandings. Dimension two “outlines the kind of disciplinary knowledge and skills students need to answer compelling questions” (Grant et al., 2015, p. 3). This combination of skills and knowledge allowed students to pursue the substance of social studies (Grant et al., 2015; Willingham, 2003).

**Dimension 3: Evaluating Sources and using evidence.** Going beyond thinking like a geographer or historian, dimension three expects students to dig into the sources, leveraging them to provide justification and evidence to answer both compelling and supporting questions. Today, when students use the technology available at their fingertips they are bombarded with answers and information. However, the information they receive through the internet may not always be the best, most trustworthy, or even accurate answers. In dimension three, students must provide more than just answers to compelling or supporting questions; they must provide justification for credible sources and rationale for their response. Additionally, Gardner (2016) suggests that dimension three “engages students in the most fundamental skills and dispositions needed for democratic citizenship, that of gathering, evaluating, using evidence and drawing reasoned conclusions based on the evidence. These are essential elements in sound decision-making in life as well as governance” (p. 11). Without the ability to answer compelling and supporting
questions with a thoroughly justified argument using reputable sources students cannot accomplish dimension four.

**Dimension 4: Communicating conclusions and taking informed action.** When students can answer compelling and supporting questions with well-formed and well-sourced responses, they are ready for dimension four: communicating conclusions and taking informed action. While some researchers and educators suggest that dimension four is the most difficult to execute (Kulmer & Vosburg-Bluem, 2014; Middleton, 2016), it is this dimension that has the potential to have the longest lasting effect on students in that they will become knowledgeable, thinking, and engaged citizens (Daneels, 2016). Additionally, Daneels (2016) suggested dimension four is the best way to assess student knowledge and understanding because taking informed action is predicated on successfully completing the first three dimensions of the C3 Framework. According to Grant et al. (2015) dimension four of the C3 Framework involves more than simply communication and action (Figure 9).

<table>
<thead>
<tr>
<th>Dimension 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructing arguments and explanations</td>
</tr>
<tr>
<td>Adapting arguments and explanations</td>
</tr>
<tr>
<td>Presenting arguments and explanations</td>
</tr>
<tr>
<td>Critiquing arguments and explanations</td>
</tr>
<tr>
<td>Analyzing social problems</td>
</tr>
<tr>
<td>Assessing options for actions</td>
</tr>
<tr>
<td>Taking informed action</td>
</tr>
</tbody>
</table>

**Figure 9.** C3 Inquiry Literacies Arranged by C3 Framework Dimension (Grant et al., 2015, p. 7)

In dimension four, students “identify a problem or issue of concern to them, research regarding its causes and effects, identify options for addressing it, and plan and or take civic action (Croddy & Levine, 2014, p. 284). Inevitably, teachers need to weigh how dimension four is enacted in and out of the classroom based on student engagement of the inquiry and time involved.
However, teachers should not shy away from dimension four because of the time needed to communicate conclusions and to take informed actions (Grant, 2013; Middleton, 2016; National Council for the Social Studies, 2013). Furthermore, many social studies teachers are, driven by content coverage demands, growing accountability requirements, and an all-too-crowded school day—spend much of their time talking at students. Instead of building understandings in a robust learning environment, students too often spend their time simply trying to keep track of all the ideas owing at them from their teachers and their textbooks. (National Council for the Social Studies, 2013, p. 83)

Even with experts proclaiming the need for fewer content standards and more in-depth authentic social studies work, many teachers may still find it difficult to create opportunities for their students to cohesively communicate conclusions and take informed action (Grant, 2013; Middleton, 2016; National Council for the Social Studies, 2013). As a relatively new framework for the social studies, the introduction and adoption are still very much in transition. One such process that could alleviate frustrations or fears within dimension four and promote the C3 Framework overall is design thinking.

**Connecting Design Thinking, C3 Framework, PBL, PBHI, and Student-centered Learning**

Using design thinking as the method to guide the creation of social studies courses regarding the curriculum, instruction, and assessment creates more opportunities for students to engage with real-world human-centered problems. There are many ways to teach social studies based on the teacher’s content knowledge, the students in the class, and the intended outcome of the curriculum. Shulman (1986) argued that pedagogical content knowledge (PCK) was vital to
the success of teaching and student learning because it is not simply a matter of the teacher having subject mastery, the content, or the students individually, but a combination of all three. Teachers must leverage their knowledge of how to teach the content with the best pedagogy to promote student learning – design thinking is one such pedagogy well-suited for the social studies.

While some scholars claim that PBL and design thinking do not lend themselves to developing curriculum, instruction, and assessment in a climate of testing and accountability, my goal is to add to the conversation on potential methods to create student-centered learning opportunities using design thinking and PBL despite high-stakes and accountability trends. While adding to the conversation on PBL and design thinking, this dissertation focused on the how the disciplinary extensions of PBL, problem-based historical inquiry (PBHI) (Brush & Saye, 2002, 2013; Saye & Brush, 2002, 2006, 2007), and the distributed scaffolding exist within students’ experience in the design thinking process. However, to best understand PBHI, an understanding of problem-based learning (PBL) is necessary.

With the introduction of PBL in medical education (Barrows & Tamblyn, 1980), Barrows and colleagues found that medical students learning through a PBL approach were as successful, if not more successful, than their traditionally taught peers in lecture-based courses. Gradually PBL garnered attention outside of medical education because of the method’s success as a learner-centered and student-driven approach focusing on solving real-world problems. Adaptation of PBL by K-12 education institutions began in the mid-1980s (Savery, 2006).

As successful as PBL was with medical and K-12 education, conclusively demonstrated the need for scaffolds to, “present learners with opportunities to engage in complex tasks that would otherwise be beyond their current abilities” (Barrows, 1996; Barrows & Tamblyn, 1980;
Scaffolding is necessary during the PBL unit of study for students to truly benefit from PBL (Collins, Brown, & Newman, 1989; Davis & Linn, 2000; Guzdial, 1994; Jackson, Stratford, Krajcik, & Soloway, 1996; Reiser, 2004b; Toth, Suthers, & Lesgold, 2002). Scaffolds are an important part of the zone of proximal development (ZPD) (Vygotsky, 1978). In addition, less experienced students require more scaffolds to guide them through a PBL unit of study because of “human development issues, younger students may not be ready to solve complex and ill-structured problems and self-direct their own learning” (Hung et al., 2008, p. 499). Without such scaffolds, students become quickly frustrated with the lack of concrete answers that confront them in the PBL approach, due to both academic maturity and often accustomed to schools presenting problems with only one correct answer. Although researchers in the field of historical inquiry and problem-based historical inquiry suggest that students in early elementary school can successfully navigate PBL (VanSledright, 2002; Wieseman & Cadwell, 2005), that success does not come without the use of scaffolds.

Considering the need for scaffolds in PBL, little research has connected scaffolding or design thinking to PBL. Few studies discuss primary school students’ engagement with design thinking (Anderson, 2012; Wendell & Rogers, 2013) and limited literature exists on design thinking and its effects on learning with regard to middle and secondary level students (Anderson, 2012). Research conducted thus far has primarily focused on the disciplines of math and science (Koh et al., 2015). There exists little design thinking research as a scaffold for PBHI in social studies and even fewer in middle school social studies. Koh and colleagues argued “that as the curriculum of social studies aims to promote good citizenship, engaging students in related design projects could instill in them a sense of designing for common good” (Design Thinking and Children, Theory Building as Human Design, para. 2).
To summarize, within the current paradigm of PBHI and design thinking there is a lack of qualitative or quantitative studies with regards to design thinking as a methodology to create learner-centered curricula (Anderson, 2012), a lack of literature with regards to design thinking in middle school curricula (Kangas et al., 2013), and even less research in middle school social studies (Carroll et al., 2010). There exist even fewer studies that examine the scaffolds of the design thinking process (Koh et al., 2015) and even fewer studies of student perceptions of design thinking across disciplines and grade-levels (Benson & Lunt, 2011; Koh et al., 2015).

Connecting PBL, PBHI, Design Thinking, and Social Studies

The social studies discipline encompass a wide range of subjects – anthropology, economics, geography, government, history, psychology, religion, and sociology - the social studies curriculum is vast (National Council for the Social Studies, 2010). Social studies courses commonly include specific themes and skills, including critical thinking, reading of primary and secondary texts, map skills, debating, and writing. Design thinking is a relatively new addition to social studies curriculum, which also includes instruction and assessment (Carroll et al., 2010).

Related to design thinking is problem-based learning (PBL), which is defined as an “instructional (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem” (Savery, 2006, p. 9). Adding PBL and design thinking to social studies curriculum creates meaningful opportunities for students to engage in solving real world ill-structured problems (Jonassen, 1997, 2000).

Incorporating PBL and Design Thinking to Social Studies

In social studies, incorporating problem-based historical inquiry (PBHI) is effective in implementing the methodology of PBL into the curriculum (Brush & Saye, 2002, 2013; Saye &

Extending PBHI to engage students in a not only student-centered, but student-directed, learning environment where students collaborate to solve ill-structured problems, design thinking provides a process and the distributed scaffolding within design thinking promotes problem solving in a human-centered empathetic manner (Brown, 2008, 2009; Jonassen, 1997, 2000; Kelley & Kelley, 2013; Koh et al., 2015). Design thinking provides a structure for novices to follow and the expert to capitalize upon to solve ill-structured problems. In the process, students fail fast and fail forward (Brown, 2009; Kelley & Kelley, 2013; Long, 2012). Students brainstorm, prototype, and receive feedback. Students also engage in iteration, defined as the process of updating a prototype based on feedback to improve the initial problem-solving attempt (Brown, 2008; Carroll et al., 2010; Goldman et al., 2012; Koh et al., 2015).

The integration of design thinking into PBHI creates a learning environment that focuses students on uncovering human-centered needs and solving human-centered problems (Kelley & Littman, 2001; Patnaik, 2009). Thus, PBHI as an extension of PBL, combined with the human-centered and empathetic nature of design thinking, creates a unique classroom environment for students and teachers to approach the social studies (Carroll et al., 2010; Goldman et al., 2012). Additionally, by utilizing PBHI and design thinking in a social studies curriculum, students are
expected to go beyond memorizing facts for a unit test, because to create a successful solution for an ill-structured problem, students must tap multiple resources, implement interdisciplinary content and skills, and navigate the collaborative nature of PBHI and design thinking. Design thinking creates opportunities for students to grapple with some of toughest concepts and issues of the social studies discipline: such as developing relationships with refugees, water scarcity, malnutrition, microfinance, and global literacy.

An example of how design thinking and PBHI combine to create a student-centered learning opportunity in middle school social studies is framing a question such as: What low-cost innovative solution can you create to solve a global issue for those that need it the most? In answering this question, students naturally seek out a human-centered problem, more than likely with ill-defined multiple parts, to solve. Without a process to follow for novice and expert problem-solvers, many students become frustrated because they do not know what to do next (Berger, 2014; Noweski et al., 2012).

**Connecting the C3 Framework and Design Thinking**

Using design thinking as a way to execute D4: communicating conclusions and taking informed action, creates more opportunities for students to engage with real-world human-centered problems. Design thinking has the opportunity to work in collaboration with the C3 Framework (college, career, and civic life) in social studies. One of the cornerstones of design thinking is solving real-world human-centered problems – taking informed action to solve a problem for someone beside himself or herself. Design thinking effectively covers all four dimensions of the C3 Framework in a student-centered empathetic way. Because design thinking promotes empathetic human-centered solutions, students will learn concepts of social justice (Banks, 2004; Bickmore, 2008; Parker, 2003), democratic education (Parker, 2003), multiculturalism (Banks et
al., 2001), civic engagement (Wade, 2008), citizenship education (Banks & Nguyen, 2008), and
global citizenship (Davies, 2006; McIntosh, 2005). Thus, design thinking promotes the kinds of
learning and skill acquisition that is central to the social studies.

Koh et al. (2015) suggested that curriculum, instruction, and assessment should center
around five 21st century competency dimensions: social-cultural, cognitive, metacognitive,
productivity, and technological. The design thinking methodology, when it informs curriculum,
instruction, and assessment practices in social studies, fosters opportunities for teachers and stu-
dents to engage in 21st century learning competencies (Koh et al., 2015; Noweski et al., 2012).
While students and teachers engage with the design thinking and 21st century competencies, once
situated in social studies, students have opportunities to promote social justice, citizenship educa-
tion, and global citizenship. Additionally, when students seek out human-centered empathetic so-
lutions, they will experience democratic education, civic engagement, and social justice first
hand because to create a human-centered empathetic solution, students must transcend their own
interests and understand multiple perspectives. “The intrinsically human-centered nature of de-
sign thinking points to the next step: we can use our empathy and understanding of people to de-
sign experiences that create opportunities for active engagement and participation” (Brown,
2009, p. 115). Design thinking creates opportunities for students to grapple with some of toughest concepts and issues of the social studies discipline.

Coupled with tough social studies concepts and issues, students develop in-depth
knowledge of their specific challenge as they iterate on their work, learn how to fail fast and fail
forward (Brown & Wyatt, 2010; Buchanan, 1992; Carroll et al., 2010; Goldman et al., 2012;
Long, 2012; Tsai et al., 2014 Hong, & Tan, 2013), learn from their mistakes and make adjust-
ments using feedback to create more powerful solutions. Gone is the hierarchical teacher-directed model where the teacher is the gatekeeper of knowledge and right/wrong answers (Thornton, 1991). Instead students learn social studies content in a flexible process where they engage in instances of “empathy, insight, innovation, and implementation. Every interaction is a small opportunity to make that exchange more valuable to and meaningful for all participants” (Brown, 2009, pp. 187-188).

While learning from past events is part of the design thinking process, current issues and problems of the user/stakeholder are strongly emphasized. However, successful design challenges in the discipline of social studies must bridge the gap between the past and present. Understanding the history of the problem in the ideas/focus and direction and research phases of DtL helps students connect past historical events and current issues relating to the problem so that students can solve the human-centered problem.

**Gaps connecting PBL, PBHI, Design Thinking, and Social Studies**

The literature to date does not specifically state how these two models, PBL and its disciplinary extension PBHI, are situated regarding design thinking, either as parts of each other or separate entities under the umbrella of socioconstructivist learning theory. Furthermore, little research exists on how PBHI and design thinking may be connected in social studies. A separate gap exists in the literature connecting the C3 Framework and design thinking, its connection to the fourth dimension, or to IDM. Lastly, a gap exists in the literature on how students experience the distributed scaffolding of the design process through design thinking.
3 METHODOLOGY

In this chapter, I will provide my rationale for this qualitative study that used an interpretivist perspective and case study research design created to understand students’ response to distributed scaffolding in design thinking within a social studies classroom. The intent of this study was to narrow the gap of research regarding the scaffolding of design thinking in middle school social studies. Additionally, it was to document students’ demonstration of social studies content gains, skill acquisition, and how distributed scaffolding can help students work towards a real-world human-centered solution. The following research questions will guide this study:

- What role does distributed scaffolding play in students becoming design thinkers in a middle school social studies classroom?
- How does distributed scaffolding incorporated into design thinking allow students to demonstrate their understanding of social studies?
- What are students’ experiences of, and how do students respond to, distributed scaffolding in a design thinking unit?

The rest of the chapter discusses the design of the research study, the strengths, and weaknesses of case study research, bounding of the study, data collection, data analysis, and trustworthiness.

Research Design

As a natural fit with my epistemology of a constructionist/interpretive view of the world, I wanted to understand and compare how students responded to distributed scaffolding in design thinking in a middle school social studies classroom. A case study research design (Stake, 1995) nested in the qualitative research field provided the opportunity to understand and explain how students experienced distributed scaffolding in design thinking. Qualitative researchers are “interested in understanding the meanings people have constructed, that is, how they make sense of
their world and the experiences they have in the world” (Merriam, 1998, p. 6). Furthermore, Stake (1995) remarked “qualitative research tries to establish an empathetic understanding for the reader, through description, sometimes *thick description*, conveying to the reader what the experience itself would convey” (p. 39). Based on the strong tradition of qualitative research, Denzin and Lincoln (2005) characterized qualitative research as:

> a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that make the world visible. These practices transform the world. They turn the world into a series of representations, including field notes, interviews, conversations, photographs, recordings, and memos to the self. At this level, qualitative research involves an interpretive, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them. (p. 3)

Qualitative research provided a strong framework to understand how students make meaning of their educational experiences because qualitative research “focuses on the people’s experience from their perspective” and qualitative researchers are interested in “people’s knowledge, opinions, perceptions, and feelings…actions, behaviors, activities, and interpersonal interactions” (Roberts, 2010, p. 143). Qualitative research has the following characteristics: a natural setting, the researcher as a key instrument, multiple sources of data, inductive and deductive data analysis, the participant’s meanings, emergent design, reflexivity, and a holistic account (Creswell, 2013, 2014; Hatch, 2002; Marshall & Rossman, 2011).

In the collection of qualitative research data, massive amounts of data are gathered, which was a strength of case study method. It was important to organize the material in a timely and efficient fashion because time constraints were part of this qualitative research (Denzin &
The goal of this case study was to "understand behavior, issues, and contexts with regard to [this] particular case" (Stake, 1995, p. 78). Without understanding this case, it would be difficult to "assist readers in arriving at high-quality understanding" (p. 88). Thus, the accuracy of data collected, the data analysis technique, and coding procedure were paramount to create high-quality understanding for readers.

**Case Study Method**

Using case study method, I developed an in-depth understanding of a social phenomenon that involved one or more individuals and many forms of data over a bounded period of time (Creswell, 2014; Merriam, 1998; Miles, Huberman, & Saldaña, 2014; Stake, 1994, 1995, 2005; Yin, 2003). Merriam (1998) asserts the need for case study:

- gain an in-depth understanding of the situation and meaning for those involved. The interest is in process rather than outcomes, in context rather than a specific variable, in discovery rather than confirmation. Insights gleaned from case studies can directly influence policy, practice, and future research. (What is Qualitative Research?, Case Study, para. 1)

Classrooms continue to be unique and complex environments (Puntambekar, 2015). The teaching and learning that takes place in classrooms continues to be nuanced—no two classroom experiences were the same for all participants. A case study lens provided the best lens to answer the research questions proposed for this study because of the socio-constructivist approach I used that centered on the students and their social environment.

Yin (2003) argued that “the distinctive need for case studies arises out of the desire to understand complex social phenomena” (p. 2), such was the experience of a collaborative group during a design challenge. This qualitative case study research had the following characteristics:
holistic, empirical, and interpretive (Merriam, 1998; Stake, 1995). Additionally, Stake (1995) asserted that case studies are empathetic; understanding how others experienced and perceived the world helped me answer the proposed research questions.

Explaining the differences of case studies further, Yin (2003) and Stake (1995) categorized case study research differently. While Yin (2003) posited that case study research was explanatory, exploratory, or descriptive and also divides case study into how the case is bounded: single, holistic, or multiple-case, Stake (1995) divided case study research into intrinsic, instrumental, or collective case study. The use of Stake (1995) definition of case studies and his description of various kinds of case study research, provided the optimal lens from which I created and executed this case study for this research study.

**Strengths of case study method.** Yin (2003) suggested that case study methodology was best when a researcher sought to know “when a ‘how’ or ‘why’ question is being asked about a contemporary set of events, over which the investigator has little or no control” (p. 9). Since I sought to understand how students experienced and responded to distributed scaffolding of design thinking in a middle school social studies classroom, the case study method was a natural fit. Yin bounded a case study as an empirical inquiry that:

1. Investigates a contemporary phenomenon [scaffolding of design thinking in a middle school social studies classroom] within its real-life context [an independent school], especially when the boundaries between phenomenon and context are not clearly evident; and

2. Copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result: relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result
benefits from the prior development of theoretical propositions to guide data collection and analysis. (p. 13-14) [student artifacts, semi-structured group interviews, and participant observations]

In addition to the strengths of case study research outlined by Yin above, Merriam (1998) asserts that case study research is a

Particularly appealing design for applied fields of study such as education. Educational processes, problems, and programs can be examined to bring about understanding that in turn can affect and perhaps even improve practice. Case study has proven particularly useful for studying educational innovations [design thinking], for evaluating programs, and for informing policy. (Case Studies as Qualitative Research, Strengths and Limitations of Case Studies, para. 2)

To summarize the strengths of case study research: (1) research takes place in a real-life context, (2) multiple variables create multiple data sources, and (3) case study research is helpful in studying educational innovations to help improve educational practices. Since design thinking is relatively new in middle school social studies classrooms, logically, case study method provided further insight into this innovative approach to curriculum, instruction, and assessment.

**Limitations of case study method.** As a researcher, I acknowledge that limitations exist for all methods of research. However, I recognized the strengths and weaknesses of case study research (Creswell, 2014; Merriam, 1998; Stake, 1994, 1995, 2005; Yin, 2003). Although the strengths of case study research outweighed the limitations, it was important to recognize and actively seek out ways to minimize the limitations throughout the study. Limitations of case study research were generalized into three categories: rigor (Merriam, 1998), researcher bias
Issues of rigor and the lack of triangulation of data in case study design can exist (Merriam, 1998; Stake, 1994, 1995, 2005). Stake (1994, 1995, 2005) asserts that utilizing triangulation, “a process of using multiple perceptions to clarify meaning, verifying the repeatability of an observation or interpretation” (2005, p. 454), allows for others to replicate a study, helps in theory building, and demonstrates the rigor of the research. Furthermore, Merriam (1998) asserts that case study research continues to be a productive form of research for studying education initiatives, innovations, or policy.

Researcher bias played into the construction, implementation, and analysis of case study research. One way to mitigate the bias of the research was to include a positionality statement so that the researcher confronts and makes available to the reader biases from the onset of the research. A second way to reduce researcher bias was to use member checking- the act of checking with participants if the observations and meaning construction perceived by the research corresponds to the experience and meaning making of the participant (Stake, 1995). Also, Yin (2003) points out that case study research was not the only research method where bias exists, noting that bias occurs in all research paradigms.

Lastly, case study research takes time. The collective time spent collecting data, analyzing the data, and completing the analysis and write-up of the study was lengthy compared to other research methods, and thus case study-based research may suffer in effectiveness. While Merriam (1998) and Yin (2003) agree that time was a limitation of case study research, Yin countered this limitation in several ways. Because this case study was bounded, there were set
beginning and end dates. Therefore, it was the researcher’s prerogative on when the study began and ended.

The Case

Setting

The Woods School, a preprimary – 6th grade independent school in a major southeastern city with an enrollment of 400 students and 90 faculty/staff. Consisting of ten buildings, The Woods School’s campus includes a media center, organic garden, music room, labs, and a gymnasium. Woods holds accreditation from the Southern Association of Independent Schools (SAIS), Southern Association of Colleges and Schools (SACS), and a National Association of Independent Schools (NAIS) member.

Of the 400 students enrolled at The Woods School, it was approximately equal by gender, with 25% of the students qualifying for educational accommodations, and less than 1% of the student body identified as English language learners. Tuition for The Woods School is $20,000 per school year for grades 3 through 6. Sixth-grade students took four core courses: language arts, mathematics, science, and social studies. In addition to the core subject areas, students took a foreign language, media, music, physical education, technology, and visual arts course. The Woods School had a reputation in the city as a nurturing and student-focused school where students call their teachers by their first name. On the spectrum between traditional and progressive, The Woods School falls somewhere between the center point and progressive.

The schools’ buildings are converted structures. The sixth-grade building, a converted condominium, had two floors with a semi-open floor plan. While there were four areas for clas-
ses to occur within, the only way to create a “traditional” classroom setting was to pull a movable divider in the large hallway between the two classrooms. Sixth-graders had core courses in the sixth-grade building along with lunch, while they traveled to their specialists.

**Participants**

There were 23 sixth-grade out of 35 students that chose to participate from The Woods School in this study. There were a total of ten groups for the design challenge where seven of the groups were part of the study and three were not. The 23 participants were part of the seven groups in the study. To better understand the data, the themes that emerged from the data, and my findings (detailed in Chapter 5), I included a simple description of the participants and groups’ (see Figure 10). In the description of the groups I provided basic demographic information about each participant and group, an image of the groups art installation prototype, and a robust description of each group and to provide a rich description. Included in the description was the rate of work turned in after a deadline. This was included because some groups were motivated to turn in work by the deadline, while others were less concerned. However, groups that tended to turn their work in on time had stronger outcomes.

Groups were comprised of three or four students from the same social studies section: A, B, and C. Sections were based off the amount of learning support needed so that the sixth-grade teachers could meet the students where they were academically and provide the proper support. Additionally, math placement played heavily into which section a student was placed. Section A needed the most learning support, Section B needed less support, and Section C needed the least.
<table>
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<th>Group</th>
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<th>Ethnicity</th>
<th>Educational Accommodations</th>
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<td>Wolfgang</td>
<td>7</td>
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**Figure 10.** Participant Biographical Data.

**Group 1: Colors of Equity**

Comprised of two females and one male, “Colors of Equity” embodied how novice design thinkers approach their first design challenge (Goldman et al., 2014; Koh et al., 2015; Zielezinski, 2016). Ready to jump in and complete assignments as individuals at the beginning of the study, they often ran ahead without checking in with their group members to see where the group stood as a whole. Still, this group was highly creative and willing to follow the DtL process. At the beginning of the study, I figured this group as a bit of a wildcard due to their creative nature, but that they could struggle with the day-to-day upkeep of such a long design challenge. This hunch proved to be true.
While one member of the group, Zell demonstrated her ability to produce top-quality work, willingness to collaborate, and hold her group accountable, her two group members fluctuated on these points greatly during the study. Interestingly, Zell was not willing to make decisions without the group’s input even though she was plenty capable. As they collaborated throughout the design challenge, they found their footing as a group, fought about their ability to work together effectively, navigated the DtL process, and finally agreed they had collaborated well during the design challenge to produce a strong art installation and proposal for the WalkLine.

![Figure 11. Colors of Equity art installation prototype (Colors of Equity, Prototype).](image)

All three members of the group identified as White, while two of them, Miles and Sarah, qualified for accommodations while Zell did not. All members were allowed to use the text-to-
speech function on their iPad which reads the text on the screen to them. The other major accommodation given to all groups was time. At the beginning of each week, the due dates for assignments were posted on the board and in the digital learning management system (LMS) so that groups and individuals could plan their week. Each member of the Colors of Equity took advantage of the accommodations/affordances of the design challenge.

Colors of Equity was in Section A; a social studies class which required the most support for individual learning out of the three social studies sections in the study. Although Colors of Equity needed more support for their academic work, specifically with executive functions and writing, they had a positive energy to them that propelled them through the ideas and prototyping phases of DtL. Much of the time Zell and Miles were on the same page while Sarah struggled to keep up. It was common for Sarah to ask which document they were working on and it often took several additional minutes for her to locate said document on her iPad in Google Drive. As frustrating as this was for the group, Sarah was ultimately the lynchpin for the group by navigating disagreements between the group by offering suggestions and compromising.

Each Colors of Equity group member struggled to turn their individual work in on time, they also struggled to turn their group assignments in on time too. In many instances, they completed the assignment, but failed to turn the assignment into the LMS. Rates for turning in assignments in on time were: Miles 81%, Sarah 71%, and Zell 61%. Zell’s was lower because she was absent several days when assignments were due and failed to turn them in when she came back to school. Because the group struggled to turn their assignments in on time, they were often scrambling to get caught up which hindered their progress and creativity.

In addition to Colors of Equity’s creativity, each member of the group enjoyed the social nature of the design challenge and brought a great deal of energy to the group. During class time,
Colors of Equity would energetically discuss their work and other subjects as they easily got off task. I often motioned to them with my hands, in a circular movement from across the room, to get back on task and keep going or walk by their table and ask them how they were progressing on the assignment. Quick to redirect and cheerful, they were engaged in the design challenge and ready for the next phase and assessment of DtL.

**Group 2: The Big Six**

“The Big Six” was comprised of two males and one female. The Big Six also was full of energy throughout the design challenge. While one or more of the group members was often late because of forgotten materials, the individual energy for the design challenge translated into the overall group’s optimism with one small exception – a “mistake” during the prototype phase.

![Figure 12. The Big Six art installation prototype (The Big Six, Prototype).](image)

Individually, Alfred, Gordon, and Maya voiced excitement and engagement for the design challenge. Each mentioned in their journals how they were encouraged by the format of the design challenge instead of sitting in class listening to a teacher lecture and reading from a text-
book. Alfred and Maya identified as Black and Gordon White; Alfred qualified for accommodations while Gordon did not. Interestingly, Maya had testing right before the design challenge and her results qualified her for accommodations, but the school ultimately did not receive the results prior to the completion of the design challenge and she did not qualify for accommodations. All members were allowed to use the text-to-speech function on their iPad would read the text on the screen to them.

The Big Six was in Section A; a social studies class which required the most support for individual learning out of the three social studies sections in the study. Although The Big Six needed more support in their academic work, specifically with executive functions, reading comprehension, and writing, group members recognized that the design challenge afforded them the necessary time and scaffolds to complete their work successfully. Unfortunately, while the work produced by The Big Six as a group and individually met expectations some of the time, often it was late. Individually, the members of the group turned in assignments (group and individual) to the LMS at a rate of: Alfred 58%, Gordon 58%, and Maya 51%. It should be noted that assignments that were not turned in on time to the LMS were often complete but not turned in by the due date. The Big Six was eager to start, and when they finally had all group members and materials for class, they frequently skipped directions, lacked the depth in their writing that properly communicated their understanding of their work, and lacked follow through without feedback from their teacher to complete their work. Yet The Big Six excelled verbally and kinesthetically, which helped them to meet expectations for the outward components of the design challenge: the art installation, presentation, and art installation proposal for the WalkLine.

Overall, The Big Six collaborated well during the design challenge. There were times, about twice a week, where their collaborative skills were tested. Gordon tended to dig his heels
in with decisions that he did not agree with, and was more critical of his group members, and had
difficulty admitting if he made a mistake. Gordon alluded to collaboration in his Journal Four:

> We need good attitudes and not get frustrated at each other or ourselves. We need to be
> happy excited and ready to get this project done in a timely manner and with finishing
> our personal goals, AND NOT GET DISTRACTED THAT'S THE BIGGEST THING
> WE NEED TO FIX. (Gordon, Journal Four)

Maya’s remarks in her Video Journal Ideas highlight her concerns with collaboration too:

> Um, for our group, I think we brainstormed pretty well, but sometimes we get off track,
> but otherwise from that we do pretty good and we work together and we get sometimes
> we get works done but sometimes we get distracted very easily and like don't get stuff
done. But otherwise we do really well. So, the third question you probably already heard
is, "What is the most annoying part of the ideas phase?" So, the annoying part is probably
getting into different fights, probably like everyday when we have social studies. But, um
... We try to like, we try to get back on track. We try to help each other and stay on focus,
but um, it's just really annoying sometimes. And we try to stop the arguing, but some-
times it just happens. (Maya, Video Journal Ideas)

In instances where Gordon was critical, Maya was quick to defend herself and Alfred. When dis-
agreement arose, I would listen to their concerns. Often, the members were frequently interrupt-
ing and talking past each other. After a short conversation about the work that needed to be com-
pleted during that class and for homework, the group would get back to work and complete the
tasks at hand. Unlike with the Colors of Equity group, where a hand motion to redirect the group
worked, listening and talking it out with me worked best for The Big Six.
Group 3: Shades of Blue

Consisting of one female and three males, “Shades of Blue”, overcame many obstacles to create a viable art installation prototype, website that was accessed by QR code on the art installation that included information about the girls’ stories (from different races, class, ethnicities, and nationalities), and art installation proposal for the WalkLine. Edwin and Nathan identify as White and Jabir and Geneva identify as Black. Early on, several group members voiced their concern about the group’s makeup. Geneva’s explanation in her Video Journal Discovery, (which took place at the end of the Discovery phase) explains the overall group concerns:

And, um, for me personally my group would've been ... I don't ... Well, I like my group, but it's not who I would've picked,... Some people I would've picked for, to be in my group, but it's people I can learn to work well with if you know what I mean. (Geneva, Video Journal Discovery)

Initially the three members of the group were hesitant to work with Edwin because they were not sure how the he would respond to criticism.

Figure 13. Shades of Blue art installation prototype (Shades of Blue, Prototype).

It is important to note at this point that many of these students started attending The Woods School in pre-primary or kindergarten and have spent significant time together in school. In much the same way that siblings look out for each other and stand up for one another outside
of home, these students were no different in class. Likewise, these students knew how to press each other’s buttons – it was a common trait amongst all the groups, but Shades of Blue had to navigate these relationships with the utmost care. One specific group member, Edwin, could derail the entire group with a single look or a word. Yet, Geneva stated the group found a way to productively collaborate. Furthermore, Geneva and Jabir worked tirelessly to navigate issues that came up during the design challenge – especially with Edwin. As a group, they found it beneficial to divvy up tasks by dividing or sharing the workload so that each member of the group was responsible for specific parts of an assignment. This helped to mitigate disagreements and allowed the group to have a positive experience of the design challenge.

Shades of Blue comprised students in Section B; a social studies section that required less individual support than Section A, but still more than Section C. Edwin and Nathan qualified for accommodations; Edwin was allowed to video record the written journals in addition to the video journals. All members were allowed to use the text-to-speech function on their iPad.

Shades of Blue had some unique experiences during the design challenge. At different times during the challenge a group member was absent; for upwards of a week. While the rate of submitting assignments, individual and group work, on time was: Edwin 68%, Geneva 74%, Nathan 45%, Jabir 39%, Geneva, Nathan, and Jabir missed portions of the design challenge. Jabir missed the last week leading up to the second presentation causing a group stress. Lastly, it makes sense that these three students’ record of turning assignments in on time was lower because of missing school. While students who missed school were given the same amount of time they were out to make up the work, frequently they would check in with me and let me know they were going to miss the deadline for making up work.
Despite all the time missed by group members, Shades of Blue remained upbeat and optimistic about their work and potential to get their art installation accepted on the WalkLine. Additionally, they demonstrated resilience by rallying around Jabir and Geneva who missed notable class time towards the end of the design challenge as large deadlines loomed. In the last two weeks as the deadlines approached, the group grew closer together by quickly divvying up tasks and navigating disagreements with greater success than earlier in the design challenge.

**Group 4: Mannequins**

“Mannequins”, was comprised of two females and two males. Phil, Petrina, and Sanders identified as White and Liza as Asian. Mannequins were students in Section B; a social studies section that required less individual support than Section A, but still more than Section C. Liza and Sanders qualified for accommodations; Sanders was allowed to video record his written journals in addition to the video journals, but chose to write them instead.
Similar to the Shades of Blue group, several group members had reservations about being in a group with one specific member. Shortly after the groups were announced and work commenced, Liza emailed me regarding her concerns about her group members. Liza was a “lifer” at The Woods School; she started in pre-primary and she knew her classmates well. Her email articulates her concerns:

Dear Todd,

I am very sorry to say this but I am not sure about my group with Petrina, Phil, and Sanders. I would like to be put in a group with them for a small project but for this upcoming huge project I would like to be in a different group.

During the first brainstorming that we had on Friday I tried to coordinate and I tried to be productive but we did not accomplish anything. I understand that it is important to find a way to cooperate with different kinds of people but for this group it was very difficult for me to get stuff accomplished. I feel like our group will be focusing on other things than the project itself. I love PBL and I would really like to learn from this project. But I don't think I can do it in this group. Can you please think about it.

Thank you,

Liza (Liza, personal communications, January, 22, 2017)

Even before the design challenge started, Liza wanted to position herself in the best possible group because she really wanted to succeed by getting her group’s art installation accepted for the WalkLine. I responded to her:

Liza,
First, thanks for emailing me to let me know your frustrations. Second, I know that Phil left early and Petrina was not there on Friday. Perhaps with all members of the group there it might be different. Third, let’s touch base tomorrow morning.

I am thinking about it.

Todd (Todd, personal communication, January, 22, 2017)

We talked on Monday and discussed Liza’s concerns regarding the group and how she could play a leading role in facilitating the work needed to be successful in the design challenge. I asked her to give the group a week and that we would touch base after each class period and at the end of the week. If at the end of the week she still felt the same, we had a couple of options we could discuss. As the first week of the design challenge ended, Liza still expressed her concerns about the group, but did say that they were working well and that she thought the group could be successful. Liza chose to stay with the Mannequin’s group, but we had many check-ins during the rest of the challenge.

Interestingly, Liza’s concern over one particular group member, turned out to be negligible; however, a different group member posed more issues later. Phil missed a week of school leading up to the first presentation and this caused a great deal of group stress. Upon returning to school, Phil assumed leadership of the group, telling his group who should work on certain tasks and by what date they should complete group work. Up to this point, the group had collaborated well and enjoyed notable success during the first four phases of the design challenge. However, when Phil took over the leadership role, his group rebelled against him because they felt it was unfair that he missed a week of school and returned to “boss the group around.” As the group teetered on the brink of implosion, I intervened. During the intervention, I asked the group to stop working on assignments and we had an open discussion. During the discussion, the group
talked about concerns, progress, and came to an agreement about how the group would move forward with the work left to complete the challenge. Over the next several days, I checked in with the group. I was more concerned about their outlook and how they were collaborating than their progress in the challenge. However, based on the group’s agreement the intervention worked, Phil saw opportunities to lead while finishing the second prototype, and he found ways to follow the leadership of the group in the script and presentation creation.

Similar to other groups during the design challenge, the Mannequins struggled to submit their assignments, individual and group, in on time. In many instances, they completed the assignments, but failed to turn them in to the LMS. Individually the rate of turning in assignments on time was: Sanders 87%, Liza 71%, Phil 61%, and Petrina 58%. After reminding them to turn the assignments in to the LMS, in all cases except Petrina (who failed to turn in several individual assignments) all members of the group ultimately turned in their assignments.

After all the emotional ups and downs, the Mannequins persevered to produce a strong WalkLine art installation prototype, presentation, and art installation proposal. Petrina stated in the Group Check-in 2 about the DtL process, collaboration, and the group’s final work:

Yeah. I think that it still that we still would have had the same idea, and it still would have been pretty good, but it wouldn't have been like really, really good, and I think that we still would have gone, I mean, like when we presented, I think we would have done really well like all through it, but I feel like we wouldn't have felt as good about it, cause like, we wouldn't have put as much work into it and stuff, so it wouldn't feel like I worked really hard to do this, so now I feel really good for that as well. (Petrina, Group Check-in 2)
For this group, they brainstormed a strong art installation idea that carried them even when they were not collaborating well. Moreover, the outward facing nature of the design challenge, having their work out in the public, proved to be more important than their individual egos or disagreements. It became common goal for the group to rally behind and collaborate towards.

**Group 5: The Essential Bench**

“The Essential Bench” group was comprised of two males and one female. Clark and Charles both identified as White and Jolie identified as Black. While no member of this group qualified for accommodations, they were permitted to use of text to speech on the iPad and extra time to complete assignments.

![Figure 15. The Essential Bench art installation prototype (Essential Bench, Prototype).](image-url)

Compared to many other groups in this study, as a group, Clark, Charles, and Jolie submitted their individuals and group assignments on time at a higher rate, 73.6%. Jolie completed
and turned in on time 85% of the assignments. Clark turned in 71% of assignments on time and Charles 65% of assignments on time. Similar to other groups in the study, while The Essential Bench group completed almost of the assignments on time, failed to turn them in via the LMS. Additionally, this group, unlike the others, turned all most all assignments in the first five phases of the design challenge on time to the LMS, it was in the final two phases, present and reflect that the group struggled to turn their work in on time.

As part of Section C, a social studies class that required the least amount of individualized support, Jolie and Clark took an academic approach to their work, while Charles took a more laid back demeanor. The Essential Bench Group took a fun, serious approach to the design challenge; they took their work seriously but not themselves. Together the group quickly divvied up tasks, completed assignments, and demonstrated finely-tuned collaboration skills. What set this group apart from many of the others was they were all in – all in to follow the DtL process down to the dotted I and crossed T, all in as to how they were willing to take turns leading and following, all in to help each other, all in to push each other to create a better art installation, all in to getting feedback and improving their work, and all in to pivot quickly when they came across a better idea. As seriously as they took their work and the design challenge, The Essential Bench group laughed and learned along the way. They expertly collaborated with each other – they were the epitome of how a group should collaborate when using the design thinking process as defined by the design thinking literature (Carroll et al., 2010; Goldman et al., 2014; Goldman et al., 2016b; Kangas et al., 2013).

**Group 6: Mural of Acceptance**

Comprised of one female and two males, “Mural of Acceptance” was part of Section C, a social studies class that required the least amount of individualized support. Everyone identified
as White. Mac and Jason qualified for some accommodations, they rarely asked to use them during the design challenge. Like the rest of the groups, they had the same accommodations of other groups: use of text to speech on the iPad and time to complete assignments.

Laura, Jason, and Mac rarely took themselves seriously. They had a fun and a playful nature to them that easily sidetracked their work if they were not careful. Yet, when time was of the essence during the design challenge and deadlines were looming, Mural of Acceptance hyper focused on the tasks and checked them off their to-do list because they had the ability to do so unlike other groups that were easily sidetracked. When the group was hyper focused on finishing assignments, they often missed directions or missed opportunities to be more creative. Frequently during the design challenge I redirected them either one of three ways: by making eye contact, using a hand motion, or sitting down with them.

![Figure 16. Mural of Acceptance art installation prototype (Mural of Acceptance, Prototype).](image)

As will be detailed later, this group had to go through stage two brainstorming twice – this second brainstorm was needed after their first session failed to yield results. Laura expressed how her group did not brainstorm well in her Video Journal Ideas in response to the following questions:
1. What do you think of this style of brainstorming (with all of rules)?

2. How do you think that your group brainstormed?

Um, badly is the answer. Um, we had no ideas whatsoever at first, and brainstorming really didn't help. It was like, um, at first we had no ideas whatsoever. We had to get Todd’s help before we actually came up with a decent idea. And brainstorming didn't really help at all to me. Like, it's ... I don't know. We didn't do that good of a job in my opinion because, well ... So one of our group members was absent, so, um, while we were supposed to be brainstorming. We couldn't really do anything major without his permission, so, and he wasn't like obviously like working on the document with us. But, it, it was just like, we just ... It was just kind of random and arbitrary. We didn't really brainstorm that well, in my opinion. We just kind of, we just kind of tried to follow the rules but didn't really manage to, which resulted in not brainstorming well. (Laura, Video Journal Ideas)

During their first brainstorming session when they were to generate an art installation idea, they struggled to come up with a strong idea, because the group did not take the brainstorming process seriously, did not give their full effort, and a group member was absent during the Ideas phase of DtL. What hurt Mural of Acceptance the most was the absence of one group member when they first brainstormed. While other groups were willing to forge ahead, Mural of Acceptance was happier to wait and make sure they had completed the task than move forward with brainstorming.

Even with frustrating moments during the brainstorming process, Mural of Acceptance generally collaborated well. Each member was willing to lead and follow and ready to reel a group member back in if they were not being productive. Overall, this group had a high rate of
turning assignments in on time to the LMS: 75.3% of the time as a group – individually: Mac 97%, Laura 55%, and Jason 74%. As a group, they were the quickest to ask questions for clarification because Mac wanted constant feedback to make sure that he was on the right track. Overall, the playfulness and the quick-thinking of the group helped the group enjoy reasonable success during the design challenge.

**Group 7: Together**

“Together”, was comprised of three males: Martin, Sol, and Wolfgang. Sol identified as Black and Martin and Wolfgang as White. As part of Section C, a social studies class that required the least amount of individualized support, Together was afforded the same accommodations as the rest of the groups in the study. They were the most self-sufficient of all of the groups, only asking for help when they were completely stuck and out of answers. Academically minded like The Essential Bench group, Together equally divided work and diligently completed it. As a group, they turned in their assignments on time 81% of the time to the LMS which was tops amongst all of the groups in the study. Individually they turned assignments in to the LMS: Martin 90%, Sol 77%, and Wolfgang 77%. Together worked incredibly well together; taking turns leading and following. Additionally, they divvied up tasks making sure that they leveraged their strengths and mitigated their weaknesses.

What set Together apart from other groups in this study was their attention to detail throughout the design challenge. Of the seven groups in the study, the willingness during group and individual assignments to take the extra time to include all the necessary information and justification for their actions was helpful when pulling out major themes from the data. Early in the design challenge, each group was to complete Video Journal Discovery at the end of the discovery phase of the DtL process – the first phase. While the average video journal was 3:44,
Martin and Wolfgang’s video journals were 7:03 and 7:07. The extra four minutes in each of these video journals provided a level of detail and nuance that other participants did not have in their video journals. This type of detail was indicative of Together throughout the design challenge. Because of their attention to detail and their thoughtful decision making process, Together had the ability to pivot and flex during the design challenge as needed without creating chaos or resentment between group members. They collaborated well too (Carroll et al., 2010; Goldman et al., 2014; Goldman et al., 2016b; Kangas et al., 2013).

![Image](image.png)

**Figure 17.** Together art installation prototype (Together, Prototype).

Each of the seven groups that participated in the study tackled the same question at the beginning of the design challenge; yet each group had a slightly different experience due to how individuals and the group responded to the design challenge. Figure 18 provides a summary of the groups in the study. Based on the experiences of the individuals in the study and the group’s experiences, the collected data and the analysis allowed me to identify themes to answer the research questions.
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<thead>
<tr>
<th>Group Name</th>
<th>Participant Names</th>
<th>Group Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colors or Equity</td>
<td>Zell Miles Sarah</td>
<td>• High energy, above average collaboration&lt;br&gt;• Highly social&lt;br&gt;• Wildcard&lt;br&gt;• Strong idea, prototype&lt;br&gt;• Engaged&lt;br&gt;• Wanted feedback, but was hesitant to ask</td>
</tr>
<tr>
<td>The Big Six</td>
<td>Alfred Gordon Maya</td>
<td>• High energy, easily distracted&lt;br&gt;• Mistake turned into a strong prototype&lt;br&gt;• Fear of starting over&lt;br&gt;• Struggled to collaborate effectively&lt;br&gt;• Highly optimistic&lt;br&gt;• Engaged&lt;br&gt;• Wanted feedback but not if it changed their course of action</td>
</tr>
<tr>
<td>Shades of Blue</td>
<td>Edwin Geneva JabirNathan</td>
<td>• Difficult group dynamics&lt;br&gt;• Found ways to collaborate by divvying up tasks&lt;br&gt;• Group navigated absent members well&lt;br&gt;• Engaged and motivated to get art installation accepted by WalkLine&lt;br&gt;• Accepted feedback, but had their own take</td>
</tr>
<tr>
<td>Mannequins</td>
<td>Liza Petrina Phil Sanders</td>
<td>• Initial concern with collaboration&lt;br&gt;• Learned when to lead and when to follow&lt;br&gt;• Very strong prototype&lt;br&gt;• Engaged and motivated to get art installation accepted by WalkLine&lt;br&gt;• Wanted feedback in very specific instances</td>
</tr>
<tr>
<td>The Essential Bench</td>
<td>Charles Clark Jolie</td>
<td>• Academically minded&lt;br&gt;• Superior collaborators, excellent at brainstorming&lt;br&gt;• All in – dot every I and cross every T&lt;br&gt;• Engaged and motivated to get art installation accepted by WalkLine&lt;br&gt;• Sought feedback</td>
</tr>
<tr>
<td>Mural of Acceptance</td>
<td>Jason Laura Mac</td>
<td>• Playful&lt;br&gt;• Struggled to brainstorm&lt;br&gt;• Easily off task&lt;br&gt;• Academically strong</td>
</tr>
<tr>
<td>Together</td>
<td>Martin Sol Wolfgang</td>
<td>• Thorough on all assignments&lt;br&gt;• Needed the least amount of support&lt;br&gt;• Expertly collaborated well together&lt;br&gt;• Able to pivot and flex as necessary&lt;br&gt;• Readily open to feedback</td>
</tr>
</tbody>
</table>

**Figure 18.** Summary of Participant Groups and Attributes.
**The Research Study**

The study took place during the spring semester of 2017. Sixth-grade students from The Wood’s School participated in this seven-week design challenge. Students were placed into collaborative groups of three or four with a total of seven groups. Over the course of a seven-week unit, Human Rights Design Challenge, students were asked to solve the following question: How might we create an artifact for the city that celebrates an individual or group that has championed human rights?

I collected the following data: student artifacts, video journals, group interviews, and participant observations. All the collected data were incorporated into the design challenge, as it was a part of the design thinking process. Students were not expected to produce or spend more time on assignments if they were a participant or if they did not participate. The data that was collected related to the distributed scaffolding of the design thinking process.

Students engaged in the design thinking process: Discovery, Focus/Direction, Ideas, Research, Prototype, Present, and Reflection. Each phase of this process allowed students to work collaboratively toward a common goal. Within each phase of the design thinking process, students had various tasks to complete. Throughout the design challenge, participants completed seventeen assignments, seven journals, two presentations, two group check-ins, one feedback scenario with an expert, and three video journals – some as a group and others individually; each was collected for analysis. Phases are detailed in Figure 19-20. (See Appendix A-Z for the full design challenge.)
Before the research study began, students were introduced to the basic structures of the design thinking process. Much of the activities and assignments of the design challenge were
available in the Google Apps for Education platform. During the introduction of the unit, students navigated to the home page for the design challenge where all the tasks, assignments, design constraints and due dates were housed. The design challenge was housed on a password-protected learning management system where students accessed, created, and turned in their work. In particular, time was spent orienting the students to the home page, which walked them through each phase of the design thinking process, the activities, and assignments that were to be completed by each group. During the design challenge, students were expected to adhere to the design constraints, timetables for each phase, and collaboration with group members. Additionally, students were made aware at the beginning of the design challenge that the summative assessment for this design challenge was a presentation of eight to ten minutes that included each aspect of the design challenge – with emphasis on the design, symbolism, and the user/stakeholder experience of the art installation.

Students produced artifacts throughout the design challenge that corresponded to the various phases of design thinking. The first assignment for each phase of design thinking was a journal entry that includes prompts. There were seven journal entries. Students completed these journals using the Google Apps for Education application Google Docs, and shared the document with me via a shared Google folder. As an extension of these journals, students videoed themselves using their school-issued iPad in a video journal. As a way for students to reflect on their own work and the work of their group, video journals were assigned three times throughout the design challenge: after discovery, after brainstorming, and at the conclusion of the design challenge. For those students who were hesitant to write extensive journals, the video journals gave them the opportunity to discuss their thoughts on the design challenge.
Based on the responses from the journals, video journals, and the group interviews, “group check-ins” that took place twice during the design challenge, during the research phase and after the second presentation, so that the group had an opportunity voice successes and areas of concern. Student artifacts consisted of written work on assignments, brainstorming sessions, research notes, physical prototypes, and two filmed presentations. Participant observations provided insight during group work sessions throughout the unit of study – these helped to inform the questions asked during the group interviews.

Data Collection

Yin (2003) suggested six forms of case study data: documents, archival records, interviews, direct observation, participant-observation, and physical artifacts. Similarly, Creswell (2014) suggested four categories for data types: observations, interviews, documents, and audio-visual materials. Whether collecting all six or just several, Yin (2003) purports that there was a need for a minimum of two forms of data. Furthermore, there exist “overriding principles” for data collection in a case study according to Yin:

1. Multiple sources of evidence (evidence from two or more sources, but converging on the same set of facts or findings);

2. A case study database (a formal assembly of evidence distinct from the final case study report); and

3. A chain of evidence (explicit links between the questions asked, the data collected, and the conclusions drawn). (p. 83)

Due to the nature of the research questions, the use of qualitative research, case study methodology, and in keeping with the recommendations of Stake (1995) and Creswell (2014), multiple forms of data were needed for triangulation (Flyvbjerg, 2011; Merriam, 1998; Stake,

Each data collection form had strengths and weakness (Creswell, 2014; Yin, 2003). Using the categories posed by Creswell (2014) for data collection types in qualitative research with the strengths and weakness of case study data forms of Yin (2003, p. 86) while adding one strength and weakness in audio-visual material from Creswell (2014), Figure 21 summarizes the strengths and limitations of each data type.

<table>
<thead>
<tr>
<th>Data Collection Types</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
</table>
| Observations – participant or direct | • reality – covers events in real time  
• contextual – covers context of event  
• insightful into interpersonal behavior and motives. | • time-consuming  
• selectivity – unless broad coverage  
• reflexivity – event may proceed differently because it is being observed  
• cost – hours needed by human observers. |
| Interviews | • targeted – focuses directly on case study topic  
• insightful – provides perceived causal inferences. | • bias due to poorly constructed questions  
• response bias  
• inaccuracies due to poor recall  
• reflexivity – interviewee gives what interviewer wants to hear. |
| Documents and archival records | • stable – can be reviewed repeatedly  
• unobtrusive – not created as a result of the case study  
• exact – contains exact names, references, and details of an event  
• broad coverage – long span of time, many events, and many settings  
• precise and quantitative. | • retrievability – can be low  
• biased selectivity, if collection is incomplete  
• reporting bias – reflects (unknown) bias of author  
• Accessibility due to privacy reasons. |
| Audio-visual materials | • may be unobtrusive method of collecting data  
• provides an opportunity for participants to directly share their reality  
• it is creative in that it captures attention visually (Creswell, 2014, p. 192). | • may be difficult to interpret  
• may not be accessible publicly or privately  
• the presences of an observer may be disruptive and affect responses (Creswell, 2014, p. 192). |

**Figure 21.** Strengths and Weaknesses of Data Collections Types (Creswell, 2014, p. 192; Yin, 2003, p. 86).

**Data Sources**

While student artifacts in this study played an important role in understanding how students experienced the distributed scaffolding of design thinking and demonstrate their skills and
content knowledge, it was important to triangulate this collected data within the rest of the collected data, group interviews, video journals, and participant observation to gain a better understanding of the distributed scaffolding in the design thinking process. Figure 22 denotes what specific data were collected.

<table>
<thead>
<tr>
<th>Phase of DtL</th>
<th>Student Artifacts</th>
<th>Video Journals</th>
<th>Group Interviews</th>
<th>Participant Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Discovery</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Week 1</td>
<td>Focus/Direction</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Week 2</td>
<td>Ideas</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Week 3/4</td>
<td>Research</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Week 4/5</td>
<td>Prototype</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 4/5/6/7</td>
<td>Present</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Week 6/7</td>
<td>Reflect</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**Figure 22.** Data Collection During Design Challenge.

**Student artifacts.** Throughout the design challenge, students produced over 400 artifacts; most in electronic form. According to Prior (2003), “a document is a product. It is a work – often an expression of a technology. And, in the ordinary way of things, products are produced – they are produced by humankind in socially organized circumstances” (p. 4). Each of these artifacts produced by student groups created a collective understanding of the design thinking process and how they navigated the scaffolding of the process. Prior advises analyzing artifacts collectively because “documents in organizational settings [schools are not] as isolated tools, but seek to discover how a document is linked into the wider information storage and retrieval system of which is will form a part” (p. 87). As a collective of the group’s work during the design challenge, it was important to use the documents to understand “everyday interaction and help constitute the social relationships in which they are embedded” (p. 52).
**Video journals.** To elicit students’ experiences of the design thinking process and students’ experiences during the design challenge, video journals were utilized as an extension of student journals (Buchwald, Schantz-Laursen, & Delmar, 2009; Larkin & Jorgensen, 2016; Noyes, 2004a, 2004b, 2008). After the discovery, ideas, and reflection phases, students recorded themselves via their iPad (see Appendix S). With the use of video diaries, students who were not as apt to extensively write in their journal had the opportunity to video record their thoughts (Buchwald et al., 2009; Larkin & Jorgensen, 2016). Recorded videos were uploaded to a Google Drive folder that was shared with me.

**Group interviews.** There were two group interviews per group – one during the research phase of the design challenge and one after the second presentation because these were optimal times to check in with the groups and get a sense of how the group was responding to the design thinking process, their group, and their engagement (see Appendices W and X). The interviews were semi-structured and lasted approximately twenty minutes in length. The interviews were recorded digitally and transcribed. Roulston (2010) asserted that interviews generate “data to examine [the] participants’ lived experiences” and to “elicit the ‘direct description of a situation or event as it is lived through without offering causal explanation or interpretive generalizations’” (pp. 16-17). The four attributes of a successful interview as posed by Roulston were followed: “(1) Prepare for the interview, (2) attend to research design and question formulation, (3) be a good listener, and (4) be skeptical” (p. 180). Recorded group interviews and participation in group check-ins, the group shared their experiences of the design challenge. Additionally, the conversations that ensued during the group interview enlightened me as to how the group worked together and how they experienced the distributed scaffolding of design thinking as a collective unit.
**Participant observation.** Participant observation as described by DeWalt and DeWalt (2011) was used to during the seven-week study to map the “physical and social scene provides important data for understanding social relationships; mapping is a very good tool for developing the kind of attention to detail and memory that truly effective fieldwork requires” (p. 82). While participant observation was used throughout the design challenge, participant observation was specifically used while student groups created their prototypes, brainstormed, and prepared for their presentation because these were vital moments of the design thinking process best captured as an observation. Participant observation, coupled with the other data collection methods allowed me to triangulate the data.

As the teacher and researcher, I used participant observation during the study. During class session, I had my researcher journal and pen with me. I switched back and forth between my teacher role, facilitating the design challenge, and my researcher role, writing down insights, thoughts, events, and questions in my journal. It was common for me to be in the middle of writing in my researcher journal and have a student ask me question. In those instances, I set aside my journal and engaged with the student to help them and then I would go back to my journal and finish my thought. Additionally, I summarized the class session and day in my journal.

**Data Analysis Progressive Focusing**

Data analysis was a continual process that started when data were first collected and did not finish until saturation via progressive focusing (Stake, 1981). Progressive focusing was first referenced by Parlett and Hamilton (1972) as a way for qualitative researchers to analyze data in innovative educational settings. Researchers move through three stages: observation, renewed inquiry, and explanation. Parlett and Hamilton (1976) extended the three stages:
Obviously the three stages overlap and functionally interrelate. The transition from stage to stage, as the investigation unfolds, occurs as the problem areas become progressively clarified and re-defined. The course of the study cannot be charted in advance. Beginning with an extensive database, the researchers systematically reduce the breadth of their inquiry to give more concentrated attention to the emerging issues. (p. 148)

Stake (1981) refined progressive focusing espoused by Parlett and Hamilton (1972, 1976) and argued for the use of this method of data analysis in case study design. Stake writes that progressive focusing:

requires that the researcher be well acquainted with the complexities of the problem before going to the field, but not too committed to a study plan. It is accomplished in multiple stages: First observation of the site, then further inquiry, beginning to focus on the relevant issues, and then seeking to explain. (p. 1)

Progressive focusing afforded me the ability to "systematic[ally] narrow and refine the research focus during fieldwork in order to accommodate highly unique and specific issues (emic) of sociocultural behavior…and examine the role of computer-assisted qualitative data analysis software" (Sinkovics & Alfordi, 2012, pp. 818-819). As I identified themes from the data throughout the study, I adjusted the questions asked in group interviews, the focus of the research, code data, and the way that I assessed student groups’ decisions (Miles et al., 2014; Stake, 1995). Sinkovics and Alfordi (2012) proposed that progressive focusing in qualitative research follows six tasks (see Figure 23). The biggest difference between this model and more traditional qualitative research models was the ability for me to go back and revisit previous tasks following the dotted lines on the right side of the figure, as needed or the data necessitated.
At first glance, progressive focusing seemed similar with grounded theory analysis. However, Sinkovics and Alfoldi (2012) delineated the differences between progressive focusing and grounded theory analysis. Progressive focusing required me to use an abductive or retroductive approach whereas grounded theory required me to use an inductive approach: "As a result, the aim of progressive focusing is neither theory generation (induction), nor theory testing (deduction), but theory development/refinement (abduction)" (p. 824). Additionally, progressive focusing began with a thorough review of the literature whereas grounded theory develops a theory out of the given data.

Figure 23. Progressive Focusing Model of the Qualitative Research Process (Sinkovics & Alfoldi, 2012, p. 825).

Sinkovics and Alfoldi (2012) extended progressive focusing and suggest that combining this data analysis method with CAQDAS helps to "facilitate" the flexibility of progressive focusing while making the process "comprehensible and trustworthy" (p. 819). While I had
flexibility to analyze the data as it presented itself while keeping true to the theory that drives this study, the use of NVivo created a useful audit trail during data analysis. Progressive focusing as an analysis technique promoted "loyalty to existing theory with loyalty to the new data" (p. 824). This method of data analysis allowed for adjustment and refocus of the research as necessary while still providing rigor and trustworthiness which were necessary for a high caliber research study. Most importantly, progressive focusing provided the data analysis technique to allowed me the ability to hone in on the instances where students experienced and interacted with the scaffolding of design thinking.

**Qualitative Analysis Methods**

Group interviews and video journals (video), and student presentations (video), were transcribed and uploaded. Student artifacts were uploaded to NVivo, along with other collected data. As data were transcribed and uploaded into NVivo, analysis and coding began as prescribed by progressive focusing. I used the progressive focusing technique of data analysis (Sinkovics & Alfoldi, 2012; Stake, 1981, 1995, 2010) with the coding process of Ezzy (2002): open coding, axial coding, and selective coding, and the assistance of NVivo, I coded, analyzed, created themes, and organized the collected data to answer the research questions. In each of coding categories, Ezzy suggested the following procedures that are in Figure 24.

For this study, I followed the research design process of progressive focusing suggested by Sinkovics and Alfoldi (2012), and the following the steps suggested by Creswell (2014) that data analysis in qualitative research should consist of: (1) organizing and preparing data for analysis, (2) reading through all data, (3) coding the data, (4) create themes and descriptions, (5) interrelating themes/description, and (6) interpreting the meaning of themes/descriptions (p. 197). Additionally, the study followed Stake’s (2005) process, which uncovered deeper
understanding of the case. Stake (2005) posits that case study researchers must: (1) bounding the case, conceptualizing the object of the study, (2) selecting phenomena, themes or issues (i.e., the research questions to emphasize, (3) seeking patterns of the data to develop the issues, (4) triangulating key observations and bases for interpretation, (5) selecting alternative interpretations to pursue, and (6) developing assertions or generalizations about the case (p. 459-460). Lastly, a computer assisted qualitative data analysis application, NVivo was used to organize and help with the analysis (coding and themes).

<table>
<thead>
<tr>
<th>Open Coding</th>
<th>Axial Coding</th>
<th>Selective Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Explore the data.</td>
<td>- Explore the codes.</td>
<td>- Identify the core code or central story in the analysis.</td>
</tr>
<tr>
<td>- Identify the units of analysis.</td>
<td>- Examine the relationships between codes.</td>
<td>- Examine the relationship between the core code and other codes.</td>
</tr>
<tr>
<td>- Code for meanings, feelings, actions.</td>
<td>- Specify the conditions associated with a code.</td>
<td>- Compare coding scheme with preexisting theory.</td>
</tr>
<tr>
<td>- Make metaphors for data.</td>
<td>- Review data to confirm associations and new codes.</td>
<td></td>
</tr>
<tr>
<td>- Experiment with codes.</td>
<td>- Compare codes with preexisting theory.</td>
<td></td>
</tr>
<tr>
<td>- Compare and contrast events, actions and feelings.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Break codes into subcategories.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Integrate codes into more inclusive codes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identify the properties of codes.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 24.** Coding in grounded theory and thematic analysis (Ezzy, 2002, p. 93).

**Coding**

The first component of open coding was data collection, transcription (for video/audio), and organization of the data (Ezzy, 2002). As data were collected, it was renamed and organized into folders, audio or video data were transcribed as well. Data were uploaded into NVivo data analysis software and organized into folders. I wrote memos (Ezzy, 2002; Miles et al., 2014) describing what I coded, when I created new codes, and insights from the data. Organizationally, data were coded to individual participant, group, distributed scaffolding present, and phase of
DtL (see Figure 25 and 26). These organizational codes were created because I needed a way to conceptually think about the data, when that data were created during the design challenge, and ultimately a way to organize the large amount of data collected. I recognized that the organizational codes would help me begin to identify themes form the data. Additionally, Figure 25 shows the quantity of data collected by participant and group.

<table>
<thead>
<tr>
<th>Organizational Code</th>
<th>Coded Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS: Activity Structure</td>
<td>264</td>
</tr>
<tr>
<td>DS: Teacher Facilitation</td>
<td>30</td>
</tr>
<tr>
<td>DS: Visualization Tool</td>
<td>182</td>
</tr>
<tr>
<td>DS: Written Prompt</td>
<td>274</td>
</tr>
<tr>
<td>DtL: Discovery</td>
<td>50</td>
</tr>
<tr>
<td>DtL: Focus/Direction</td>
<td>58</td>
</tr>
<tr>
<td>DtL: Ideas</td>
<td>58</td>
</tr>
<tr>
<td>DtL: Research</td>
<td>49</td>
</tr>
<tr>
<td>DtL: Prototype</td>
<td>28</td>
</tr>
<tr>
<td>DtL: Present</td>
<td>183</td>
</tr>
<tr>
<td>DtL: Reflect</td>
<td>65</td>
</tr>
</tbody>
</table>

Figure 25. Open Coding Organization.
<table>
<thead>
<tr>
<th>Group Name</th>
<th>Participant Names</th>
<th>Number of Data Collected</th>
<th>Number of Coded Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colors or Equity</td>
<td>Zell</td>
<td>47</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>Miles</td>
<td>48</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Sarah</td>
<td>43</td>
<td>44</td>
</tr>
<tr>
<td>The Big Six</td>
<td>Alfred</td>
<td>52</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>Gordon</td>
<td>52</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>Maya</td>
<td>50</td>
<td>52</td>
</tr>
<tr>
<td>Shades of Blue</td>
<td>Edwin</td>
<td>42</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Geneva</td>
<td>47</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>Jabir</td>
<td>42</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Nathan</td>
<td>41</td>
<td>44</td>
</tr>
<tr>
<td>Mannequins</td>
<td>Liza</td>
<td>43</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Petrina</td>
<td>42</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Phil</td>
<td>43</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Sanders</td>
<td>45</td>
<td>47</td>
</tr>
<tr>
<td>The Essential Bench</td>
<td>Charles</td>
<td>47</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>Clark</td>
<td>48</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Jolie</td>
<td>48</td>
<td>50</td>
</tr>
<tr>
<td>Mural of Acceptance</td>
<td>Jason</td>
<td>50</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Laura</td>
<td>50</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Mac</td>
<td>50</td>
<td>52</td>
</tr>
<tr>
<td>Together</td>
<td>Martin</td>
<td>59</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>Sol</td>
<td>58</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>Wolfgang</td>
<td>57</td>
<td>59</td>
</tr>
</tbody>
</table>

**Figure 26.** Open coding organized by group and participant.

Initially, I intended to start with the first piece of data that I collected, Journal 1; however, I struggled to identify data to code because it was not pointing towards the student’s experience of distributed scaffolding or design thinking. I realized that the students were still too new to the design challenge in Journal 1 and had not had enough experiences to comment on their experience of the design challenge. I took a step back from the data and thought about a different starting point to code the data line-by-line. What I kept coming back to was how fascinated I was with the individual and group responses from Group Check-in 2 – the last data collected from the study. I decided to start line-by-line coding Group Check-in 2 and work chronologically backwards based on the type of data. After open coding Group Check-in 2, I
coded Video Journal: Present/Reflect, and Journals 1 – 7 starting at Journal 7 and working backwards through Journal 1. Next, I open coded Video Journals Ideas and Discovery, Assignments 1-17 in descending order which resulted in fruitful themes. Rounding out open coding, I coded Presentations 1 and 2. As codes were identified, they were added to NVivo, defined, and I kept memos of insights and when I created new codes so that I could go back and look at previously coded data for the newly defined codes (Ezzy, 2002; Miles et al., 2014). When I finished open coding, I looked over the list of codes that I had identified (see Figure 27).
<table>
<thead>
<tr>
<th>Codes</th>
<th>Number of coding references</th>
<th>Number of items coded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art installation change over time</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>Art installation experience</td>
<td>23</td>
<td>16</td>
</tr>
<tr>
<td>Brainstorming changed anything</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Feedback</td>
<td>74</td>
<td>50</td>
</tr>
<tr>
<td>POV</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>Presentation as prototype</td>
<td>111</td>
<td>108</td>
</tr>
<tr>
<td>Prototype</td>
<td>44</td>
<td>30</td>
</tr>
<tr>
<td>Scaffold Frustration</td>
<td>49</td>
<td>37</td>
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<tr>
<td>Scaffolding organization</td>
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<td>47</td>
</tr>
<tr>
<td>Collaboration</td>
<td>53</td>
<td>45</td>
</tr>
<tr>
<td>Critique of DTL process</td>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>DTL process fun</td>
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<td>32</td>
</tr>
<tr>
<td>DTL process helpful</td>
<td>53</td>
<td>39</td>
</tr>
<tr>
<td>Easiest phase DTL</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Engaged</td>
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<td>73</td>
</tr>
<tr>
<td>Experience</td>
<td>38</td>
<td>32</td>
</tr>
<tr>
<td>Failing fast and failing forward</td>
<td>30</td>
<td>23</td>
</tr>
<tr>
<td>Fatigue</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Hardest phase DTL</td>
<td>29</td>
<td>28</td>
</tr>
<tr>
<td>Novice design thinker</td>
<td>31</td>
<td>28</td>
</tr>
<tr>
<td>Optimism</td>
<td>59</td>
<td>53</td>
</tr>
<tr>
<td>Pace</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Pressure to finish or complete</td>
<td>42</td>
<td>37</td>
</tr>
<tr>
<td>Traditional vs Design Thinking</td>
<td>57</td>
<td>49</td>
</tr>
<tr>
<td>Ah Moments</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Art installation</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Art installation failure to promise</td>
<td>2</td>
<td>2</td>
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Aside from the organizational codes, I recognized that I needed to reorganize codes by grouping codes together into themes. After finishing open coding, I started *axial coding* (Ezzy, 2002). During axial coding, I explored the codes and organized the codes again. I examined relationships between codes and narrowed the code list to themes related to my research questions. I reviewed my memos and began to group the codes around identified themes. I went back and analyzed the data again – specifically journals, video journals, and group check-ins to make sure the codes I grouped together worked (see Figure 28).
### Codes Table

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**Figure 28.** Axial coding list of codes.

During selective coding (Ezzy, 2002), I organized the code list again by theme. By organizing the code list again, I identified two central themes of the data: distributed scaffolding and
students’ experiences. Distributed scaffolding divided into three subthemes: presentation as prototype, feedback loop, and social studies content. Students’ experiences had three subthemes: students’ feelings, design thinking versus traditional social studies classes (DT vs. traditional SS), and collaboration.

<table>
<thead>
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<td>DS: Social studies content</td>
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<td>SE: Collaboration</td>
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<td>SE: Students’ feelings</td>
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</tr>
<tr>
<td>SE: DT vs. traditional SS</td>
<td>101</td>
</tr>
</tbody>
</table>

Figure 29. Selective coding list of codes.

Distributed Scaffolding

The broad category of distributed scaffolding was divided into subcategories: presentation as prototype, feedback loop, and social studies content. The code presentation as prototype was used to label instances in the data where participants discussed, expressed, or experienced presenting their presentation twice. The code feedback loop was used to label instances where participants received feedback multiple times during the same activity. The code social studies content was used to identify instances where students used any of the four dimensions from the C3 Framework (National Council for the Social Studies, 2013).

Students’ Experiences

The broad category of students’ experiences was divided into subcategories: collaboration, students’ feelings, and DT vs. traditional social studies. Data that was coded collaboration were instances when participants discussed, expressed, or experienced collaboration during the design challenge. The code: students’ feelings was used to identify instances when participants
expressed their feelings of the design challenge, DtL process, and distributed scaffolding that was present. Data that was coded design thinking verses traditional social studies class were instances when participants compared, discussed, or expressed their experience with the design challenge and DtL with their previous experiences in social studies classes.

**Sample of Coded Text**

Using Martin’s Video Journal: Present/Reflect below, I illustrated how I used codes to analyze data. In the excerpt, Martin reflected on his experience of the design challenge – especially the Present and Reflect phases of DtL.

Reflection question three: What does this design challenge compared to more traditional forms of learning? So, this design challenge is so much different than traditional forms of learning, 'cause traditional forms of learning are just like remembering dates and like battles, and this is more learning how, like, human rights affect us and other people now. Not like our past, just now. And like, what is happening, and what we, and what people are doing, and what we can do. That is very good to know, and like, know what's happening now, instead of what happened 50 years ago. That's very important.

Reflection question four: Describe the design thinking process. What is most helpful about the process? What is most frustrating about the process? So, the design thinking process, is like, we first go to places and we learn stuff we discover. Then we go and we learn stuff, like, more of on our own. And then we start brainstorming and developing our ideas. Then we keep on egging our ideas and really getting them perfect, and preparing for, um, what's coming on later. And then we really develop our ideas and maybe start presenting, or working on presenting, and then we reflect.
So, the most helpful thing about the process is probably ... Well, there's actually lots of different stuff. So, the discovery part, ongoing to different places, and on our own time, is very helpful, 'cause we get to obtain knowledge about our topic. Then presenting helps us a lot, 'cause then we had to like, the, um, Assignment 14, present ... Giving our two presentations really does help us for Assignment 14, and really, like, editing it, and making it better. Also, reflecting is really good, 'cause you get to know what you did, and then know what you can do better, and then apply that to future stuff.

The most, um, frustrating part about the process is probably just revising, editing it, and then finding the really good idea, and then just destroying it, going onto a new one, or making it better. And it's really hard just to be like, "Okay, I just gotta do this," even though you like your idea. (Martin, Video Journal: Present/Reflect)

First, I coded this video journal organizationally: Martin, Together, DS: Written Prompt, DS: Activity Structure, DtL: Present, DtL: Reflect. This excerpt was coded organizationally so that I could conceptualize the data and could use the organizational codes to analyze within each organizational code. As an example, I could see how Martin and other participants experienced the DtL: Reflect phase of the design challenge by using NVivo software to pull all data that was coded by this organizational code.

Next, I line-by-line coded the excerpt. I coded the first paragraph: DS: Social studies content because Martin expressed how it was important to understand how events from 50 years ago affect what is going on today. He demonstrated D2: Applying disciplinary tools and concepts from the C3 Framework (National Council for the Social Studies, 2013) by applying a history and civic approach to his thinking. Additionally, the first paragraph was coded SE: DT vs. traditional SS because Martin compared his experience of design thinking and the design challenge to
his previous experiences in social studies classes. I coded the second paragraph *SE: Students’ feelings, DS: Social studies content, and DS: Feedback loop* because Martin described how the DtL process was helpful to him and his group to complete the design challenge, how he demonstrated D3: Evaluating sources and using evidence from the C3 Framework to make learning his own, and how getting feedback helped his group to “perfect” their idea.

The third paragraph was coded *DS: Presentation as prototype, DS: Feedback loop, and SE: DT vs. traditional SS*. Martin explained how presenting twice helped his group complete Assignment 14, which his group, like the rest of the groups in the study, struggled to complete. Without presenting and completing other activities and assignments during the design challenge, his group may not have been able to successfully complete Assignment 14. Martin connected presenting twice to his learning. He expressed that he had a deeper understanding of human rights and the organization that his group was honoring because of the second presentation, and how he could apply this new knowledge in the future. As Martin reflected on the design challenge, he recognized the importance of the DtL process and how it helped his group create a strong art installation prototype, presentation, and WalkLine art proposal. Although Martin did not specifically mention feedback in this paragraph, his group received feedback between their first and second presentations which helped to make their second presentation stronger.

In the final paragraph of this excerpt, Martin described his frustration with the DtL process which I coded *SE: Students’ feelings*. As his group collaborated, they created “really good idea[s], and then just destroy[ed]” them. While Martin recognized that iterations made his group’s ideas better, he found the experience frustrating at times. Additionally, I coded this paragraph *SE: DT vs. traditional SS*. As Martin completed the design challenge, he understood that it
was tough but okay to walk away from a good idea because that was part of the DtL process. Martin demonstrated how he was thinking like a design thinker.

**Authenticity of Research**

Miles et al. (2014) assert that there are 13 processes that researchers incorporate into a study to ensure the trustworthiness of the research study: checking for representativeness, checking for researcher effects, triangulating, weighting the evidence, checking the meaning of outliers, using extreme cases, following up surprises, looking for negative evidence, making if-then tests, ruling out spurious relations, replicating a finding, checking out rival explanations, and getting feedback from participants. However, for this study several steps were combined: checking the meaning of outliers, using extreme cases, negative evidence, and rival explanations to produce one category because of the crossover between them. If-then tests were not used.

As mentioned earlier in this chapter, progressive focusing was used for data analysis. Stake (1995) strongly recommended the “need [for] certain case protocols or procedures which researchers and readers alike come to expect” (p. 109). Progressive focusing as espoused by Sinkovics and Alfoldi (2012) acted as my procedure for data analysis and made the case “embraceable” (Stake, 2005, p. 455). By making the case embraceable using progressive focusing, I could “perceive the nature of the case” and I came to experientially know the case (p. 455). Lastly, to ensure authenticity of research for this case study, I included my positionality and subjectivity.

**Checking for Representativeness**

Miles et al. (2014) also advised researchers to choose wisely regarding the sample of participants for their study. Random sampling is best, but there are situations where random sam-
pling is not a possibility. However, Miles and colleagues warn that if the sample is nonrepre-
sentative of the population, events, activities and processes of the findings are not generalizable. To counter issues of representativeness, researchers should “(1) increase the number of cases, (2) look purposively for contrasting cases, (3) order the cases in various ways in a matrix to see who or what may be missing, and (4) randomly sample people and phenomena within the site(s) you’re studying” (p. 296).

In this study, participants were comprised of students from The Woods School who were in sixth grade. Students’ ages ranged from 11-12 years old. There were 23 participants in the sixth grade, and they were divided into groups of three or four, with a total of seven student groups. Student groups were based on the students’ class section (A, B, or C) and groups were assigned by me. The rationale for assigning these cooperative groups was to create groups that would work together based on how students worked together during the school year, separate those students who demonstrated their inability to productively work together, and attempt to create a productive classroom environment (Johnson & Johnson, 2013; Johnson & Johnson, 2016; Johnson, Johnson, & Holubec, 1994). Therefore, representativeness for this study was present in having seven groups of a variety of students, but the pedagogical reasons outweighed the design potential for having numerous cases or randomly sampled cases.

Checking for Researcher Effects

According to Miles et al. (2014) two potential types of bias exist: “the effects of the re-
search on the case and the effects of the case on the researcher” (p. 296). To guard against these two researcher effects, I made my intentions clear as the teacher/researcher to the participants
and their parents, explained how the data were collected, and what I intended to do with the collected data. Additionally, I kept my research questions firmly in mind, sought out outliers, attempted to understand them, and triangulated my data.

There were ethical considerations that informed the course of the research at The Woods School. Since I was the teacher and researcher, I was alert to teacher interference and coercion. My interactions with students had the potential to change their actions, the potential quality of their work, and the research study itself. However, progressive focusing allowed me to adjust the trajectory of the study as the data suggested. I was aware that the research took place in my classroom, yet I sought to understand how students responded to the distributed scaffolding of design thinking. To counter issues of coercion, I had my faculty advisor distribute the assent forms and parental permission forms, forms were turned into the front office, and then collected and maintained by a sixth-grade teacher at The Woods School until the unit of study was concluded and grades were entered. By following the grading procedures of the unit, assignments were assessed via a rubric, which students had access to before each assignment. Feedback and scoring of student work was completed by the students themselves via self-assessment, an expert panelist, and me. Additionally, at this research site, the school did not grade students in an A, B, C etc. manner; instead assessment was through rubrics, feedback, and written narratives.

Additionally, I dealt with situational ethics throughout the study. I was teacher and researcher – I wore two hats, a researcher hat and a teacher hat. Sometimes I switched between the two, while others I wore the hats at the same time. As important as conducting sound research was, my first obligation was to my students as their teacher. I did have a deep interest in their success in this unit of study. Many of the decisions regarding groups and adjusting assignments
were made as a teacher. The intentional groups created for this study were based on how the students had previously worked with their peers in their respective academic groups (A, B, and C), because they had worked together on several previous projects earlier in the school year. There were multiple instances during the study where I was conflicted as to which hat to wear. In those instances, I made the choice to do what was best for my students first and my research second. Much like I intentionally created the groups for the design challenge, I made the choice to intervene when Mannequins and Mural of Acceptance struggled during the design challenge because my role as teacher and facilitator of the design challenge was as important as being the researcher.

**Triangulation**

Stake (2005) defines triangulation as “a process of using multiple perceptions to clarify meaning, verifying the repeatability of an observation or interpretation” (p. 454). Stake (1995) espouses four forms of triangulation: data source, investigator, theory, and methodological for qualitative case study research. For this study, I used methodological triangulation. Methodological triangulation required multiple data points to confirm findings. Stake suggests that methodological triangulation is “the most recognized” form of triangulation that includes multiple data sources: “observations, interview, and document review” (p. 114). Additionally, Stake (2005) posits that “good case study research follows…triangulation to tease out what deserves to be called experiential knowledge from what is opinion and preference” (p. 455). In collecting student artifacts, video journals, group interviews, and participant observation, I could see how a student group experienced the distributed scaffolding of design thinking through various types of data and determine if different forms of data corroborated each other.
Weighting the Evidence

In this qualitative research, some of collected data were stronger than others (Miles et al., 2014). Miles and colleagues suggest that weighting the evidence produces better findings. Additionally, a running log of data quality in the form of memos and effort by the researcher to improve data quality on future visits will help to create strong data. In alignment with Miles et al. (2014), Parlett and Hamilton (1972, 1976), Sinkovics and Alfoldi (2012), and Stake (1981, 1995), I used researcher notes and memos to log of the data quality which afforded me the opportunity to adjust data collection to insure higher quality data.

Checking the Meaning of Outliers, Using Extreme Cases, Negative Evidence, and Rival Explanations

According to Miles et al. (2014), seeking out extreme cases or outliers of data can help to confirm original conclusions or the findings of the research. Instead of focusing on those cases that helped answer the research questions, looking for extreme cases often provided more insight into phenomena. It helped to have a “curmudgeonly skeptic” outlook on data that defied prevailing notions of truth (p. 304). In my case study, not all student groups behaved the same way. However, seeking to understand how the student groups responded to and experienced the scaffolding of design thinking helped me to analyze the data. In considering instances of outliers, extreme cases, negative evidence, and rival explanations, I held on to several explanations, “until one of them gets increasingly more compelling as the result of more, stronger, and varied sources of evidence” (p. 308).

Following up Surprises

Inevitably, as a researcher I was surprised by some of my field experiences. Miles et al. (2014) suggest following up on surprises by: “(1) reflect on the surprise to surface your violated
theory, (2) consider how to revise it, and (3) look for evidence to support your revision” (p. 304). I investigated what, how, and why I was surprised. By seeking out instances of surprise and reflecting on these instances, I gained greater clarity of the study.

**Getting Feedback from Participants**

Miles et al. (2014) argue for the importance of getting feedback from participants in qualitative research. Commonly referred to as member checking, Miles and colleagues suggest that member checking can happen at any point during the data collection process. Both early and after the fact member checking is useful for different reasons. In my research, I member checked after group interviews that occurred at the middle and end of the data collection cycle. Because the interview questions were based on the collected student artifacts, student journals, and student video journals, the group interviews acted as member checks. Additionally, I gave the participants opportunities to read excerpts of my data analysis.

**Positionality**

As a member of the teaching faculty at The Woods School, I had intimate knowledge of the school, curriculum, the culture of the school, and students. Throughout the year, I built strong relationships with my students. In addition to my teaching position at Woods, I am a white male who attended a boarding school for high school, graduated from a private liberal arts college with a bachelor of arts in American Studies, hold a master’s degree in social studies education, and has taught in four different independent schools during my 15-year teaching career. During my teaching career, I have been a department head, a head and assistant coach for various sports from middle school to varsity level, and created two social studies curricula (Global Issues and World Geography), as well as have co-authored a geography textbook.
Subjectivity

My journey as an educator is rooted in my own learning experiences, my insights as a curriculum developer, and a constructivist, student-centered understanding of education. From an early age, I knew that I wanted to teach; even as early as third grade people would ask me what I wanted to be when I grew up, and I would respond proudly: a teacher. It was not a matter of if I would teach, but when, where, and what the subject would be. My educational path has been more like a mountaineering expedition than a walk along the beach. Very little of my education, secondary or postsecondary, has been easy; rather I have failed more than I have succeeded. However, throughout my educational experiences there have been those who have demanded excellence and would not allow for me to cut corners because they believed in my ability to truly have an impact on my students. These events, my academic struggles, and those mentors who would not let me quit, shaped who I am now as an educator.

As a student, the classes that I did well in were all student-centered, not drill and kill classes. More traditional classes were the ones where I performed the poorest and felt most frustrated. It was clear that some students were simply “good at school” and performed well under traditional models of teaching. I was not one of them. For those “good at school” students, they quickly learned how to do well at it and achieve high marks on traditional testing (Jackson, 2013). However, when the class was student-centered I found that it leveled the playing field for me. Attributes such as curiosity, grit, and creativity brought about success (Kelley & Kelley, 2013). Reflecting on my own struggles and successes, I knew that I should facilitate my classes in a student-centered manner to better serve all students’ needs (Bain, 2004; Pink, 2006). As a novice, there was only one problem: I did not know how to facilitate a student-centered curriculum.
I have participated in collaborative development and planning of curricula. In each of these instances of curriculum development, I was an active participant: reading background materials, writing proposals, thinking about the objectives of the course, questioning ideas, and trying to understand how far we could collectively push the boundaries of initiatives.

All in all, each instance when I questioned the system better helped to discern how we could better position our students in the midst of the curricula so that they could enjoy success. What is better than observing students who throw their hands up victoriously after overcoming a challenge?
4 FINDINGS

This chapter contains analysis of the data collected during the research study. Starting with a short summary and overview of the study followed by the research questions, this chapter will continue with a short vignette explaining one group’s process to complete their final art installation prototype. All names are pseudonyms. A detailed description of the seven groups in the study follows this short vignette to set the stage for how the participants experienced the phases of DtL and the design challenge.

Given my previous success as a curriculum designer using backwards design, I leveraged my experience with the work of Wiggins and McTighe (2005) to help design the Human Rights Design Challenge (HRDC). By starting with the final outcomes of the unit, this allowed me to create the necessary assignments, journals, video journals, and group check-ins, and include distributed scaffolding to help students navigate the DtL (Wass, 2015) process so that at the culmination of the design challenge, students were capable to present their art installation prototype in a professional manner, all used to inform their course assessment, and to complete the WalkLine art proposal.

Overview of Study

Starting in mid-January, students began the Human Rights Design Challenge (HRDC) with the objective to honor a person/group/organization that has promoted human rights in the city by creating an art installation for a public space. The public space was the WalkLine, a multi-use trail of converted rail lines stretching over a 20 mile loop and connecting many of the cities neighborhoods. Over the next seven weeks, student groups worked through the seven phases of DtL, a design thinking process created for middle school social studies. Within each
phase of DtL, students completed various tasks ranging from assignments, journals, video journals, and group check-ins. Assignments were the most far-reaching and open tasks that students worked on. Some assignments had students read articles or watch videos and answer questions, while others had groups brainstorm, prototype, or prepare their presentation – assignments differed depending on which phase of DtL groups were in and the next steps that groups needed to undertake. Conversely, the journals and video journals were similar throughout. In the journals, students were asked to individually respond to prompts in written form (see Appendix R); this was similar for all seven journals. The video journals were an opportunity for students to individually respond to prompts by using their iPad to record their answers; this process was similar for all three of the video journals. Lastly, the two group check-ins were in the format of a group interview. Collectively, the seventeen assignments, seven journals, three video journals, two group check-ins, and two presentations constituted the tasks students and groups needed to accomplish the HRDC. This data was collected, analyzed, and themes were identified. Three research questions helped to frame the study.

Research Questions

- What role does distributed scaffolding play in students becoming design thinkers in a middle school social studies classroom?
- How does distributed scaffolding incorporated into design thinking allow students to demonstrate their understanding of social studies?
- What are students’ experiences of, and how do students respond to, distributed scaffolding in a design thinking unit?
An Example: What Groups Produced

During the seven-week design challenge, student groups were tasked to identify a person, group, or organization that works to promote human rights in the city and create an art installation honoring their work to be placed on the WalkLine. Aside from the assignments in each phase of DtL, the journals, video journals, and group check-ins, groups finished the challenge with three significant products: an art installation prototype, presentation, and a written art installation proposal.

One of the most enjoyable and exciting outcomes for students was their art installation prototype. More than the final presentation and the art installation proposal, each group discussed on several occasions throughout the design challenge that their motivation to produce strong work was the hope of getting their idea accepted by the organizing committee and that it ultimately be installed on the WalkLine. Often when fatigue, frustration, or lack of collaboration occurred in a group, reminding the group of their goal, to get the art installation installed on the WalkLine, helped calm issues within the group and allowed for the group to proceed to the next step in the design challenge. A more detailed explanation of this outward-facing component of the design challenge, beyond the classroom, installation will take place later in this chapter as it came up during the different phases of DtL.

The following vignette describes one group and their art installation prototype. What makes this art installation different from others in this study was the journey this group went through to complete their final art installation prototype. “The Big Six” began with an idea to honor a dignitary and The Civic Center for their work on human rights. However, when pressed as to which human right and why they chose this dignitary and The Civic Center, the group struggled to come up with a strong justification for their decision. They changed ideas and came
up with the Museum of Human Rights. Again, when pressed, they could not come up with a strong justification for their idea. As they went back to the drawing board and brainstormed more ideas, they came across various pictures of soda counters during the civil rights movement.

These images and a powerful shared experience at a museum struck a chord with the group. After deciding to change their topic, The Big Six worked with their art teacher and me to come up with a symbol that best represented the civil rights movement using the images of the soda counter. As the discussions continued and the group researched more, they came across information about The Big Six – Alfred, Gordon, and Maya and asked if a poster would work. Eventually they decided to honor the Big Six, Martin Luther King Jr., John Farmer, John Lewis, A. Philip Randolph, Roy Wilkins, and Whitney Young, for their work during the civil rights. However, they were given feedback that a poster did not constitute an art installation that would hold up to the elements when installed outside.

The Big Six changed gears again and began working on the idea of a pastel mural instead of a poster. Gaining momentum with a better idea, they drew several quick mockups of this idea. When they asked for feedback on their idea, they learned that the use of pastel for the mural would prove to be difficult because pastels would still not stand up to the elements and conditions when placed on the WalkLine. In a special lunch session with their art teacher, they discussed how they might enhance their idea. At the conclusion of their discussion, they kept the mural idea of the Big Six but changed from pastels to a silhouette. Upon receiving positive feedback on their idea from their art teacher and me, they drew several more mockups.

The Big Six’s mockups showed a mural of the Big Six, half of the mural with a background of white with black silhouette and half with a black background and a white silhouette. As their idea for the art installation continued to evolve, they moved from a small mural to a 4 x
6-foot mural as the actual size for the WalkLine submission. Given the green light to start their “final” prototype on canvas, the group began by drawing an outline of the Big Six. After completing the outline, they started painting the half of the mural that was to have a white background and black silhouette. Unfortunately, the group did not communicate well enough on the different sides of the mural and made a “huge” mistake while painting. Gordon walked over to me and with a pained look on his face and said, “our group made a mistake and we need help to fix it.” When I walked over to their art installation prototype, it was clear the mistake they made. They started to make the entire silhouette of the Big Six black instead of half black and half white. I suggested that they use white paint and paint over the entire canvas, as is a typical move used by artists to reuse a canvas, and start over so they could properly execute their idea. The look of frustration and disappointment on the group’s face was disheartening because Alfred’s comment about his biggest fear during the Group Check-in 1 came true. He feared, “Messing it [the art installation] up and having to do our work over again.” Adding salt to the wound, the group realized how little time they had to fix their prototype and finish the presentation and art installation proposal. This was a stressful time for the group. Normally, this challenge would have thrown this group into chaos, but with so little time and their backs against the wall, they put their heads down and persevered. Towards the end of class, The Big Six finished painting over the entire canvas, but ran out of time to start over. I had them leave their canvas on the table to dry and told them they could begin work the following day.

At the end of the day, as I was cleaning up the room which included putting up the canvas, I moved the drying canvas to a window sill to let it dry overnight. I noticed something oddly cool about the canvas and looked over their work for several minutes. I left the canvas on the window sill for the next day. The next morning when The Big Six group and their classmates
came to class, they asked me where their canvas was so that they could get started because they had considerable work to accomplish during that class period. I sent them over to the window sill to get their canvas.

I heard Gordon from across the room telling Alfred and Maya to come over to the window. For several moments, the group looked at their work without saying anything. At just the right time during the morning, sunlight was coming through the window and their canvas was backlight by the sunlight. Figures 30 and 31 show what they saw.

Figure 30. The Big Six art installation prototype (The Big Six, Prototype).

Shortly after spending time looking at their art installation prototype, Gordon asked, “Can we use this even though it was a mistake?” We gathered the group and I mentioned that they could consider this as their art installation prototype, even though it was originally a mistake. What The Big Six did not know was that when groups fail fast and fail forward they often come up with a better idea than their original one. I suggested to them that they had just experienced some of the
best aspects of design thinking because they would never have gotten to this point unless they used design thinking – brainstorming, getting feedback, producing multiple prototypes, being willing to take risks and make a mistake. Alfred remarked in his Video Journal Present/Reflect:

I wish, I wish we were more prepared on making the art project. Um. I mean, the thing that we made, it was like a, a mistake. I mean, we didn't mean to make that. But, I am happy that we did make it that it happened to be that. (Alfred, Video Journal Present/Reflect)

Not only was The Big Six proud of their art installation prototype, they received many compliments from their classmates, teachers, and several parents. Interestingly, the group was not finished making changes to their art installation idea.

![Figure 31. The Big Six art installation prototype in window (The Big Six, Prototype).](image)

Yes, they completed their prototype and were proud of their work, but they realized, with some feedback and discussions with the art teacher and me, it would be difficult to backlight cement without spending a large amount of money on installing electrical work. As their look of excitement and pleasure quickly faded away, I suggested they look at what kind of material they could
paint the silhouette on to achieve the same effect as their prototype. They feverishly started throwing out ideas. Eventually they settled on Plexiglass. The Big Six’s art installation changed drastically during the course of the design challenge. In the end, they settled on a silhouette of the Big Six on a 4 x 6 foot Plexiglass that would be backlight by sunlight.

While the group initially saw their work as a mistake, it turned out to be a blessing that propelled their group forward to achieve the design challenge with stronger outcomes. Because the group was in a design challenge and using DtL, a version of design thinking, instead of failing as would be the case in a typical classroom when they made a “mistake,” the group learned how to deal with adversity, be flexible, and rely on their colleagues for improvement.

This vignette describes how one group worked through their art installation idea. During the process, this group succeeded and failed along the way and demonstrated how ideas and prototypes change over time. While The Big Six was an extreme case compared to the other six group’s experiences in this study, frequently, a group’s idea and their prototype changed over time – as is customary to the design thinking process.

**Themes**

Following the proposed method of data collection and analysis discussed in Chapter 3, data were organized first and then analyzed. Through the coding process – open, axial, and selective, themes were identified. Over time, themes were grouped and regrouped with two major themes: *distributed scaffolding* and *student’s experiences* which were essential to understanding the data (Figure 32). The themes and respective subthemes were divided according to how the design challenge was organized and how students/groups experienced the design challenge. By using themes in this manner, it allowed me to gain a better understanding of how students experienced the curriculum, with its distributed scaffolding.
### Distributed Scaffolding

When creating the design challenge, I intentionally spent considerable time fleshing out the activities that students would experience. Using backwards design (Wiggins & McTighe, 2005) and DtL (Wass, 2015), I created assignments, journals, video journals, and group check-ins to organize the design challenge for students. By detailing the curriculum before the students started the design challenge, it provided them a road map to follow. While there were times when changes were made to the design challenge, like combining Video Journal: Present and Video Journal: Reflect, that was only possible because the design challenge was already planned.

As I analyzed the data, I identified several components that comprised the distributed scaffolding, *presentation as prototype*, *feedback loop*, *scaffold frustration*, and *social studies content*. While three of the four themes were intentionally placed into the design challenge, I felt that these themes took on greater importance as I analyzed the data. Scaffold frustration later became a finding. This finding was identified during the data analysis because it suggested that the distributed scaffolding was either not enough of a scaffold or the wrong scaffold for the participants. This will be discussed in Chapter 5.

<table>
<thead>
<tr>
<th>Codes</th>
<th>Number of coding references</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Distributed Scaffolding</strong></td>
<td></td>
</tr>
<tr>
<td>DS: Presentation as prototype</td>
<td>192</td>
</tr>
<tr>
<td>DS: Feedback loop</td>
<td>175</td>
</tr>
<tr>
<td>DS: Social studies content</td>
<td>75</td>
</tr>
<tr>
<td><strong>Students’ Experiences</strong></td>
<td></td>
</tr>
<tr>
<td>SE: Collaboration</td>
<td>102</td>
</tr>
<tr>
<td>SE: Students’ feelings</td>
<td>364</td>
</tr>
<tr>
<td>SE: DT vs. traditional SS</td>
<td>101</td>
</tr>
</tbody>
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**Figure 32.** Selective coding list of codes.
Distributed scaffolding was defined as instances where participants utilized or experienced structures and processes that were purposefully placed into the design challenge for students to be successful. As stated in Chapter 1, the goal of distributed scaffolding is to help students learn, perform, and discuss their experiences with the learning process to create defensible knowledge claims. The distributed scaffolding supported inquiry, structured tasks, fostered communication, and promoted reflection (Hsu et al., 2014).

The need for distributed scaffolds in the design challenge grew out of my understanding that participants were novice design thinkers and middle school students, and my experience as an educator and curriculum developer. For participants to have a prototyped art installation, present to a panel of experts, and complete the WalkLine art proposal application at the end of the design challenge, they needed specific structures and processes to guide them during the design challenge (Shulman, 1986; Wiggins & McTighe, 1998). Working backwards, from the three major outcomes of the design challenge, there existed many smaller components that participants had to complete to successfully tackle the three major outcomes. However, since the participants were both novice design thinkers and learning academic skills coupled with social studies content, distributed scaffolding was used so that participants could complete the design challenge. Using backwards design and DtL, I created assignments, journals, video journals, and group check-ins to structure the design challenge. Given the 17 total assignments to navigate inquiry (Azevedo & Hadwin, 2005; Davis & Linn, 2000; Hsu et al., 2014; Puntambekar & Kolodner, 2005), structure tasks (Fretz et al., 2002; Hsu et al., 2014; Quintana et al., 2004; Reiser, 2004a), and support communication (Choi et al., 2005; Ge & Land, 2003, 2004; Pifarre & Cobbs, 2010). Journals (7) and video journals (3) fostered reflection (Davis & Linn, 2000; Hsu et al., 2014;
Quintana et al., 2005; Sandoval & Reiser, 2004). Group check-ins (2) supported communication and reflection.

The purpose of the distributed scaffolding was for groups to build a foundation of knowledge and skills over the course of the design challenge and leverage their work to create the art installation prototype, present to a panel of experts twice, and complete the WalkLine art proposal application. During Essential Bench’s Group Check-in 2, which was the last activity of the design challenge, Charles put all the pieces together:

I think one thing we didn't do is, I thought of this, but I don't know why I didn't say it, but we could've just like gone on previous assignments and done a couple copy paste exercise. We should have just copy paste our pitch into the 250-word thing [Assignment 14] ...If I could go back in time." (Essential Bench, Group Check-in 2)

While Charles missed the idea of taking the work the group had previously completed and using it to their advantage in future assignments until the end of the design challenge, he finally understood why the design challenge was organized as such. The reason why the distributed scaffolding worked for groups was because they could explicitly build on the work they had completed in previous assignments. What made this different than transfer of previous knowledge was the additional elements of design and a real-world and outward facing problem. For many groups, like Essential Bench, they were not aware they could do this until Assignment 14 for fear of self-plagiarizing. (Self-plagiarism was a point of emphasis from a unit earlier in the year when students learned about citing, MLA formatting, summarizing, paraphrasing, and plagiarism). For many groups, however, they began to use their work from previous assignments on Assignment 17.
**Presentation as prototype.** Presentation as prototype was defined as the act of participants presenting their “final presentation” to two separate panels of experts twice in one week. In most instances when groups present their work, whether in school or in the workforce, they rarely have the opportunity to give the same speech multiple times in such a short amount of time. Thus, the “final presentation” became high stakes with little room for failure. Presenting once did not fall in line with the iterative nature of design thinking (Brown, 2008, 2009; Brown & Wyatt, 2010; Buchanan, 1992; Carroll et al., 2010; Cohen, 2014; Cross, 2006, 2011; Goldman et al., 2012; Goldman & Kabayadondo, 2016; Goldman et al., 2016a; Kelley & Littman, 2001; Kimbell, 2011; Koh et al., 2015; Long, 2012; Noweski et al., 2012; Rowe, 1998; Saxe, 2008; Schön, 1983). Therefore, I purposefully included time for groups to reflect on their first presentation so they could improve their work on their second. Much like their art installation prototypes, in which groups used an iterative process during the design challenge, participants began to see the iterative nature of their presentations as a strength and not just another assignment to complete or an annoyance. Groups used the first presentation as an opportunity to fail fast and fail forward (Brown, 2009; Cross, 2011; Goldman & Kabayadondo, 2016; Goldman et al., 2016a; Kelley & Kelley, 2013; Kelley & Littman, 2001; Long, 2012), pivoting quickly to revise and improve.

Between the first and second presentations, groups received feedback in the form of comments on a rubric after their first presentation, (see Appendices Y and Z), and their presentation was recorded. Using the feedback participants received from the panelists and me via rubrics, and the feedback they received from their group and their own analysis after watching their presentation, groups had the opportunity to make changes to their presentation. While the feedback from the panelists was important for the participants, watching their presentation and filling
out the same rubric that the panelist did proved to have a considerable impact on the participants’ urge to improve their presentation. The most powerful moments came when the feedback from the panelists highlighted the same items participants also identified as areas for improvement. In those instances, participants were exceptionally critical of their work and their presentation style which proved to be the impetuous to change their presentation.

As stated earlier, I purposely included the second presentation, recording of the presentations, and reflection time into the design challenge because I saw the necessity for students to practice their presentation skills in front of a real audience (Sara & Parnell, 2004). Petrina discussed why it was helpful to present in front of experts:

Okay, so for me, it was the present days [which were the best], because, like, we got to see, like, what other people thought of it, so how we could improve it, and, so what people like, "That's a really good idea; you should stick to that one." We were kind of like, ah, maybe you could change these ten things to make it better. (Mannequins, Group Check-in 2)

By including an audience that was from outside the classroom, students recognized the real-world nature of the design challenge. The “stakes” were higher than presenting to just their teacher.

While participants were not initially expecting to present twice, when given the chance, groups jumped at the opportunity to make their presentations stronger because they recognized how much they could improve. Towards the end of the design challenge, participants explained in their journals, video journals, and group check-ins that presenting a second time was well worth the time and effort. Gordon stated this in his Video Journal: Present/Reflect:
Presenting twice was worth the time and effort because we got feedback the first time. So, we knew what to do and what to say for the second time. So, it was a lot better. And I think it was worth the time and effort because our presentation was really good and we didn't have that many group members that stopped and they didn't say their line or anything like that. So, I think it was worth the time and effort to spend on it. (Gordon, Video Journal: Present/Reflect)

Almost all the participants emphatically stated that their second presentation was better than their first. Martin remarked in his Video Journal: Present/Reflect:

> Also, [we] got very good feedback, and were thinking now, like, how this second presentation really did help us. We also prepared for, lots of feedback questions, and we prepared our idea. We really developed our idea and made it a lot more clear on how we're, um, supporting the Special Olympics. (Martin, Video Journal: Present/Reflect)

As all the participants worked to improve their presentation, but Martin used the opportunity to make sure his group’s second presentation was stronger than their first. Also, he demonstrated how his thinking went beyond just the presentation. He and his group members worked on answering questions from the panel, making their ideas clear, and how they were specifically supporting the Special Olympics. They were iterating on all their work from the previous phases.

**Feedback loop.** Feedback loop was defined as instances where a student received feedback from a teacher, expert, panelist, or group member. While most of the feedback was given in verbal form, some was given via rubric or in written form. Liza mentioned how helpful feedback was for her in her Group Check-in 2: “Um, everybody would give you feedback after you presented. Everybody will give you feedback on the way you presented” (Mannequins, Group
Check-in 2). Notice that Liza mentioned receiving feedback on their content and how they presented.

As a tool in other classes, students received feedback on their work from time to time – getting feedback on a draft of an essay and then turning in the final draft, getting a grade and perhaps some additional feedback. Following the literature for feedback in design thinking (Kwek, 2016), the difference between feedback and the feedback loop in the design challenge was the iterative nature of the feedback – timing and quantity. Kwek asserts that feedback should be: value immediate feedback (real-time or almost real-time feedback), process over product, and fluid experimentation. Zielezink (2016) suggested that feedback was exceptionally important for novice design thinkers, “the process of getting user feedback is an important reality check, a formative assessment that tells the novice designer what they have done correctly and where they could improve” (Finding Your Fit Empathy, Authenticity, and Ambiguity in the Design Thinking Classroom, No. 4 Be Mindful of Modifications, para. 1). An excellent example of how participants experienced feedback was highlighted by Laura.

One of them [frustrations of the design challenge] is how much feedback we have to get. It's like my version of things. Like, it's like my version of things. Do something, get a grade on it, done. Design thinking form of things, do something, get a grade on it, do it again, get another grade, do it again, get another grade, do it again, get another grade, and the process repeats again and again and again and again and again. And it's just like so much feedback that sometimes it makes me feel stressed out but the good parts about it are, it makes me learn more. It makes me think much more than just taking an actual test. (Laura, Video Journal: Present/Reflect)
Both Liza and Laura changed their thinking and actions during the design challenge. Remember that Liza and I had the email conversation about collaboration and on-going check-ins, and Laura “hated” that there were so many assignments. Yet, over the course of the design challenge, Liza and Laura came to value the on-going feedback that they received during the design challenge; it took time, their experience of the design challenge, and reflection for them recognize how the feedback loop helped them and their group succeed.

Another good example of the feedback loop took place during Assignment 12. It was all about the feedback that they got from Kelly the art teacher. All the groups took her feedback and adjusted their ideas. This helped all the groups by providing feedback early in the Ideas and Prototype phases. Without this many feedback loops, groups would have gone down the road with a poor or difficult idea to put on the WalkLine.

Social studies content. Social studies content was defined as instances where participants demonstrated or incorporated any of the four dimensions from the C3 Framework during the design challenge:

- D1: developing questions and planning inquiries
- D2: applying disciplinary tools and concepts,
- D3: evaluating sources and using evidence,

Interestingly, I overheard and was posed the question multiple times during the design challenge, “why aren’t we doing more social studies during social studies class?” While most participants believed that social studies consisted of reading out of a textbook, listening to a
teacher lecture, discussing wars, and taking a test, social studies content was intertwined throughout the design challenge – just not in the form that participants were accustomed.

From the beginning of the design challenge, groups collaboratively planned how they would navigate the DtL process. At various points during the challenge, groups used disciplinary tools and concepts to finish tasks. Groups demonstrated civic engagement, raising awareness, activism, and social justice by choosing to honor a group for their work promoting human rights. Geography was incorporated into the design challenge when groups considered the WalkLine space and their art installation. When students completed Assignment 14, they used economics to create a budget for work. Historically, groups had to justify why they chose a specific group to honor. Throughout the design challenge, groups gathered sources, evaluated them, and used them to develop evidence-based claims. Lastly, groups used the first three dimensions of the C3 Framework to inform how they communicated conclusions and took informed action.

Of the four social studies dimensions that participants used during the design challenge, dimensions three and four were used the most. Over the course of the design challenge groups had to identify a person/group/organization that promoted human rights in the city, develop an art installation that honored the work of the chosen subject, provide a rationale for why the subject was to be honored, prototype an art installation, present their work to two panels of experts, and apply to the WalkLine. In most instances during the design challenge, participants incorporated social studies content with academic or design thinking skills.

A great example of participants using social studies content was when groups had to explain the symbolism and user experience of their art installation in Assignment 13 and Assignment 17. In these assignments, groups had to justify why they had chosen the person/group/organization that they wanted to honor for their work in human rights. Groups had to connect how
their art installation honored their subject. Furthermore, groups were required to explain the symbolim of their art installation and how a user on the WalkLine would experience their art installation. In completing these tasks, groups had to gather and evaluate sources, they developed claims by using evidence, communicated their conclusions, and took informed action.

**Students’ Experience**

The second theme that I identified from the data was students’ experience. Based on the first theme, distributed scaffolding, students expressed how they experienced the design challenge itself. Specifically, participants expressed their experiences of learning the DtL process, feedback loop, distributed scaffolds, presenting twice, and social studies content. These experiences were organized into subthemes: students’ feelings, design thinking vs. traditional social studies, and collaboration.

**Students’ feelings.** Students’ feelings included instances where participants expressed how they experienced or felt during the design challenge. Purposely imbedded in the journals, video journals, and group check-ins were prompts that allowed for participants to discuss their experiences, positive and negative, of the design challenge. Students often used words such as fun, cool, engaged, and excited to describe their engagement with the design challenge.

Interestingly, most of the participants expressed that the design challenge was one of hardest things they had completed in school – especially Laura; however, participants remained highly optimistic, excited, and willing to complete the activities at the same time. Instead of shying away from work they deemed hard or complaining about the nature of the work, thus bringing a negative tone to the group and design challenge, students continued to express positive experiences regarding the design challenge. Miles stated, “It is a lot more fun than social studies. I
LIKE PBL!!!! Just the assignment I don’t like” (Miles, Journal 5). Often, participants would express their frustration with an aspect of the design challenge, yet in the very next statement they recognized that it was important for them to succeed in the design challenge and have a positive outlook. Laura demonstrated this notion in her Video Journal: Present/Reflect:

The next question is, if you could do this design challenge differently what would you have done differently…It's kind of mostly hard for me not to imagine doing a design challenge again because it was like so hard and like tedious, and stuff….I'm happy with my group's work. I'm happy with our prototype. I'm just really happy with what we've done, so I really don't think I actually do anything differently. (Laura, Video Journal: Present/Reflect)

Laura’s remarks exemplified the recognition that the design challenge was hard, but that the process and outcomes of DtL were worthwhile.

When asked about the design challenge and how engaged he was, Clark remarked, “Weeeeleeeeee hoooooooo. This was sooooooooooooooo oooch foooooon [sic]” (Clark, Journal 5). Interestingly, it was the outward facing and real-world nature of the design challenge that helped to draw students in and proved to be a major driving force for groups to continue their work even when they encountered difficulty. Students recognized the importance of DtL, because it extended beyond the classroom and people from outside of the community would view their work, there was a great sense of pride and “we have to do this right” attitude. The real-world problem that extended beyond the classroom and the ability to learn design thinking and to solve problems in the future continues to be a hallmark of design thinking (Brown, 2008, 2009; Carroll, 2014; Carroll et al., 2010; Cross, 2011; Estrada & Goldman, 2016; Goldman et al., 2012; Goldman & Kabayadondo, 2016; Goldman et al., 2014; Goldman et al., 2016a,
Additionally, when a group hit bumps along the way, simply reminding them of the real-world nature of the design challenge was generally enough for the group to pause and reengage in their work.

What struck me about the overwhelmingly positive experiences of the participants was how the participants recognized the difference between the design challenge and other units they had experienced in social studies and in school. Jabir stated in his Video Journal: Present/Reflect, “Yeah, this was an all-around fun project, this was a really fun experience to do and I hope we can do more of it later next year and stuff in seventh grade” (Jabir, Video Journal: Present/Reflect). As they compared their experience of the design challenge to their previous experiences of school, they recognized the level of difficulty in the design challenge, and they recognized that they enjoyed the design challenge more than many of their previous experiences in school.

**Design thinking vs. traditional social studies.** Design thinking vs traditional social studies was defined as instances where students compared their experiences with the design challenge versus social studies classes they previously had. The design challenge was all the participants’ first experience with design thinking and the DtL process.

Wolfgang described the difference between “normal” social studies and the design challenge as:

I think that my work on the design challenge is much, much different than any normal social studies project. For one, we go on much more field trips than any other social studies. In most units, we don’t take any field trips, and if we did it would be a puppet show or something else equally as random. For another, it is much more organized. In these PBL units we have everything planned out and we don’t talk about the same thing over and
over again for a period of time. Lastly (but there are many more reasons), we always end with a big thing or presentation to spread awareness and also to let the info sink in. In most other units, we just learn about it and then take a test. If you asked me in which one am I more engaged or less engaged I would say that I am definitely more engaged in PBL units because I am doing so much more work and other stuff. (Wolfgang, Journal 5)

Wolfgang expressed that the difference for him when he compared the design challenge and his other experiences in social studies was the depth of the process. Instead of reading out of a textbook and listening to lectures to ultimately take a test, Wolfgang recognized how design thinking helped position him to raise awareness and take action. He suggested that the organization of the design challenge allowed him to dig deeper into his topic. The process allowed him to combine his content knowledge with academic skills, which facilitated a stronger presentation, art installation prototype, and WalkLine art proposal application. His remarks were consistent with his peers.

Issues that did come up about design thinking and the DtL process stemmed from participants’ status as novice design thinkers. Because they were novices, they were not always sure how to proceed during the design challenge. Some participants suggested that going through the DtL process before they started the design challenge would have helped them to have greater familiarity with how it all worked. This was consistent with the design thinking literature (Carroll et al., 2010; Estrada & Goldman, 2016; Goldman & Kabayadondo, 2016; Goldman et al., 2014; Goldman et al., 2016a, 2016b; Kangas et al., 2013; Koh et al., 2015; Spencer & Juliani, 2016). However, I made the decision not to introduce DtL and design thinking before the design challenge because of time. Nathan connected his experience learning design thinking and the DtL process in his Video Journal: Present/Reflect:
It is this design process is a lot different than normal learning because normal learning, you just walk into a classroom, you sit down, and you learn something you're probably never going to use, but DtL was very helpful, like, it was very hands-on and then you would actually use stuff, like you would make an art project to make on the WalkLine, you would actually go out into the world and experience things and you wouldn't be held back by the boundaries of a classroom. (Nathan, Video Journal: Present/Reflect)

Jabir extended Nathan’s idea in his Video Journal: Present/Reflect:

Before starting this, I really wish I knew how the DtL [process worked] before we even started it. 'Cause it would be really helpful and I kind of wish I knew that before, I mean but that was the point of like teaching it to us, but if I already knew how to do it I think I would have been better at it and we could have generated more ideas. (Jabir, Video Journal: Present/Reflect)

As part of Shades of Blue, Nathan and Jabir recognized that learning design thinking through the design challenge was part of the intended learning of the design challenge. They understood that they had to go through the process as a novice before they would gain a better grasp of how to use design thinking and DtL in the future.

Collaboration. Collaboration was exemplified by the interaction within a group to work towards successful completion of the design challenge. This included the “shared meaning-making through identifying and negotiating various alternatives, constraints, and possible solutions” (Kangas et al., 2013, p. 39). While there exists extensive literature on collaboration, I am identifying collaboration with the design thinkers’ definition (Carroll et al., 2010; Goldman et al., 2014; Goldman et al., 2016b; Kangas et al., 2013). Successful collaboration was a process where “students actively work together in creating and sharing their design ideas, deliberately making
joint decisions and producing shared design objects, constructing and modifying their design solutions, as well as evaluating their outcomes through discourse” (Kangas et al., 2013, p. 31). Collaboration was a key for success for groups because participants had many opportunities to solve various problems during the design challenge together. While several groups struggled to find their groove in the beginning, Colors of Equity, Shades of Blue, and Mannequins, they became more empathic with their group members over time which allowed them to better focus on the various goals of the design challenge (Carroll et al., 2010, p. 39). Additionally, activities were created to foster collaboration throughout the design challenge.

As discussed in the participants section of the previous chapter, groups were comprised of as many students with “different backgrounds, disciplines, and prior design and team experiences” as possible (Goldman et al., 2014, p. 32). These differences posed advantages and disadvantages for the groups because “students need[ed] pointers about how to manage, massage, and capitalize on their differences in support in the instructional process” (p. 32). Additionally, participants had to navigate previous experiences with some of their group members since many had been enrolled at The Woods School for many years. Design thinking and the DtL process promoted 21st century competencies (Carroll, 2014; Goldman et al., 2012; Goldman & Kabayadondo, 2016; Koh et al., 2015; Noweski et al., 2012); as was discussed in the review of literature. Furthermore, participants had to shift from a “siloued” understanding of work and learning to the “interdisciplinary collaboration, teamwork, and active prototyping with iteration” (Goldman et al., 2016b). As this change took place during the study, some participants demonstrated elements of good collaboration, mutuality, joint focus of attention, and shared task alignment. “Mutuality” refers to reciprocity with potential for all participants to meaningfully contribute; “joint attention”, to
the degree which attention is focused by all, working in concert; and “shared task alignment”, the establishment of a collaborative orientation toward problem solving. (Kangas et al., 2013, p. 31)

Groups that developed and engaged in good collaboration had an easier time navigating the design challenge. However, groups that collaborated well together were not completely in the clear; meaning that while they were not destined to have strong outcomes – art installation prototype, present to panels of experts, and WalkLine art proposal application. Good collaboration was one piece of two pieces that if present for a group had a higher chance of strong outcomes. Figure 33 depicts which themes were present during the phases of DtL.
<table>
<thead>
<tr>
<th>Phase of DtL</th>
<th>Activities</th>
<th>Themes</th>
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<tbody>
<tr>
<td>Pre-design Challenge</td>
<td>- Master doc for design challenge</td>
<td>SE: DT vs. Traditional SS</td>
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<td></td>
<td>- DtL process</td>
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<tr>
<td>Discovery</td>
<td>- Immersion journal</td>
<td>DS: Social Studies Content</td>
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<tr>
<td></td>
<td>- Assignment 1: Organization of the design challenge</td>
<td>SE: Collaboration</td>
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<td></td>
<td>- Trip to museum and human rights organization</td>
<td>SE: Students’ Feelings</td>
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<tr>
<td></td>
<td>- Assignment 2: UDHR third grade version</td>
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<td></td>
<td>- Trip to human rights museum</td>
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<td></td>
<td>- Journal 1</td>
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<td></td>
<td>- Introduction to art terms and art installations</td>
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<tr>
<td></td>
<td>- Assignments 3-5</td>
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<tr>
<td></td>
<td>- Video Journal: Discovery</td>
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<tr>
<td>Focus/Direction</td>
<td>- Journal 2</td>
<td>DS: Feedback loop</td>
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<td></td>
<td>- Assignment 6: Topic selection</td>
<td>SE: Collaboration</td>
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<td></td>
<td>- Assignment 7: The pitch article</td>
<td>SE: Students’ feelings</td>
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<td></td>
<td>- Assignment 8: Point of view statement</td>
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<td>- Assignment 9: The pitch – individual</td>
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<td></td>
<td>- Assignment 10: Group pitch</td>
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<tr>
<td>Ideas</td>
<td>- Journal 3</td>
<td>DS: Feedback loop</td>
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<tr>
<td></td>
<td>- Assignment 11: Brainstorming art installation ideas</td>
<td>SE: Collaboration</td>
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<td></td>
<td>- Assignment 12: Feedback from art teacher</td>
<td>SE: Students’ feelings</td>
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<td></td>
<td>- Video Journal: Ideas</td>
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<tr>
<td>Research</td>
<td>- Assignment 13: Art installation symbolism</td>
<td>DS: Social studies content</td>
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<td></td>
<td>- Assignment 14: WalkLine art installation proposal</td>
<td>SE: Students’ feelings</td>
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<tr>
<td></td>
<td>- Group Check-in 1</td>
<td>SE: DT vs. Traditional SS</td>
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<td></td>
<td>- Journal 4</td>
<td>SE: Collaboration</td>
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<tr>
<td>Prototype</td>
<td>- Walk on the WalkLine</td>
<td>DS: Social studies content</td>
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<td></td>
<td>- Journal 5</td>
<td>DS: Feedback loop</td>
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<tr>
<td></td>
<td>- Assignment 15: Prototyping</td>
<td>SE: DT vs. Traditional SS</td>
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<tr>
<td></td>
<td>- Assignment 16: Prototype feedback</td>
<td>SE: Students’ feelings</td>
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<tr>
<td>Present</td>
<td>- Journal 6</td>
<td>DS: Presentation as prototype</td>
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<td></td>
<td>- Assignment 17: Script and presentation</td>
<td>DS: Feedback loop</td>
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<td></td>
<td></td>
<td>SE: Collaboration</td>
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<tr>
<td></td>
<td></td>
<td>SE: DT vs. Traditional SS</td>
</tr>
<tr>
<td>Reflect</td>
<td>- Journal 7</td>
<td>DS: Social studies content</td>
</tr>
<tr>
<td></td>
<td>- Video Journal: Present/Reflect</td>
<td>DS: Feedback loop</td>
</tr>
<tr>
<td></td>
<td>- WalkLine art application proposal</td>
<td>DS: Presentation as prototype</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SE: Students’ feelings</td>
</tr>
</tbody>
</table>

**Figure 33.** Themes from collected data.

**Phases of DtL**

In this section, I describe how groups worked through the design challenge. Organized chronologically by DtL phases, I elaborate on the themes from the previous section. Throughout
this description, events or experiences are highlighted as well as similar events or experiences had by all groups.

**Pre-design Challenge**

Students were collectively introduced to the design challenge in mid-January during a grade-level meeting time. The HRDC Student Master Google Document was shared with them digitally. Students were asked to read the master document on their iPad along with all the associated Google Documents for the design challenge (see Appendix A). After reading the master documents, students focused on the question posed to them for the design challenge: “How might we create an art installation that recognizes and/or raises awareness of a person/group/organization in the city who has worked to further human or civil rights?” In addition to focusing on the compelling question for the design challenge, students were exposed to the DtL process for the first time. There were many student questions regarding the specifics of the design challenge, the DtL process, and student groups. More importantly, students were excited by the possibility of their art installation to be publicly viewed on the WalkLine and that their work could potentially be funded through the WalkLine art proposal grant.

**Discovery**

According to the Discovery phase of DtL, students were to immerse themselves in the design challenge. Groups explored different current issues, events, and problems such as human rights issues. They located resources and interviewed experts and continued to build knowledge. Lastly, groups journaled what they learned and what questions. All the groups finished the discovery phase in a week and a half.

**Immersion journal.** Participants completed the immersion journal after taking a field trip to a local design museum and hearing from six different individuals/organizations regarding
their work with human rights in the community. Students participated in several simulations around topics of LGBTQ, mental health and suicide, Special Olympics, aging and elders, homelessness, and the learning disabled. One of the museum exhibits taught the students about user-centered design by demonstrating how designers created a patch that could give immunizations. At the design museum, students prototyped a handle for a utensil that could help those that struggle to use a common fork, spoon, or knife. This was the first instance where students were asked to create a prototype for a user/stakeholder other than themselves.

**Assignment 1: Organization of the design challenge.** This assignment was quick and easy for groups to complete – it was constructed as such so that participants and the group felt a sense of accomplishment to spur motivation and collaboration. In Assignment 1, groups were tasked with setting up the organization of their Google Drive folders for the design challenge. Groups created a shared folder and granted editing privileges to all group members and me. All group work for the design challenged was stored in this private folder. Individual work was placed in a separate folder and only shared with me. Using the Google Apps for Education Suite, participants had the ability to collaborate on the same document in shared folders using their individual iPad. Therefore, students frequently worked synchronously and asynchronously if they did not have Wi-Fi access. Additionally, each participant made a separate individual folder in their Google Drive where they placed their journals and video journals and shared that folder with me; this private folder gave participants the opportunity to engage in an individual conversation with me. This assignment created an organizational structure for participants and groups so that they could quickly find their work and collaborate seamlessly.
Trip to museum and human rights organization. The entire sixth grade went on a field trip to a local museum and human rights organization, The Civic Center. There the students engaged in several simulations that highlighted the organization’s work throughout the world. Serendipitously, while touring the museum we met a prominent dignitary and his wife after they gave a press conference. As the press conference concluded, the they took time out of their busy schedule and talked with our students asking them what they were working on and what school they attended. Unquestionably, this was a highlight for many participants. One participant, Alfred, even garnered enough courage to ask the dignitary for his autograph – he obliged.

When I, well, when you first told us about it, I was like, "Eh", it's not a big deal. Like, well I didn't really know that much about him. But um, when we went to The Civic Center I was like, "Wow, he did all that stuff?" And I was like, "Whoa. I need to meet this guy." So um, when he was walking by, I was like, "Oh my God. That's him! Yes!" Okay, so then I walked up to him and like said, "Hey, can I get your autograph?" And then I got his autograph and I was uh, very happy and my heart was pounding the whole time I was talking to him. (Alfred Video Journal Discovery)

For Alfred and the rest of the students, meeting a dignitary and his wife was a magical moment for them. Many of the participants stated that meeting them was one of the highlights of the entire design challenge.

Assignment 2: UDHR third grade version. In this assignment, students were asked to read the Universal Declaration of Human Rights created by the United Nations in 1948 (United Nations, 1948). After reading the UDHR, groups watched several related short videos on the history of human rights and the importance of human rights around the world. Groups were tasked with creating a translated version for third graders. If students could interpret the UDHR and
translate its 30 articles so that a third grader could comprehend the UDHR, they would have a better understanding of human rights. Article V of the UDHR states: “No one shall be subjected to torture or to cruel, inhuman or degrading treatment or punishment” (United Nations, 1948). See figure 26 for examples of how groups translated this article for third graders.

<table>
<thead>
<tr>
<th>Group’s Translation of Universal Declaration of Human Rights Article V</th>
</tr>
</thead>
<tbody>
<tr>
<td>No human on Earth should be treated in a harmful and mean way, and should not be yelled at or hurt without a good reason. (The Essential Bench)</td>
</tr>
<tr>
<td>No one should be tortured for punishment. (Colors of Equity)</td>
</tr>
<tr>
<td>No one should be tortured in an evil way. (Together)</td>
</tr>
</tbody>
</table>

![Figure 34. Group Translation of UDHR Article V.](image)

Each group’s translation of Article V differed slightly, but the major point of the article existed in each translation – humans should not be tortured or punished unfairly.

It should be noted that this assignment has been used as a summative assessment on human rights and this demonstrates the complexity and scope of the design challenge. However, for this design challenge, the goal of this assignment was to expose students to the UDHR and the 30 human rights articles agreed upon by the United Nations in 1948. Using the UDHR as the foundation of the project allowed students to reference the UDHR as they worked through the rest of
the design challenge. Without exposing students to the UDHR and discussing that the United States did not sign the document (social studies content), students would have had to identify human rights abuses and understand the work of those that are working to promote human rights in the city without any historical context. Geneva explained in her Video Journal: Discovery,

What piece of information do you wish you knew before starting the discovery phase?"

Um, I wish I knew more about civil and human rights, because Todd was like, "Well, does anyone know what civil and human rights are? And do you know how many there are? And did you know that people violate them?" I was like, "Oh, let me think about that, before I started this whole unit I was like, "Oh, what are civil and human rights? Why don't I know them?" And I didn't ... When I started this, I didn't even know that there were 30. I thought there were like, I don't know, 100, but like we've learned, we've grown, we've processed more information. (Geneva, Video Journal: Discovery

Geneva critiqued the DtL process in her statements regarding learning about human rights. She suggested that learning about civil and human rights, in particular the UDHR, should have taken place before the design challenged started so that she could have leveraged the knowledge, social studies content, during the Discovery phase of DtL. Geneva’s comments as a novice design thinker, follow the process described in design thinking literature (Goldman et al., 2014; Koh et al., 2015; Razzouk & Shute, 2012b; Zielezinki, 2016).

Trip to human rights museum. Students headed off campus to visit another museum in the city which focused on civil and human rights. While many students had studied the civil rights movement in the United States, many were unaware of the scope of human and civil rights abuses throughout the world and in the United States. The museum in its entirety proved to be a powerful experience for the students. Two exhibits that had the most impact on the students per
Journal 1 and Video Journal Discovery analysis: a map of the world that denoted where human rights abuses occurred and a soda counter simulation. Jabir’s and Zell’s comments on their experience of the soda counter best explained the experience of the students.

The most powerful experience was the soda counter. It was because it made me think that people had to experience the things that I heard [about in social studies class]. It was also powerful reading about all the civil rights leaders and what they’ve done for humanity. It made me think about how much bravery it must have taken to sit at a counter knowing you would take abuse and be spat at. It also got me angry that this was a period in history happened. (Jabir, Journal 1)

And Zell:

The most powerful experience at the museum was the soda fountain. I knew that people protested peacefully, but I never thought about what they went through until I was in line waiting to put the headphones on. That’s when I thought about how it must have felt. When I put the headphones on, I heard a voice on the left side of my ear it was telling me to stay calm. Then the other voices came. They started kicking my stool and yelling nasty things like they are going to stab a fork in my neck. During all of this I knew I was safe, but the people that actually did this were beaten and had horrible things done to them. The soda fountain made me think about how horrible people were and I also thought about how brave the peaceful protesters were. (Zell, Journal 1)

The simulation was emotional, Laura extended Jabir’s and Zell’s comments when she wrote “It made me feel really scared that not only this had happened in the past, but this is still happening in some places. It also made me realize how mean people could be, for no reason at all” (Laura, Journal 1). After students experienced the soda counter, several students were emotionally
shaken. Classmates recognized the power of the simulation for some of the students and comforted them with hugs and talked about their experiences together.

In contrast to the soda counter experience, students interacted with the map of countries colored-coded based on human rights abuses with less emotion. Geneva relayed in her Video Journal Discovery:

So there's like red, yellow, or orange [that countries are colored on the map]. Red meant people were violating human rights in that country. Orange meant it was a, like, in the middle and yellow meant it was like, there were [some] human rights violated. All across the Middle East it's like most of them is red and orange, 'cause people violate other people's human rights, but in the United States it's yellow, 'cause like [few people] violate human rights because they know that they will get in serious trouble for that. (Geneva, Video Journal Discovery)

Students accepted that much of the Middle East, parts of Africa and Asia were colored red; denoting numerous human rights abuses. Yet, they were amazed that the United States was yellow which indicated current human rights abuses. Students asked what kind of human rights abuses were taking place in the United states compared to the rest of the world, which helped to spark a larger conversation about promoting human rights.

Journal 1. At this point in the design challenge, students had many different experiences: three field trips, six different individuals or organizations visited campus and spoke with the students about their work promoting human rights, and they completed the UDHR third-grade translation. The goal of Journal 1 was for students to reflect on what they experienced so far during the design challenge. The journal included five prompts (see Appendix R). It was important to give students opportunities to journal about their experiences. To prompt students to take the
time to look back think about their work and experiences. By reflecting, students made connections between their work and the goals of the design challenge. They demonstrated metacognition by putting ideas into their own words (Carroll et al., 2010; Estrada & Goldman, 2016; Koh et al., 2015).

In Journal 1, Jabir and his classmates defined human and civil rights in their own words. Jabir used his definitions to explain the difference between human and civil rights in his Journal 1:

Human rights are rights you have for just being human like to not be put into slavery or be beaten. Some human rights include basic human needs like the right to have food and water. Civil rights are more rights that you get through the government or society you live in like the right to vote the right to free speech and the right to practice your religion.

(Jabir, Journal 1)

In Journal 1, Jabir went beyond parroting back a definition for human and civil rights given by a textbook or video and put it into his own words. This demonstrated his understanding. After defining these terms, students were prompted to discuss which human right they most wanted to work to solve.

When prompted about which human right they would like to work to solve in the future, students used their knowledge of the UDHR to write their response:

- I would like to work on “Everyone has the right to freedom.” (#13) because people are being forced out of there \textit{sic} countries not having the freedom of speech to stand up for what they want. People are being arrested and not being able to have the freedom to say that they aren't guilty. People are being shot on the streets without ever having the freedom to know what they did wrong. (Zell, Journal 1)
The human right I want to work on solving is number thirty because it is like the core human right for all of them and if everyone has all their human rights than they will live a happy human life the way they want to. (Jolie, Journal 1)

I would like to work in the second right, which is “These rights belong to everyone no matter what and will not be broken” I want to work on this one because it is very powerful and, this right is broken a lot across the world and that not ok. (Charles, Journal 1)

Zell, Jolie, and Charles connected their knowledge of the UDRH which took place in Assignment 2 with a human right they were passionate about. In their journal responses, they demonstrated how they were building off previous assignments, experiences, and the distributed scaffolding in the design challenge.

**Introduction to art terms and art installations.** Taking an interdisciplinary approach in the social studies and in art class, students were exposed to art terms that they would use later during the design challenge. Terms such as scale, social commentary, emphasis, and space (positive and negative) were defined and discussed. Additionally, students defined the art installations itself. With their art teacher, they reviewed art installations of various sizes from around the nation and in the city. Discussions centered around symbolism and experience to support students’ future explanations during the design challenge.

Interestingly, when analyzing the data, little came up in journals, video journals, or group check-ins regarding the students’ experience discussing art terms and art installations. They did not connect the lesson to the larger design challenge; yet it was an important part of the process. Without exposure to these terms and what an art installation could be, students would not have gained the knowledge they would need to develop their own art installation.
**Assignment 3 – 5.** These assignments are presented together to provide a stronger foundation during the Discovery phase of DtL. In Assignment 3, students read an excerpt from *Lies Across America* (2010) by James Loewen on Stone Mountain – a local historical space with public art. Students had two main comments about the reading. First, most students did not know that Stone Mountain had a checkered past with the KKK and racism – during its history it was more than a private park and a place to hike as it is now. Second, many struggled to see why they were learning about Stone Mountain when they were supposed to create an art installation for the WalkLine. Participants found the information interesting but not connected to the goal of the design challenge. Unfortunately, many groups did not make the connection between the art installation on Stone Mountain and the art installation they were tasked to create for the WalkLine. A potential way to change this would be a field trip to Stone Mountain.

In Assignment 4, groups watched a TED talk by Ngozi Adichie titled *The Danger of a Single Story* (2009). In the talk, Ngozi warned the audience of subscribing to a single story of an event, place, or person. She claimed, the danger of a single story led to stereotypes and misinformation because there existed more than one story about an event. Ngozi, a Nigerian woman who attended college in America, discussed several instances where she was stereotyped based on this single-story type narrative. This TED Talk, along with the excerpt of Stone Mountain from Assignment 3, necessitated that groups used historical thinking, “an approach used in the social studies as a method of teaching history in a rigorous, contextual, and realistic way” (Sullivan, 2007, p. 1), to dig deeper into the person/group/organization they planned to honor for their work with human rights in the city (Barton & Levstik, 2004; Foster & Yeager, 1998; Saye & Brush, 2007; Seixas, 1993; VanSledright, 2004). The Mural of Acceptance group commented when making the connection between Assignments 3 and 4 that, “do not just assume something is the
way it is” (Mural of Acceptance, Assignment 4). This suggested that there existed more than one story or interpretation for historical events, and they needed to be aware of that idea of multiplicity as they prototyped their art installation.

Assignment 5 was the last assignment of the Discovery phase. In the assignment, groups learned about the WalkLine. They took a virtual tour of the WalkLine, looked at current art installations, read the art installation proposal application, and watched a TED talk from the WalkLine creator. Many groups were familiar with the multiuse trail and acted as though they had spent considerable time on the WalkLine; however, that was not completely true. While some group members had spent time on the trail, virtually no one had taken any time to look at or interact with the art installations. Additionally, when participants had the opportunity to dig deeper into the WalkLine’s website to learn more about the trail and its art on the trail, the groups glossed over much of the information based on the amount of time they spent working on the assignment. This was a missed opportunity for the students to leverage this knowledge later in the design challenge. Also, it was a missed opportunity to scaffold knowledge about the WalkLine. Assignment 5 provided multiple resources for students to dig into research and there were questions that students were required to fill out, but the questions did not help the student go beyond surface level observations.

Assignments 3, 4, and 5 were important parts of the Discovery phase of DtL exposing students to historical thinking in Assignments 3 and 4, and exposing students to the WalkLine using distributed scaffolding. Students had a stronger foundation and conceptual understanding to generate with an art installation to honor a person/group/organization that promoted human and civil rights than if they had not completed the assignments. Interestingly, during data analysis, I found that students commented little on these three assignments in their journals, video
journals, or during group check-ins. Furthermore, there existed few instances where students recognized that these assignments broadened their understanding and knowledge that they could leverage later in the design challenge even though they would use what they learned in future assignments.

Even though participants did not discuss these assignments in great detail, I observed engaged participants during the Discovery phase. It was common for our classroom building to have visitors throughout the day and in several instances when an admissions tour came through the classroom space, groups were not distracted at all. In one instance, students did not even look up from their work and when prompted to engage with the tour, they struggled to transition from their work. Later that day, the admissions director asked me what the groups were working on because she was taken aback by how “laser focused” they were. When I explained that they were working on the design challenge she was intrigued and we ended up having a long conversation about what the students were learning.

**Video journal discovery.** Unlike material from Assignments 3, 4 and 5, the Video Journal Discovery provided extensive opportunities for analysis of the student responses to the prompts. Like the journals, this was an opportunity for students to reflect on their work and the experiences thus far. Overall, the students enjoyed this video journal because it was very different than other DtL assignments. Students could answer the prompts or discuss something else that was on their mind, for most, they stuck to the prompts provided.

This set of video journals, and the three others that took place later, provided insight into students’ experiences. Below are three excerpts from three different video journals.

I really liked the discovery phase. It was like opening a book for me, like you know when you read a book, you like see a book cover, you're like, "Ugh, I don't know maybe I don't
want to read this book." And I was like that for the discovery phase. I was like, "Oh, I don't really want to do this, because this doesn't seem very fun." But once I journeyed into it and learned more about civil and human rights I was like, "Whoa, this is a real problem and what can I do to help? What can I do to solve a real-world problem that's happening right now?" (Geneva, Video Journal Discovery)

For Geneva, as was the case with most of the participants, they were slightly apprehensive when they began Assignments 2, 3, and 4 because they did not know exactly what they were being asked to do beyond creating an art installation. Their apprehension was typical of novice design thinkers (Goldman et al., 2014; Koh et al., 2015; Razzouk & Shute, 2012a; Zielezinki, 2016). As Geneva and the participants continued to progress through the Discovery phase, they became more engaged in their work because they realized that human and civil rights abuses were a real-world problem and they had an opportunity to honor those working to promote human and civil rights. Similarly, Nathan was engaged in the Discovery phase and wanted to know what he was going to do later in the design challenge. But, his comments in his video journal focused on experiences, getting out into the real world, and learning.

Now the discovery process is basically instead of sitting in your classroom and doing work, you're actually going out into the real world and discovering problems and ways to fix it. Like just last week I went to the museum and human rights organization and I learned probably as much or maybe even more than I would if I just sat in the classroom. Like I learned so much and I had first hand experiences and that's part of my favorite thing about it. And I feel like once I go into high school I'll probably still remember that moment in middle school where I was doing that. But if I were sitting in a classroom, I'd probably forget that in like a week and that doesn't really help. Especially since your
teachers are trying to make you remember things. And that, that just really helps a lot.

The discovery process is such a good process, it's so helpful and it's, it's not perfect but right now I can't think of anything that would be better than it. It's really cool. Um, hm ...

So information that I wish that I knew going into the discovery process was like I didn't know what I was going into. Like if I knew what was gonna happen, it'd be probably much easier for me. (Nathan, Video Journal: Discovery)

Nathan acknowledged real-world experiences as important for his own learning. While he has previously experienced textbooks and lectures in the past, he believed that the Discovery phase was a better way for him to learn because he was really learning and he felt like he would remember what he learned for years in the future. Similar to Nathan, Jolie was engaged in her own learning. Her comments in her Video Journal: Discovery were hopeful and optimistic. She focused on events, speakers, and field trips.

Well the discovery process was really interesting and inspiring for me 'cause I learned, um, many more things that I didn't really know about the human and civil rights, and it made me, like, know more facts, and it made me, like, more, inspired and stuff things like that. And I loved meeting the wonderful people at the museum and human rights organization including [the dignitary] and [his wife], and, um, the wonderful tour people there. And I also love meeting the people at the Museum of Human Rights. And I really loved meeting them, and, like, it was really helpful when all those people came in for us and told about other civil rights and human rights around the world. And it was really helpful information, and probably the best part about the discovery process was probably when we went to the Museum of Human Rights and it made me really sad, but it made me have
a better feel of how I can make a difference. And what I wanted to change about the discovery phase was probably to, have more people come in and tell us more about, like other things more opening people, maybe like other people that are helping in the world, that have made a difference, maybe, 'cause it's like when I went to the museum, I actually saw some of these people I hadn't heard of before, and it was, like, better if I already knew them. I knew some of them, but not all of them, and then I also wish we had a little bit more field trips on the discovery process, and I think all of the field trips we took were really great, but I think I could have used a little more field trips for more information outside from our classroom. (Jolie, Video Journal: Discovery)

Martin and Jolie suggested that field trips and speakers along with their classwork work helped them to extend their learning. Furthermore, what set their comments apart was the critique of the DtL process that they wanted more field trips and speakers during the design challenge. Their experiences outside of the classroom were more than their experiences in previous social studies class; however, they wanted even more. Martin explained that by exploring in and out of the classroom and the exposure to new experiences helped to learn even more than if he had just stayed in the classroom like a more traditional teacher-directed social studies class.

What do you want change about the discovery phase? Well, that's pretty hard 'cause I really liked the discovery phase, so I don't know what I'd want to do. Maybe, uh, we could maybe (clears throat) go on more class experiences, and make own parts to learn about. So, we'd make our own discovery, and then show it to the other groups. So, we would go into groups, and then we would make our own little discovery phase part, and then we'd have other groups explore that to learn even more. That way we'd be maximizing how much we learned. The discovery phase was, uh, very well prepared. Maybe we were to
get information about what we're gonna do in the end, and some stuff to look for so that will help us. Also, we could get information on how this will help us in the end, and, um, how it will make our project better. (Martin, Video Journal: Discovery)

Martin echoed the vagueness that Nathan and Geneva commented on during their Video Journal: Discovery. He extended the sentiments of Nathan and Jolie about their investment in their own learning and how the Discovery phase’s structure helped to discover new knowledge and “maximized” what he had learned.

**Summary of Discovery and themes.** The overall optimism, engagement, and apprehension expressed by the students during the Discovery phase connected to the SE: Students’ feelings theme. There was an overall positive vibe from each group and from each social studies section; especially in their Video Journal: Discovery. While they did not comment on how some of the assignments helped them to learn or propel them forward in the design challenge, they were following the process and excited to move to the next phase of DtL.

**SE: Collaboration.** The Discovery phase gave groups several easy opportunities to collaborate – contributing to the SE: Collaboration theme. Participants quickly moved through the Discovery phase, many stating that they were ahead of schedule and easily keeping up with their work. Miles’ comments reflected the sentiments of the participants,

For [assignments] three, four, and five, I feel like we really knocked that out. We got the information and we just went straight for it. We knocked it all out and um, that kind-that felt kind of good. I mean, I was just able to get it all done with. That's a good feeling when you know you can just do the work and get it done with without trying to struggle.

(Miles, Video Journal: Discovery)
Groups were excited that they were succeeding in the DtL process, they were engaged and not easily distracted.

**DS: Social studies content.** Participants demonstrated knowledge gains in social studies content supporting the DS: Social studies content theme by referencing the UDHR and its articles when writing about which human right they would like to focus on for the design challenge. The Discovery phase was intended for participants/groups to enjoy success, explore issues of human and civil rights, and build the foundation for the rest of the design challenge.

**Focus/Direction**

In the Focus/Direction phase of DtL, participants worked to develop their knowledge, going from a broad field set of questions to a specific set of questions. They looked beneath the surface of their discovery to develop deeper understanding of their work. For example, groups chose a user/stakeholder and developed empathy for the user/stakeholder by observing and interviewing them. Groups synthesized information and chose a direction for future work. Lastly, groups composed a “needs” or “point of view” statement. During this phase of the DtL process, groups began to make strategic decisions that changed the trajectory of the design challenge. This was the phase where groups started to make their own path. Depending on how groups decided on the person/group/organization to honor for the work promoting human rights determined how successful groups were at the end of the design challenge.

**Journal 2.** As groups started the Focus/Direction phase of DtL, Journal 2 prompts focused on the day-to-day upkeep and organization. Included in the prompts were questions addressing areas of confidence and areas of concern. As participants wrote several similar ideas emerged from the journals: engagement with the work, positive sentiment of group collaboration,
excitement over creating an art installation for others, fear of not finishing assignments or turning assignments in late, and fear that their art installation will not be good enough since they were only in sixth grade and not professionals. Laura’s journal articulates many of the ideas that emerged from Journal 2:

I am most confident about actually getting started on the art piece because I have always been an artistic person. I am also excited about choosing our topic and deciding what we are going to do, because when I work on a long-term PBL like this I like to know what our main goal is. I know that our main goal is to create an art piece that represents a human rights organization, but it's satisfying to know what exactly your main goal is. Or at least to know what organization you're going to be representing. It concerns me how many assignments we have. I know that it isn't really that many, but it feels like a lot. But I think my group can manage it pretty well, though, because it’s Wednesday, and my group has completed the assignments that were due Friday already. And I actually kind of enjoy them. So, the only reason I’m concerned is that I feel like I will forget to turn them in or something like that. But I'm going to work extra hard to make that not happen this PBL. There is nothing more satisfying than pressing that done button. I think that overall I am keeping up with my work very well. Every night I work on a little bit and eventually it pays off. That resulted in me being done with all I need to do before the due date and me not even feeling stressed. (Laura Journal 2)

Laura’s satisfaction for turning in assignments was important for her and the rest of the participants. It gave her a sense of accomplishment and proof that she and her group were progressing through the design challenge. This highlighted the necessity for more distributed scaffolding in assignments because as novice design thinkers, they were not familiar with the design thinking
process and needed to achieve success, by turning in assignments, along the way instead of being forced to wait for the larger payoff when completing the design challenge in its entirety. Laura was not alone in these sentiments. Below are excerpts, from Focus/Direction: Journal 2 that highlight participants’ confidence and concerns.

Confident Responses from Focus/Direction: Journal 2:

- “I think what I am very confident about is trying to make our art tell a story” (Alfred, Journal 2)
- “I can’t wait to work with my team to create something that none of us could’ve thought of and something others can relate to” (Nathan, Journal 2).
- “My group members are ROCKSTARS they work very hard and so far, get everything done on time. To be honest I'm struggling to keep up” (Charles, Journal 2).
- “I am most confident about working on the ideas for what we are planning on doing for the challenge. I think it will be cool to dig deep into the symbolism” (Zell, Journal 2).
- “I am most confident about coming up with ideas for the installation art on the WalkLine because I think my group members and I can come up with some cool ideas” (Mac, Journal 2).

Concerned Responses from Journal 2:

- “The concerns I have in this design challenge is when we start a design for our project, we mess up really bad somewhere and we have to start all over” (Jolie, Journal 2).
• “The thing that most concerns me that we will not finish on time. I feel like I have turned everything on time but I feel it might get harder going further into the assignments” (Phil, Journal 2).

• “What concerns me most is whether or not my group's project will look good because we are amateurs and have never done anything like this” (Sol, Journal 2).

There was a love/hate relationship with assignments. Participants recognized the importance of the assignments and turning them in because the sense of satisfaction it gave them and what they were learning, but felt that there were too many. This kind of comment came up several times throughout the design challenge, this was just the first time that it was highlighted by over half of the participants.

Assignment 6: Topic selection. Groups were asked to locate three art installations on the WalkLine that they enjoyed the most. Also, students brainstormed what person/group/organization they were going to honor for their work promoting human or civil rights. Groups looked through a picture gallery of art installations on the WalkLine. While one group, The Essential Bench, took their time looking through the gallery, the other groups hastily chose from the gallery. I told the groups on several occasions to dig into the gallery and spend time with each photo of an art installation before they decided. It was clear that all but The Essential Bench group had a hurry up and finish mentality during this portion of Assignment 6 because of the rationale used by groups to describe their favorite installations.

In the second part of Assignment 6, groups embarked on their first brainstorming experience where they followed the brainstorming rules as defined by the d.School (Hasso Plattner Institute of Design at Stanford, 2016). Groups watched a video that demonstrated how to brainstorm and included the eight rules for brainstorming (see Appendix F). Using the brainstorming
process, groups worked to decide on a person/group/organization to honor for their work promoting human and civil rights.

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Participant Names</th>
<th>Person/Group/Organization to Honor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colors or Equity</td>
<td>Zell Miles Sarah</td>
<td>LGBTQ Advocates (pseudonym)</td>
</tr>
<tr>
<td>The Big Six</td>
<td>Alfred Gordon Maya</td>
<td>The Big Six</td>
</tr>
<tr>
<td>Shades of Blue</td>
<td>Edwin Geneva Jabir Nathan</td>
<td>HELP (pseudonym)</td>
</tr>
<tr>
<td>Mannequins</td>
<td>Liza Petrina Phil Sanders</td>
<td>Homeless Mission (pseudonym)</td>
</tr>
<tr>
<td>The Essential Bench</td>
<td>Charles Clark Jolie</td>
<td>Fresh H2O (pseudonym)</td>
</tr>
<tr>
<td>Mural of Acceptance</td>
<td>Jason Laura Mac</td>
<td>Special Olympics</td>
</tr>
<tr>
<td>Together</td>
<td>Martin Sol Wolfgang</td>
<td>Special Olympics</td>
</tr>
</tbody>
</table>

Figure 35. Group's brainstorming of person/group/organization to honor.

Six of the seven groups were successful during their brainstorming because they came up with a person/group/organization to honor. The Big Six struggled the most during the process while in contrast The Essential Bench masterfully brainstormed. The difference between the two groups was that The Essential Bench group took a little time before they started the brainstorming process and Google-searched organizations located in the city that worked to promote human or civil rights. This allowed the group to find organizations that other groups were not aware of during the brainstorming process which gave them more options to choose from – further description of The Essential Bench’s brainstorming will be discussed during Assignment 11. The rest fell somewhere in between.
The Big Six immediately started the brainstorming process but struggled to come up with more than a few ideas that were centered around field trips they had taken and the guest speakers who came into to talk even though they knew the constraints of the design challenge where they were to choose a person/group/organization not a museum. As discussed earlier in this chapter, The Big Six initially chose to honor two different museums, The Civic Center and The Human Rights Museum. This group struggled to conceptually understand the directions of Assignment 6. While this was their initial idea, when they came to me for approval, we sat down and discussed how they must dig deeper into the moments that had the most impact on them while visiting the museums. Instead of picking a person/group/organization that they learned about during their museum visits, The Big Six could not get past honoring one of the two specific museums which led to some frustration and tense discussions. Eventually they decided to honor the Big Six for their work promoting civil rights.

**Assignment 7: The pitch article.** Before writing the pitch, groups completed Assignment 7 which included a video with an example of a strong elevator pitch and an article describing how to create a pitch. Groups completed this assignment quickly without much fanfare. After deciding on what person/group/organization to honor, groups were tasked with writing a pitch to justify their choice.

Unfortunately, much of the information from the article and example video did not transfer to their group pitch in Assignment 10. Since participants had not given an elevator pitch before, the article and video were intended to provide an example and details how to write and give a strong pitch – a foundation for them to build academic skills of writing and presenting a pitch. If the students had incorporated more of the information from the article and video, their group
pitches would have been stronger. More will be discussed about the group pitch writing and presentations in Assignment 10.

**Assignment 8: Point of view statement.** Assignment 8 built off the Assignment 7. Groups were tasked to write a point of view statement (POV) in Assignment 8. In the DtL process, students had the opportunity to write one of two statements: a needs statement or a POV. When I created Assignment 8, I made the decision that groups would create a POV instead of a needs statement. Since groups had not met with the person/group/organization they were honoring with an art installation they were unable to create a needs statement. Additionally, since they did not interview people who spend time on the WalkLine, they were unable to write a needs statement for those who experience art on the WalkLine. Instead they wrote a POV.

There exists a nuanced difference between a POV and a needs statements. The POV consisted of observations from the student group’s view point, not the thoughts or the needs of user/stakeholder. Unlike in d.School graduate level courses such as *Extreme by Design* where students learn the design thinking process and then were sent to different parts of the world to observe the problem first hand, in K-12 education the POV continues to be a better option to write since it comes from the point of view of the designers.

Even though groups were tasked with writing the easier of the two statements, the POV, this assignment proved to be extremely difficult for groups. Groups worked through the prompts of the POV:

- We were tasked to…
- We were amazed to discover…
- It would be game-changing if…

Here are two examples of POV statements:
• To make a project that reflects on civil rights and human rights. We can present it to the American [WalkLine]. We try to make our art symbolize something that has to do with human and civil rights. We were amazed to discover that Stone Mountain was the second place where the KKK started their attacks. The government was trying to promote segregation. The separation of white and black and schools and how white people had less laws then black people and black people had a lot more rules than white people. It would be game changing if we had restaurants, schools, water fountains, bathrooms, buses and houses of black and white and see the differences between black and white.

Our ultimate goal is to finish this project. (The Big Six, POV)

• We were tasked with creating an art installation that represents a person, group, or organization who fights for human/civil rights in [the city]. We were amazed to discover the work HELP does with humanitarian crisis, and in particular with girls’ education around the world. It would be game changing if we could honor the work in women’s education that HELP does around the world. (Shades of Blue, POV)

There was notable contrast between the two POVs. The Big Six’s POV was not streamlined and was not consistent with the group they chose to honor. Moreover, the POV provided evidence that suggested that group did not fully understand the civil rights movement and its placement in American history compared to the POVs of the other groups. The POV submitted by The Big Six received eight feedback loops by me. Conceptually they struggled to understand the need for the POV and how it would focus them as they continued through the design challenge. In contrast, Shades of Blue’s POV was streamlined, highlighted the organization they planned to honor, described why it was important to honor HELP, and provided a mission statement for the remainder of the design challenge. Interestingly, this POV was not approved until after the group
moved on to Assignment 9. After realizing that Shades of Blue had not turned in Assignment 8 and had not received approval for their POV, they stopped work on Assignment 9 and went back to finish their POV. Even though this POV took multiple drafts and feedback loops, Shades of Blue finally created a strong POV which provided the group with a mission statement for the rest of the work during the design challenge.

Overall, groups quickly went to work and completed the prompts. When groups believed they were finished, they brought their POV to me for approval. I gave feedback to each group and asked them to rework sections that I commented on. Interestingly, groups only went back and worked on the sections I made suggestions on and did not look at the entirety of the POV before coming back for approval. Groups quickly realized after they received the feedback that they must streamline their entire POV; this was not an easy task. Groups went from not caring about the words they used to scrutinizing every word to determine how important it was to their POV. Assignment 8 took longer than groups expected. For some groups, it took well over an hour – the better portion of two class periods to complete the POV. Groups began to speak negatively of Assignment 8 using a tone of anguish and frustration because groups “got stuck in the feedback loop.” On average, groups sought approval for their POV between eight and ten times. Mac commented on writing the POV as, “We had to come up with these three sentences. I never knew three sentences could be so hard to come up with” (Mac, Group Check-in 1). Each time they received feedback on how to change their POV to make it better before finally they received approval to turn in Assignment 8 and move on to the next assignment.

Assignment 8 was a turning point for many groups. Several groups faced adversity going through multiple feedback loops with resilience and understanding that a strong POV would help the group later in the design challenge (Shades of Blue, The Essential Bench, Together, and
Mannequins) which helped them to write better POVs, while other groups became frustrated with the process (The Big Six, Mural of Acceptance, and Colors of Equity) and struggled to write a quality POV. When groups became frustrated, they often bickered with each other and their ability to collaborate suffered. Often, in the struggling groups, one group member worked meticulously on writing the POV while other group members watched on their iPads. In moments when groups bickered with each other, I sat down with the group and brought them back together to discuss how best the group could complete the POV and ultimately turn in Assignment 8. The conversations with struggling groups were important so that they did not fall further behind the timeline for the design challenge.

**Assignment 9: The pitch – individual.** Now that groups had their POV from Assignment 8 and completed Assignment 7, participants were tasked with writing their own two-minute pitch justifying why their group chose the person/group/organization to honor with an art installation. Because of the timeline of the design challenge, participants began writing their individual pitch in class, but much of this assignment was completed at home. In writing an individual pitch it provided an opportunity for participants to demonstrate academic skills and social studies content by composing a script that justified their group’s choice of whom to honor.

**Assignment 10: Group pitch.** Assignment 10 was the culmination of the Focus/Direction phase of the DtL process. It combined portions of Assignments 6 – 9. Groups listened to each group member give their individual pitch, provided feedback, and combined the best parts of the individual pitches into one group pitch they would present to the class. Pitches were limited to one and a half minutes. Groups practiced their new pitch and prepared to present their pitch in front of the class; group pitches were also recorded so that groups could watch and reflect on their pitch presentation.
Most of the groups gave me feedback that they were ready to present after running through their pitch after three or four times. Unfortunately, only one pitch met the designated length, five were too short, and one was two minutes too long. Mac’s comments highlighted the tension between the deadline, time limit, and professionalism: “I wish we had more time to come up with a better pitch and to make us sound professional. We want to shorten our pitch without making it sound unprofessional and like we don't care about [it]” (Mac, Journal 3). Beside the timing of the pitches, only one group, Together, followed the nine C’s for crafting a pitch as discussed in Assignment 7 (see Appendix G); yet even their pitch failed to justify why they honored the Special Olympics. Colors of Equity’s pitch showed some potential, but they needed to reflect and improve on their delivery.

The group that struggled the most was The Big Six. Much like their POV, it was clear from their pitch that they did not understand what the pitch was or why it was necessary. Each member of the group went off script and they struggled to stay on track, yet even the script failed to follow the directions because their script did not include the required information from Assignments 8 and 10.

As difficult as the pitches were for students to present, they were more squeamish about watching themselves on video. Watching their pitch turned into an opportunity to reflect on their script and presentation skills. Participants gave themselves and group members ways to improve. Comments such as: “we can make better eye contact”, “what are your hands doing?”, “are we dancing?”, “oh, we can do so much better than this”, “we didn’t even say the POV”, and “I thought I knew my lines” was overheard as groups watched and rewatched their pitches. One participant, Liza came up to me after she watched her groups pitch and said to me, “I am sorry you had to watch those, they were awful.” Martin took the sentiment a step further, “I think more
experience would help even though I have presented a lot of projects. Maybe redoing that and whenever I need to do something someone would stop me in the middle of my pitch” (Martin, Journal 3). He wanted immediate feedback and someone to stop him during the middle of his pitch and give feedback so that he could make the real-time adjustments.

This proved to be an important exercise for the participants because this was one of the first times that they watched a recording of themselves presenting. The recording exposed so much more about the quality of the pitch than looking at the script or having a student reflect on using their memory.

**Summary of Focus/Direction and themes.** The events and experiences during the Focus/Direction phases connected across several major themes: DS: Feedback loop, SE: Collaboration, and SE: Students’ feelings. When group wrote their POV for Assignment 8, this was the first time that they received multiple rounds of feedback, which for many was a cause of frustration. Students were accustomed to only one or two rounds of feedback. It took time for groups to realize the power and importance of every word in their POV.

**SE: Collaboration.** The Focus/Direction phase was the first real test for collaboration in the design challenge because this was the first time that students and their respective group had difficulty finishing assignments. The more the group struggled, the more their collaboration was tested. While groups like Together and The Essential Bench collaborated to overcome their struggles, Colors of Equity and Shades of Blue did not. For those groups that struggled, their collaboration suffered and it often took one group member to pull the group back together and work out how they would tackle the remaining assignments in this phase.
**SE: Students’ feelings.** For the first time in the design challenge, some participants expressed negative feelings towards the design challenge. These feelings were mainly tied to Assignment 8, writing the POV, and the challenges associated with this assignment. This was a difficult assignment and it was natural for students to be frustrated. Additionally, this was the first time that groups felt the pressure to finish tasks because of time constraints. These negative feelings tended to be part of the natural flow during the design thinking process (based on my observations) because writing the POV suggested that the group had identified the human-centered problem.

**DS: Feedback loop.** During the Focus/Direction phase of DtL, groups chose the person/group/organization they would honor with an art installation. They participated in their first brainstorming using the rules set forth by the d.School (Hasso Plattner Institute of Design at Stanford, 2016). Groups wrote a POV and received multiple rounds of feedback on their work in verbal and written form from me. Some groups experienced frustration and lack of collaboration during this phase of DtL. The process began with participants presenting their pitch to their group. Groups then crafted a group pitch, rehearsed it, and presented their pitch to the class. Groups reflected and received feedback on their pitch by watching the recording and discussed further improvements with their group. In the Focus/Direction phase of DtL, participants navigated multiple demands that existed within the design challenge. One key demand was groups were under time constraints to complete assignments so that they would be on track to complete the entire design challenge. A second demand was when participants demonstrated academic skills by writing their script for their pitch, and then collaborated with their group members to combine each pitch to make a group pitch. And third, students participated in one of the hallmark design thinking experiences – brainstorming. Finally, they demonstrated knowledge of their
topic so that they could justify their decision to an audience, presumably the WalkLine proposal board.

**Ideas**

In the Ideas phase of DtL, participants had brainstormed ideas for the art installation such as a sculpture or mural. Groups generated ideas, shared them, and voted on the best way to honor their person/group/organization. Compared to the end of Focus/Direction where group morale dipped, during the Ideas phase group morale was more positive because groups got to choose their art installation idea. Now, their idea became more than just a thought in their head, but an agreed upon idea with several quick sketches.

**Journal 3.** Like Journal 2 in the Focus/Direction Phases, Journal 3 was the first Ideas activity. The prompts encouraged reflection on their experiences and the work they had completed up to this point in the design challenge. While participants were critical of some of their experiences to this point, they also expressed a sense of accomplishment for completing several difficult assignments in a row consecutively.

Overwhelmingly, participants discussed experiences of the POV in Assignment 8. Below are several excerpts:

- “The hardest was making the answers to the question short but powerful. It was hard because we had to redo the statement a lot” (Sol, Journal 3).
- “The POV was pretty hard there wasn't anything easy about it. I did not like doing it” (Phil, Journal 3).
- “The hardest part of the POV was when Todd kept editing ours over and over again in a tight deadline” (Jolie, Journal 3).
These excerpts highlighted the three major issues participants had: feedback, deadlines, and streamlining. Participants were used to receiving one or two rounds of feedback on their work and several groups as discussed earlier in this chapter actively sought out feedback. However, with the POV, students received eight to ten rounds of feedback on a short writing piece. Throughout the feedback loops students were frustrated at their inability to “get it right,” but learned the importance of word choice. Sol expressed this sentiment, that it was hard to make an answer “short but powerful” (Sol, Journal 3). I used the word streamline when groups needed to eliminate extra words or choose better words to make a clear and concise statement that would pop. Only a handful of participants actively took on the role of wordsmith as Sol and Jabir referred to it. Lastly, participants felt the pressure of the deadlines. Because writing the POV took longer than groups anticipated, they did not allot enough time to complete the assignment; thus, they felt considerable pressure to complete the POV before the deadline. All three of these issues would continue to arise at various times during the rest of the design challenge – especially deadlines, and feedback loop.

Aside of the universal comments regarding the POV, there were two individual commentaries worth noting that arose during Journal 3. Petrina and Liza were group members, but had two different responses to the prompts. Up to this point, Petrina’s journals just barely met the requirements for her to turn them in. I was concerned because her writing in her journals was not indicative of her abilities. Based on how engaged Petrina was in the design challenge, it was odd that her journals were so unengaged. Petrina wrote, “I wish I had more patience to do my journals” (Petrina, Journal 3). Looking beyond the design challenge, Petrina was the poster child for busy and overscheduled. She was a member of the basketball team, had leading roles in chorus, participated in competitive swimming and triathlons, and had a lead role in the school play.
Given all of the activities Petrina was involved in at the time of the design challenge, it was surprising that the only part of her work that suffered during the design challenge was her journals.

Similarly, Liza’s journal, the participant who emailed me early on and asked to change groups, was not indicative of her academic abilities. More importantly, Liza was still concerned about her group even though we were still checking in on this issue and she had not voiced these concerns to me face-to-face. She wrote:

I thought this was going to be really fun and I was going to learn a lot of new things and have a great group and that they would be very helpful. But know I realized that some groups I am put in don’t always fit. I wish I could of had the skill to persuade my teacher to put me in a different group. (Liza, Journal 3)

What was most striking about her comments was that she was not having fun and she believed that she was not learning much. This was an important moment during the design challenge for Liza. I was concerned beyond the importance of collecting data, my student voiced discontent in her learning.

I decided to wait to discuss concerns until her group completed Assignments 11 and 12, because Liza told me about her idea for an art installation, which I thought had some promise. I did not want to sway her or the group into picking that idea. Knowing the composition of the next two assignments, I believed that there was a strong chance that her discontent would lessen because she and her group would have a clearer a picture of what their art installation was going to be regardless of the idea they perused and she might have an idea that could turn into a great idea for her group.

**Assignment 11: Brainstorming art installation ideas.** One of the hallmarks of design thinking, brainstorming a solution, was the major component of Assignment 11 (Brown, 2008,
This was second time that groups used the brainstorming process developed by the d.School; their first was in Assignment 6. Because this was the second time that groups brainstormed, most groups improved and had a more positive experience. The rules of brainstorming according to the d.School were:

- One conversation at a time
- Go for quantity
- Headline
- Build on the ideas of others
- Encourage wild ideas
- Be visual
- Stay on topic
- Defer judgement – no blocking (Hasso Plattner Institute of Design at Stanford, 2016)

Following the rules of brainstorming helped groups come up with more creative ideas and a collective understanding of their idea.

Laura’s comments in her Video Journal: Ideas of the brainstorming process stressed the difference between the d.School’s version of brainstorming compared to just typical brainstorming:

Before we started doing PBL, uh, in like third and fourth grade, the teachers just kind of said, "Get an idea of what you're doing and do it." We didn't have brainstorming. We didn't have all these assignments, so this brainstorming thing helps me get a better idea of what I'm doing without making me feel stressed. Like, there are points in this project
where I have felt stressed, but, uh, like not as much as I would before without the brainstorming. (Laura, Video Journal: Ideas)

Laura mentioned the structure and the number of assignments associated with the brainstorming process as a positive attribute to the design challenge in this portion of her video journal yet she changes her tune later in the same video journal.

Um, so, next [question] is how excited are you about your art installation. So, uh, answer to that, not very. I enjoy PBL. I really do, but this one, um, this one just seems so, like ...

So, I, I'm into art. I'm into art. I'm into drawing. I'm into all that stuff. But this is like, the art installation part is what gets me. I don't like, I just am not that excited about it because I feel like to get there, ... We're going to have done so much to get there, and then the product, really, I don't feel like it's going to be that exciting. (Laura, Video Journal: Ideas)

And then in the next statement of her video journal she states that she is excited.

Okay, so, I am excited about it, but not as much as I was, let's say, about our first PBL, like, our what nourishes me. Because, in general, sculptures are not my thing, but I'm still going to try my hardest in this project because I know it's important, but I'm not that excited about it. (Laura, Video Journal: Ideas)

Interestingly, this was a different sentiment than she had earlier in the design challenge and will have later. Laura oscillated between being excited about the design challenge and her group’s art installation and not. She was excited to create something for the public, but it was coupled with the frustration of not knowing how to make the art installation. She recognized that her group still needed to accomplish multiple assignments to create their art installation. For all of the
groups, there was added excitement because they now had a tangible shared idea for their art installation. The idea was no longer an idea of an individual, it became a collective idea of the group.

Of the seven groups, two had notable brainstorming experiences that differed from the rest of the groups: Mural of Acceptance and The Essential Bench. The Essential Bench masterfully executed the brainstorming process while Mural of Acceptance struggled to generate a viable art installation idea after their first attempt.

The Essential Bench’s characteristics likely contributed to their success, and hyper engagement in the design challenge, built on their first brainstorming experience from Assignment 6 and executed a near-perfect brainstorm in Assignment 11. Before starting to brainstorm, the group moved away from others and worked outside. Additionally, they read all of the directions first and had a conversation about how to attack the process. What started out as a plain bench, quickly turned into an acrylic bench with waves on its sides. Ideas were thrown out about adding water to the inside of the bench, the use of different colors, leading to a lengthy discussion of how a person would experience the bench. Beyond the extensive brainstorming conversation that took place, each group member, Clark, Charles, and Jolie actively listened to each other. I overheard bits of their conversation:

- “I really like that idea.”
- “I have an idea to make yours better.”
- “What if we added?”
- “How can we make the user think about water issues?”
- “Oh, that is even a better idea! How can we merge the two together?”
They made suggestions and built off each other’s ideas. As equal members of the group, no one idea or one person controlled the brainstorming process. Because each member of the group wanted to produce a top-quality art installation, they were willing to follow the rules and do whatever it took to come up with the best idea. Jolie confirmed my observations of her group:

So, I really liked this style of brainstorming because like, when we work together we actually like, it was like better in the planning process. And then, we came to a conclusion of a really, really good idea and I think it really helped us like get to that conclusion. And I think our group did really, really well brainstorming because we all listened to each other’s ideas and then we took out the ones that we thought weren't really going to make sense and things like that. We chose the ones that we really, really liked. And so, um, I'm really excited for this because I think if it gets on the WalkLine, I think people would really understand it. And it would be using at the same time, and it would really make me like really happy like to see it on the WalkLine, people using it, like every time you go on it. (Jolie, Video Journal: Ideas)

The Essential Bench had a positive brainstorming experience. They were amazed how their idea changed and evolved in just a short amount of time. The group’s positive energy was palpable and this experience propelled them to tackle the next several assignments with confidence.

Conversely, Mural of Acceptance had a different experience than The Essential Bench during their brainstorming. While the group went through the brainstorming process, and came up with several ideas, the group was not excited about their art installation idea they settled on and they asked for feedback from me. I observed their concern over their art installation idea, they asked if they could start over and pick an entirely new person/group/organization. Mural of Acceptance toyed with the idea of starting completely over at Assignment 6, but grew concerned
over the amount of work they would have to complete just to get back on track. Eventually they decided that a less than desirable topic was better than starting over, given the looming deadlines.

As the group decided to keep their topic, I was asked to give feedback on their brainstorming idea. Instead of giving direct feedback on their idea, I asked how they came up with it. During a lengthy discussion, it became clear that the group was struggling to navigate how to honor the Special Olympics without creating an art installation that created an “us versus them” or “us to them” experience.

I asked the group to take a step back and individually come up with four words that they believed best symbolized the Special Olympics. Then each group member shared the words with the group, and they voted on the top four. Each member of the group had two minutes to draw what each of the four words symbolized to them. From this stage two brainstorming, the group generated the word acceptance and an art installation idea they were happy with; they were ready to move on.

As groups completed Assignment 11, their optimism and energy for the design challenge returned because groups were excited to have an art installation idea. This was a stark difference to the general mood as groups worked through Assignments 8, 9, and 10. Because the goal of the design challenge and Assignment 11, groups’ art installation idea was more tangible than in previous assignments, group collaboration improved too. Martin and Zell remarked of the brainstorming process:

- I like the sticky notes. They give everyone in the group a chance to speak their voice and give their ideas. (Zell, Journal 4)
• I like how the brainstorming is organized and categorized into assignments. Now brainstorming is more efficient and helps us learn the most we can. (Martin, Journal 4)

Again, moments where students saw their work as having an impact beyond the classroom and where people would interact with their work proved to be a strong motivating factor. Because groups were motivated to produce an art installation for the WalkLine, students were more willing to work together and push their group members to achieve greater success.

**Assignment 12: Feedback from art teacher.** As I developed this design challenge, I knew that the participants for this study would be novice design thinkers and novice artists. Assignment 12 was created so that students would get feedback on their art installation idea from an art expert. The school’s art teacher, Kelly, and I scheduled time for her to come and meet with each group to give feedback and suggestions. Before the Kelly met with groups, we reviewed what the groups’ accomplished since she had exposed them to art terms and art installations.

I envisioned this student feedback session with the art expert to take about an hour, but it took almost two. Groups were very excited to show off their idea and Kelly really wanted to maximize her time with them so that they could build their prototype. Overall, the groups were open, receptive, and thankful for Kelly’s perspective. Furthermore, they eagerly wanted her feedback. The following excerpts from Assignment 12 embody this experience:

The feedback Kelly gave us was very helpful. We wanted to make a Plexiglass bench and then put water inside the bench. Kelly told us that it was a good idea but she didn’t know how we could connect the glass and keep the water in at the same time. She suggested that we should use a different see through material. So, we decided acrylic. We decided to change the water inside of the bench and replace it with different colors of acrylic.
Also, we will have two waves made of fake water on the sides to come up and form a roof. We decided to change our idea because we realized that it would be really, really hard to put the Plexiglass together and put the water in it too, so we decided to do the bench with acrylic glass and a giant wave covering with questions on the back. (Clark, Charles, and Jolie, Assignment 12)

The Essential Bench found Kelly’s feedback helpful. Their conversation spawned several other ideas that the group eventually incorporated. Moreover, the feedback that Kelly provided the group was practical. In many ways, it gave The Essential Bench a way to take their idea and bring it to life. Without Kelly’s expert feedback as an artist, the group may have struggled to produce a strong prototype.

Earlier in this chapter, I mentioned how Liza commented in her Journal 3 that she was not having fun or learning as much as she had hoped. I also discussed my decision not to intervene at the time and wait until the group completed Assignments 11 and 12. This decision proved to be fruitful because her group liked her idea and eventually adopted it when they finalized their brainstorming session. I observed Liza smiling more after her group picked her idea. As the group fleshed out the idea, Kelly and I met with the group on several occasions to discuss their art installation idea.

Kelly and I provided a number of choices during our feedback conversations so that Mannequins would have multiple options to improve on Liza’s idea. The group’s experience captured in Assignment 12:

Kelly told us that we might want to paint clothes onto the mannequins because the weather may mess up real clothes. Todd said that we should have multiple mannequins. Todd said that we should maybe have more than just one mannequin and have multiple
mannequins. Kelly just encouraged us and said that she liked it. When Todd suggested it, we had a little bit of conflict about whether to do three, four, two, or one. But at the end we decided to do a family of four with a man, boy, girl, and woman. First, we were going to do one because that’s when we first came up with the idea and then we were going to do three because Todd suggested more than one and also said that there should be a middle to show that we are all the same after that we thought it would just be best if we do a man, boy, girl, and woman. We think we should decently do more than one for example I think we should do two. We have decided to do four. Kelly told us to pick a couple of mannequins instead of one. So, we picked four, then she told us if we could interview a person that was homeless that has gone through going to the Homeless Mission. We thought that idea would not be the best. So, after that we decided to do three mannequins. After that we did four a man a woman and two children. (Liza, Petrina, Phil, and Sanders, Assignment 12)

Although this was a group assignment, Liza and Phil wrote most of their explanation. This turned out to be a pivotal moment for the group for several reasons. Multiple events transpired between Journal 3 and the completion of Assignment 12. First, Liza’s demeanor changed from negative to positive because her idea was chosen by the group. Second, Liza and Phil began to take on more of a leadership role with the group. Third, the Mannequins liked the options they had from the feedback from Kelly and me. Fourth, the group began to collaborate at a higher level, they were willing to put aside their egos and differences to work together because each participant was excited by the idea they came up with and they were excited to see their idea come to life.
Compared to the feedback in Assignment 8, when groups wrote their POV, the feedback during Assignment 12 was specific, they knew how to improve their work and it created positive momentum. There existed less frustration at the end of this assignment than at the end of the Focus/Direction phase of the design challenge.

**Video journal: Ideas.** Video Journal: Ideas concluded the Ideas phase of DtL. The video journal had a similar set up and prompts like Video Journal: Discovery. Again, students could follow the prompts or discuss something else they believed was valuable; most answered the prompts. This video journal had two goals: to have students relate their experiences of the Ideas phase and to better understand how a group’s art installation idea changed over time.

Martin’s Video Journal: Ideas was a prime example of how a group’s art installation changed over time. Additionally, Martin was thorough in his explanation of his experience during the Ideas phase.

So, I don't think there was much of an annoying part, but it is ... some of the parts, it's a little stressful getting it all done. I think we can deal with that though, and, really, we passed the hard part. And, there's also, um, I think the ideas phase is really effective, not as much like annoying. So, also, um, yeah, I think that it's just, it's not super annoying.

So, when we first knew our organization, we were thinking about having like a little miniature one by one sculpture of the Special Olympics happening, you know? And then it kind of changed to like more of an abstract sort of. Then we decided thinking of like of words like small little words forming like the uh big word like hope or something. And then it kind of developed a little more into like um not as much of a poster but more of a canvas that had that and we would paint it. And then we talked with Kelly the art teacher about our idea and she was thinking more of different materials, wood, paint,
metal, all that sort of stuff. Sadly, not by drawing but that's okay. So, we also thought about having it upside down to make it a little more mysterious and because um people with intellectual disabilities since a lot of regular people ... don't see the good in them, maybe we'd be showing them that you need to see the good in them by having it upside down. And so, then I also came up with the idea of like a little tripod so it would obviously have like well two um, three poles there and like one in the middle. And then there would be like little clock form there, like a little circle. And then we would have the bill-board almost with all the different materials to say the word together upside down. So, at first, we decided to do “United”, but then we realized um [there are several Major League Soccer Teams with the word united], so we couldn't do that. “Brave” ... then we thought brave, but [there is a Major League Baseball team in the southeast named the Braves]. So, then we thought of like “Together”. So, we're going to have the word Together upside down and have like all the different materials and inside lots of words that encourage and promote people with intellectual disabilities. Also, the little circular part, we were thinking about it turning around to have human interaction and that would just be a lot cooler.

I'm very excited about our art installation, because it's just ... I love making stuff. I love designing stuff, thinking of stuff. Awesome projects that I get to make stuff. And it's always been like that really. Yeah. (Martin, Video Journal: Ideas)

Martin’s video journal highlighted several prominent threads during the design challenge: excitement, fear of not getting work completed, deadlines, feedback, and how ideas evolve over time. At this juncture, groups had settled into the flow of work, yet they still seemed uneasy about looming deadlines and cited fears of not finishing. Martin, as did the rest of the participants, voiced this concern during the Ideas phase more so than in the previous two phases of DtL.
While Martin does not specifically cite the concept of feedback in his video journal, it was the main reason why his group’s art installation changed over time. Each time, Together, elicited feedback, their idea evolved. The word the group chose and the material their art installation was to be made of changed. As was evident in Martin’s comments, evolving ideas continues to be part of a natural iterative progression when using design thinking (Brown, 2008, 2009; Brown & Wyatt, 2010; Carroll, 2014; Carroll et al., 2010; Cross, 2006, 2011; Dewey, 1938; Di Russo, 2016; Goldman et al., 2012; Hasso Plattner Institute of Design at Stanford, 2007; Kelley & Littman, 2001; Kimbell, 2011; Koh et al., 2015; Long, 2012; Rowe, 1998; Schön, 1983; Spencer & Juliani, 2016). Lastly, Martin expressed excitement about the design challenge and the upcoming build of their art installation idea. Again, the outward-facing component of this design challenge continued to drive the engagement and provide the motivation to collaborate and complete assignments.

**Summary of Ideas and themes.** As groups shifted from the Focus/Direction phase to the Ideas phase, their single goal was to generate an idea for their art installation. Compared to the previous phase of DtL, groups progressed through the Ideas phase at a faster rate. Groups leveraged their previous experience of the d.School’s style brainstorming to come up with many ideas and then narrowed the list to their final idea. Participants enjoyed the brainstorming process. Students criticized the rule “Encourage wild ideas” because participants thought that it wasted time with unrealistic ideas – Jason, Phil, Edwin, and Laura were most vocal, specifically stating that encouraging wild ideas slowed them down (Hasso Plattner Institute of Design at Stanford, 2016). Even as they critiqued the process, they were still excited about their art installation idea and the opportunity to build it. Even Liza, who had earlier voiced concern that she was not learning or having fun commented at the end of the Ideas phase, “Am I excited? Yeah, I’m really excited.
Um, I really hope our installation, will be allowed on the WalkLine. It would be really cool for ours to be really public” (Liza, Video Journal: Ideas). Additionally, the feedback that groups received regarding their art installation idea from Kelly, the art teacher, helped students think about their work in different ways and their art installation ideas evolved and became stronger.

**SE: Students’ feelings.** Compared to Focus/Direction phase, students expressed a similar level of excitement, optimism, engagement, per the SE: Students’ feelings theme in the Ideas phase as they did during the Discovery phase. One notable reason for this change was that groups brainstormed their art installation idea. Each group has a shared understanding of their idea; the art installation was evolving and became more tangible.

**DS: Feedback loop.** After groups’ experiences with feedback loops in the Focus/Direction phase, groups recognized how helpful feedback was for their work. The theme DS: Feedback loop was an important aspect of this phase. When Kelly, the art teacher, provided feedback and in most cases several different options for groups to improve their idea, groups took advantage of the opportunity. In most cases, groups sought out feedback recognizing its positive attributes compared to the hesitancy to get feedback during the Focus/Direction phase. Groups began to realize how they could seek out feedback and the positive impact it had on their work.

**Research**

Throughout the Research phase, students continued to research the person/group/organization they chose to honor for their work promoting human rights. Groups discussed the significance, user experience, and symbolism of their art installation. Groups completed the WalkLine art proposal application and began to prototype their art installation.

**Assignment 13: Art installation symbolism.** In the first assignment in the Research phase of DtL, Assignment 13, groups identified, discussed, and wrote what the symbolism for
their art installation and the user experience. This assignment was intended for participants to use their amassed knowledge to detail the symbolism and user experience. Additionally, this assignment was intentionally placed before they prototyped their art installation idea so that groups discussed the symbolism and user experience before prototyping. Specifically, groups applied the knowledge they gained from art class when they discussed art terms, installations, and symbolism. Additionally, they could use their knowledge of the person/group/organization they chose to honor.

Six of the seven groups provided strong justification for the symbolism of their art installation and user experience while one group, The Big Six, struggled. Alfred, Gordon, and Maya had difficulty because they did not have the conceptual understanding to connect the symbolism and how a person walking on the WalkLine would experience their art installation. Conversely, Colors of Equity and Shades of Blue thoughtfully justified the symbolism of their art installation and user experience. In this excerpt from Assignment 13, Shades of Blue commented:

We believe that girls are treated differently because of their race and gender. We also believe that HELP is helping girls that live in countries where they can't get a good education and aren't treated like others. This is why we have chosen HELP to be the theme of our art installation.

We plan to symbolize what is really happening out in the world to girls in different countries, by showing an image with websites that explain their stories. The stories will take place where the girls were born and tell why they want to go to school and why they aren't allowed to go to school. We will show this by creating a mosaic where there are four girls wearing the same type of clothing which symbolizes that they are all the same even though they are treated differently.
The intended experience is to make everyone who sees the girls in blue become curious on why there are multiple girls in blue and figure out that they are connected somehow. They then realize that there's a larger story then they thought. They then investigate and find that the girls have QR codes that takes them to a website that we've created. It shows them that HELP is helping out other people and they’re not only thinking about themselves and actually working further to provide the rights of young girls who don't have the same opportunities as we have in the United States. (Shades of Blue, Assignment 13)

Comparing the justification provided by Shades of Blue above to The Big Six below, Shades of Blue was more specific and employed greater detail to the use of color and storytelling.

What are the five most important facts/ideas that you want to convey to the user? That black people were treated badly because of their color. And some might argue that it still happens till this day. We plan to symbolize six amazing people who helped human and civil rights. It is for them to see and learn about six great people who helped civil and human rights. I know people know MLK but not that many people know about James Farmer. It is supposed to honor the big and how they helped so many people. (The Big Six, Assignment 13)

While several groups recognized that being able to justify in written form the symbolism and user experience of their art installation, there were several groups that did not connect the need to express these attributes of their art installation. Assignment 13 gave groups time and space to think about the principals of art, the user experience, and the symbolism of their art installation. What groups did not know was that in Assignment 14 and in their presentation the group would
need to explain both attributes in detail. This assignment helped groups by giving them an opportunity to get their thoughts down on paper and receive feedback on their responses so that they could improve. Like many of the assignments in the design challenge like, Assignment 5 where groups were exposed to the WalkLine itself, and Assignment 13 exposed groups to ways of thinking about their art installation that would help them later during the design challenge.

**Assignment 14: WalkLine art installation proposal.** Of all the assignments, journals, video journals, Assignment 14 proved to be the hardest and most frustrating for participants; it took the longest to complete, too. Like Assignment 8, when groups wrote their POV, participants spoke of Assignment 14 with anguish and a frustrated tone. They seemed perplexed by the nuance of the questions and the detail they were asked to provide about their work.

Assignment 14 was the only assignment in the design challenge that I did not create. Most of the assignment came directly from the WalkLine art proposal application that I modified for my students. The application was altered as little as possible so that participants could take much of the assignment and plug it into the actual WalkLine application at the end of the design challenge. From the early stages of this assignment, it was clear that students were struggling and frustrated. Aside from details like which email address to use, personal or school, and what did the application mean by “biographical information”, students had to write a detailed explanation of the installation and break-down of their WalkLine art installation. In addition, students were tasked with creating a line-item budget. Observing that groups were struggling with this assignment, I extended the deadline until after groups completed the last three phases of DtL: Prototype, Present, and Reflect. This assignment and the actual WalkLine art proposal application became the last items groups turned in for the design challenge. Groups labored on portions of this assignment for the better part of three weeks.
Looking back, I should have modified this the application from the beginning so that groups did not become so frustrated with this assignment. It was only after reviewing Assignment 14 and each group’s final WalkLine art installation proposal did I realized, that not enough distributed scaffolds were placed in this assignment for any group to excel. Instead students were frustrated and it showed in the lack of clarity and depth of each group’s application. Students reached scaffold frustration. I defined scaffold frustration as a learning experience where scaffolds are present, but there are either not enough or the wrong scaffolds in place for students to succeed. Therefore, participants felt like no matter how much they tried or used their problem-solving skills, they were not going to succeed – provoking a constant feeling of upcoming failure. This was not the only time that students experienced scaffold frustration during the design challenge, but it was the most severe.

Aside from participant’s experiencing scaffold frustration during Assignment 14, there was a moment of breakthrough for Shades of Blue. As students completed Assignment 14, Jabir asked me if his group could go back and use previous assignments to answer and complete the application. I replied that the work that the group previously completed was to be used as they saw fit and announced this to the rest of the sections, too. Jabir had made the connection that the design challenge was iterative. Each assignment, journal, video journal, and phase of DtL was a building block for the next step. I intentionally scaffolded activities that built on previous activities. Many participants did not realize why the design challenge was organized in this manner – to use or leverage previous design challenge work/knowledge for future activities.

**Group Check-in 1.** While I observed and interacted daily with groups, Group Check-in 1 was the first formal check-in and structured as a group interview with an interview protocol (see Appendix W). Based on the pace and deadlines of the design challenge, the Group Check-in 1
took place over the period of four days depending on when all group members were present and it fit into the day’s schedule. The purpose of the Group Check-in 1 was three-fold. 1) Were students gaining a better understanding of human rights? 2) How was the group collaborating? 3) What was the group excited about and what were they concerned about? These themes were similar to the journals and video journals; however, these were group answers. This provided an opportunity to analyze experiences between an individual and their group, member check, and triangulate the data.

Over the course of the design challenge, participants developed a deeper understanding of human and civil rights. Jabir and his group Shades of Blue demonstrated in the Group Check-in 1 as compared to Journal 1. In Journal 1, Jabir, Geneva, and Nathan defined human rights,

- Human rights means that all humans all humans are equal for just being human. It also means that you deserve a decent way of living. You also have the freedom to in some way take part in the politics of your country. (Jabir, Journal 1)

- Human rights is very important to me and when I learned that people just like me are in child labor, and technically they are slaves. It's so unfair that we get to live in a place that doesn't have slavery and that there are other places in the world that have slavery and child labor and poverty. (Geneva, Journal 1)

- Human Rights are what every human has and what humans can or can't do. (Nathan, Journal 1)

In the Group Check-in 1, Jabir answered for the group. Geneva, Edwin, and Nathan agreed with his definition.

To me human rights means ... to us, human rights means that they're the rights that we have just for being human. Cause we're all humans, we're all the same species, and so we
all have the same ... we all deserve the same chances economically, socially, and physically. (Jabir, Shades of Blue, Group Check-in 1)

Jabir eloquently defined human rights for the group. He acknowledged that all humans enjoy these rights. Whereas in their first journal definition, members of Shades of Blue used a specific example to define human rights, Jabir conceptually conveyed the breadth of human rights as defined in the UDHR in his last sentence during the group check-in. Upon finishing his definition his group members were asked if they had anything to add and each declined to refine the definition.

This exchange, like many others, demonstrated how groups collaborated and helped each other to learn. While Jabir stated the definition, his groupmates listened to him and would affirm or reject his statement. By affirming his definition, members of Shades of Blue gave Jabir recognition that they believed his definition was strong and changes were not necessary. I observed exchanges like this one throughout the design challenge. When groups discussed thoughts, ideas, or how to tackle assignments, it provided a space for members of the group to test their assumptions against the group, come to a shared understanding, and collective voice.

Another aspect of the Group Check-in 1 was to understand how groups were collaborating and keeping up with their work. All the groups agreed that they were working together and working towards a common goal. The group Together echoed this, but included a more detailed answer than others:

Interviewer: How are you as a group keeping up with your work?

Wolfgang: Uh, as a group I think we're keeping up pretty well. We've been, most of the time we've been on top of things and maybe a little bit ahead, and there
might of been once or twice when we were behind a bit but we're fast workers.

Martin: Yeah, we organized it up an then put it into pieces and then we individually did that unless it was a group thing that we needed to complete.

Interviewer: Okay. Is your group working together towards a common goal?

Wolfgang: Yeah, definitely.

Interviewer: What's that goal?

Wolfgang: That goal is to get, get on the WalkLine and to do well on the presentation. I think doing well on the presentation is actually before getting the art on the WalkLine.

Martin: Agreeing with that and getting, um, our art-art installation to have its wanted effect by making a difference in promoting the Special Olympics.

Together went a step further by mentioning how important it was for the group to promote their chosen organization. While most groups’ answers were about their work – art installation, presentation, and art installation proposal, Together demonstrated that they had empathy for their organization because they wanted people who were on the WalkLine to experience their art installation and recognize the impact that the Special Olympics had on those that participated in the program.

While Together was both inward and outward facing about their work and the importance of promoting the work of the Special Olympics, conversely, The Big Six was inwardly focused on how people perceived their work. Furthermore, Together was confident in their ability to produce top-quality work, The Big Six lacked that confidence. Therefore, the goal of getting their
work on the WalkLine and having people enjoy their art installation was most important to The Big Six.

Gordon: My goal is to get it [our art installation] on the WalkLine and have a lot of people-

Alfred: Like it-

Gordon: People to come up to me that go on the WalkLine and all and say, "Have you seen this art piece on the WalkLine?"

Interviewer: Is that also a goal for you?

Alfred: And say like, "That's our art"-

Goodwin: And I can tell them that it's mine. (The Big Six, Group Check-in 1)

The difference between these two groups suggested that groups were at different levels of thinking about their work and academic maturity. All the groups in the study understood the value of getting their art installation accepted on the WalkLine, but there were several groups that recognized that their art installation was bigger than they; it was a way to honor the work of person/group/organization that promoted human rights. In this first formal recorded group check-in, participants echoed similar sentiments as a group as individuals.

**Journal 4.** As the last part of the Research phase of DtL, Journal 4 was another opportunity for participants to reflect on their progress during the design challenge. Participants responded to prompts in written form. Participants wrote about their excitement for the design challenge and the potential of getting their art installation on the WalkLine. Clark and Zell remarked:

- I like the openness of DtL because you can do anything. I wouldn't change anything.

  (Clark, Journal 4)
I would not change anything because all that we have done with our DtL process has been really fun with my group. Yes, my group is working together very well. We all love working together and have been working towards our goal. (Zell, Journal 4)

Clark spoke of the openness that the DtL process provided for his group and Zell remarked how much fun she had with her group. Even with the structure of the DtL process, all the assignments, journals, and video journals, Clark felt like he had the freedom to create and produce what he wanted without trying to fit his passion into a box for a school project or produce something for school that he was not passionate about. Zell and her group, Colors of Equity, had the freedom to follow their passion and create an art installation that meant something to them. Because of this freedom and the outward nature of the art installation, Zell had fun.

Zell suggested that her group was working well together; they were positively collaborating. One of the prompts in Journal 4 asked participants who was the most valuable group member (MVGM). Colors of Equity’s answers were similar to that of four other groups. Each of the participants, Zell, Miles, and Sarah named one person as MVGM. Conversely, two groups responded differently to the prompt. In the group Together, Sol and Wolfgang each stated that the other two members of their group were Co-MVGM. Martin stated that he could not choose who was the MVGM. The participants in The Essential Bench group, Clark, Charles, and Jolie each stated that the other two members of the group were Co-MVGM. Compared to Colors of Equity, Together and The Essential Bench groups’ participants demonstrated that when a group collaborates well, that each group member believes that each group members were valuable to the group.
One other notable comment occurred in Journal 4. Just as Together demonstrated deeper understanding about their art installation, that it honored and raised awareness for those that work to promote human rights, Geneva wrote of that deeper understanding in her Journal 4:

You need to be patient because it will be a little while before the installation is actually on the WalkLine. You also have to have knowledge about the HELP organization and what they do around the world. Also, you have to be concerned about girl’s education. Why? Because if you don't then you will not know a lot about what my group and I are trying to help other people see what is happening. To girls in other countries by honoring them for their [human] rights. Our goal is help people see that there are actual problems in the world and we can't just sit back and let other people handle it for us. We need to step out there and make [a] difference. (Geneva, Journal 4)

While Geneva mentioned elements of this earlier in her journals and video journals, this was the first time that she began to include elements of social justice and equity into her thoughts and writing. In her earlier comments, she identified that there was a problem with girl’s education, but now she wants to use her group’s art installation as a vehicle to spread the word about girl’s education and promote activism, too.

**Summary of Research.** During the Research phase of DtL, participants explained the user experience and symbolism of their art installation, worked on the WalkLine art application, had a formal group check-in, and completed a journal. As groups continued to reflect on their work in the design challenge, they began to express an understanding of their art installation as two-fold. One, groups were proud of their art installation and wanted to be acknowledged for it. Two, some groups began to see their art installation as an opportunity to raise awareness for
those promoting human rights. Additionally, participants started to use phrases that included elements of social justice and equity to describe their work.

While Assignment 14 proved to be the most difficult assignment and produced notable scaffold frustration, participants continued to state their excitement for the DtL process and their group’s art installation as a whole. Groups were excited to start prototyping in the next phase of DtL. Looking ahead to upcoming deadlines, participants began to ramp up their work because they knew that presentations were less than two weeks away.

**DS: Social studies content, SE: DT vs Traditional SS, and SE: Collaboration.** Several themes helped to understand the Research phase: DS: Social studies content, SE: Students’ feelings, SE: DT vs. Traditional SS, and SE: Collaboration. Students demonstrated their acquisition of social studies content by refining their definition of human rights. Jabir’s description of human rights had deepened since the Discovery phase. His group, Shades of Blue, had the opportunity to adjust or add on to his description but chose not to suggesting agreement with his definition. Additionally, groups had to explain the symbolism and user experience of their art installation. With this explanation, groups demonstrated the third and fourth dimensions of the C3 Framework (National Council for the Social Studies, 2013).

**SE: Students’ feelings.** Students’ experiences of the Research phase connected to the theme SE: Students’ feelings. Students expressed frustration similar to the Focus/Direction phase. Specifically, students felt that they were not going to succeed in Assignment 14 not matter how they tried. This was not the first instance of scaffold frustration, but this was the most severe instance of frustration in the design challenge. Regardless of the distributed scaffolding that was present in Assignment 14, they were either the wrong scaffolds or there were not enough for students to successfully finish the assignment.
Even as participants expressed their frustration and anguish during this phase of DtL, they recognized how the design challenge differed from their previous experiences in social studies and they expressed excitement and optimism for the entire DtL process. The themes SE; DT vs. Traditional SS and SE: Collaboration helped to me to understand how students were experiencing this phase of DtL. While a difference of opinion existed between several groups as to who the MVGM should be, others believed that it was the whole group. Students demonstrated how they had to rely on their group to fulfill the requirements of the Research phase.

Prototype

Participants created several prototypes during the Prototype phase of DtL which were low resolution (sketches, digital mock-ups) for fast feedback and iteration. Groups worked through problems they encountered while prototyping, sought feedback from peers and experts, then refined their original idea and adjusted their prototype.

During the Prototype phase of DtL, groups began to assign work to each member of the group so that they could meet the upcoming deadline of the presentation. This was a change from previous phases of DtL where groups worked together. Shades of Blue, as an example, agreed to divvy up tasks due to looming deadlines. Edwin oversaw creating a website and QR codes to tell the story of the four girls in their art installation. Jabir was tasked with finishing Assignment 14. Nathan and Geneva worked on initial prototypes of the girls and Nathan drew and painted the final prototypes on canvas. Geneva worked on the presentation. By divvying up work, this helped the group collaborate because of the characteristics of the group members and work efficiently towards the upcoming deadlines.

Walk on the WalkLine. Taking a walk on the WalkLine during the prototype stage of the design challenge was not in the initial plan; however, it became clear that participants needed
to get out of the classroom again – especially since groups were still working to complete the troublesome Assignment 14. Participants needed a positive experience that would breathe a bit of life and fresh air back into their work. This “break” from the daily grind of the design challenge was modeled after the documentary *Extreme By Design* (King & Schwarz, 2013). Unlike Assignment 5 when groups used the WalkLine’s website to look at art installations, they actually walked on the path. When participants walked on the WalkLine, they took time, many for the first time, to look at the art installation on the WalkLine. The field trip took about two hours and participants walked about two and a half miles. More importantly, groups were energized by their time on the WalkLine because they could see how their art installation ideas could fit. This proved to be the right field trip at the right time.

Upon getting back to campus, participants debriefed their experience on the WalkLine. While many participants stated that they had been on the WalkLine before the field trip, it was clear that few had actually been and even fewer had taken time to look at the art installations. During the debrief, participants were asked to discuss the symbolism of several of the art installation they saw while on the field trip. Two of the art installations dominated the discussion. One was several pinwheel-type looking structures that moved in the wind. The other was a Sherpa-looking installation. Students were asked how these two installations could symbolize human rights. The conversation was lively as they discussed and participants began to connect their art installation idea to the symbolism they wrote about in Assignment 13. When discussing the pinwheels, participants thought it symbolized standing up for others, relying on others for help, wind, and the movement of the installation. Similarly, participants remarked that the Sherpa was hollow inside and people could go up into the installation. One participant noticed that the Sherpa was carrying the load of others and more than likely was not getting paid a fair wage for
his work. Towards the end of the discussion, Clark asked to split into groups and discuss the symbolism and user experience of their own art installation idea after experiencing the walk and class. The school day concluded with groups considering how to capitalize on their experience of walking on and observing art installations on the WalkLine.

**Journal 5.** Similar to the previous journals, Journal 5 included prompts which helped participants reflect on the work they and their group had completed. Three ideas were consistent among participants: the design challenge was fun and exciting, the DtL process and the design challenge was better than normal social studies class, and a critique of the DtL process that there were too many assignments. Excerpts from Journal 5 highlighted the ideas:

- Weeeeeeeeee hoooooo000. This was sooooooooooooooooooo moooooooooooch f00000oon [sic]. (Clark, Journal 5)
- Normally in a normal social studies class you would just read about human rights or listen and do nothing with it but we don't, we do something with it. (Phil, Journal 5)
- Well we usually read from a textbook but PBL brings you to a different place of what a social studies class is really about. (Geneva, Journal 5)
- You learn to really think about design and creativity rather than recalling dates and studying for quizzes. In this [design challenge] unit we have been doing a little bit of both which I think is a little superior to our prior PBL units. (Martin, Journal 5)
- It is a lot more fun than social studies. I LIKE PBL [design challenge]!!!! Just the assignment I don’t like. (Miles, Journal 5)
- I'm more engaged in my work. That's because that the end product could potentially be on the WalkLine. (Jabir, Journal 5)
Comments from participants in Journal 5 demonstrated how they enjoyed problem-based learning (PBL) more than what they experienced in previous years in social studies. Moreover, participants stated that they liked the design challenge more than the other PBL units they completed earlier in the year. While Clark ecstatically stated that the design challenge was so much more fun, Geneva, Martin, Miles, and Jabir provided sophisticated analysis. They remarked how the design challenge was real-world and outward facing compared to their experiences in other social studies classes. They explained how in their previous experiences in social studies they were accustomed to reading from a textbook, listening to lectures, remembering dates, and taking tests; whereas in the design challenge helped students see a different way to experience social studies.

Wolfgang described the different between “normal” social studies and the design challenge as:

I think that my work on the design challenge is much, much, different than any normal social studies project. For one, we go on much more field trips than any other social studies. In most units, we don’t take any field trips, and if we did it would be a puppet show or something else equally as random. For another, it is much more organized. In these PBL units we have everything planned out and we don’t talk about the same thing over and over again for a period of time. Lastly (but there are many more reasons), we always end with a big thing or presentation to spread awareness and also to let the info sink in. In most other units, we just learn about it and then take a test. If you asked me in which one am I more engaged or less engaged I would say that I am definitely more engaged in PBL units because I am doing so much more work and other stuff. (Wolfgang, Journal 5)
There was one aspect of Wolfgang’s response that extended the comments of Geneva – they were in different groups. Wolfgang mentioned the importance of taking action instead of taking a test. Earlier in Journal 4 Geneva remarked on activism. In his comments, Wolfgang noted that activism and raising awareness was important and that the design challenged allowed him and his group that opportunity, whereas his work in previous social studies classes had not. Because of how the design challenge was organized and the process groups went through they were taking informed action (National Council for the Social Studies, 2013). Taking informed action continues to be the hallmark of the National Council for Social Studies C3 Framework. Both Geneva’s group, Shades of Blue and Wolfgang’s group, Together, began to make the connection between their work in the design challenge and taking informed action and recognized that their work was bigger than themselves.

**Assignment 15: Prototyping.** Of all the assignments, journals, and video journals in the design challenge, Assignment 15 was the most highly anticipated. Groups took their art installation idea from Assignment 11 and brought it to life in prototyping. Beyond the quick drawings that were required of the group in the assignments leading up to the Prototype phase, participants were emotionally and physically excited to create a tangible form of their idea. Laura remarked of the prototype phase:

> It is where we finally have a solid idea of what we are doing. In that phase, we were making our prototype, and when you have your prototype there in front of you, it gives everyone a clear idea of what you are doing and gives you a reference to go back to if you ever get lost. I think the work in this design challenge lets people learn more, in a way that’s outside their comfort zone and that stretches their brain. In a regular social studies class, like in fifth grade, we just read out of a book and took a test every once in a while. I
would say that I am more engaged [in the design challenge]. I think that I am more engaged because I am learning more and that PBL [and DtL] allows me to learn in a way that is right for me and not just out of a textbook. (Laura, Journal 5)

Surprisingly, Laura, who was critical of the DtL process and all the assignments, stated in her Journal 5 that it allowed her to learn the way that was right for her. More importantly, she remarked that seeing her group’s idea in prototype form was important to her. For Laura, it gave her a reference to make sure her group was on the right track.

**Prototyping with Tinkercad.** There were two forms of prototypes that groups created. Groups chose between a web-based 3D software Tinkercad to 3D print their prototype or building by hand. Originally, I intended all the groups to use Tinkercad, it became clear as groups brainstormed, that it was appropriate for some art installations, but not by all. It should be noted that all participants were exposed to and used Tinkercad during a science unit in early January prior to the design challenge in science. During that unit participants found a real-world object to 3D print, measured their real-life object, and used math to find their magic number. The magic number was a ratio to scale the real-life object measurements to fit the limitations of the 3D printer’s.

With this set of skills from the science unit, participants were ready to tackle Tinkercad for DtL prototype. For the three groups that used Tinkercad to create their prototype, (Together, Mural of Acceptance, and The Essential Bench) one group member became the lead builder while other group members worked on Assignment 14 and the presentation; because Tinkercad did not have the ability for groups to work synchronously. Clark, Jason, and Wolfgang used Tinkercad because each was voted by their group to have the best Tinkercad skills based on their
work in the science unit. Jason from Mural of Acceptance, used the initial drawings of the art installation and built the prototype on Tinkercad. This was progression of the prototype:

![Prototype progression Mural of Acceptance (Mural of Acceptance, Assignment 15).](image)
Jason spent several class periods and time at home to complete the 3D rendering because he ran into several issues. Making sure that the people around the earth were proportional and equally spaced proved to be the crux of the problem because Tinkercad helped with the proportion, but not with the equal spacing. Like Jason, Clark and Wolfgang progressed from the initial drawings from the group to a 3D printed prototype and each had to overcome several obstacles while they used Tinkercad.

**Prototyping without Tinkercad.** Colors of Equity, Shades of Blue, The Big Six, and Mannequins either painted or built their prototype by hand. Shades and Blue had a similar progression to The Big Six, as discussed earlier in this chapter. Unlike those groups that used Tinkercad, Colors of Equity worked together to create their art installation prototype. From the individual drawings to painting and drilling the wood pieces, the group collaborated well based on my observations. This was the progression of their prototype.
Figure 37. Prototype progression Colors of Equity (Colors of Equity, Assignment 15).
All the groups were excited to prototype their art installation idea. As the ideas came to life, groups expressed excitement that their idea became a real object. As mentioned earlier in this section by Laura, groups used the creation of their art installation prototype as a reference to mark the work needed to get to that point and completing the prototype was one of three major components needed to complete the design challenge along with the presentation and WalkLine art installation proposal.

**Assignment 16: Prototype feedback.** As a concurrent assignment with Assignment 15, Assignment 16 provided groups another opportunity to get expert feedback and reflect on their prototype. Kelly the art teacher, consulted again but only with the groups that did not use Tinkercad. Interestingly, all four groups that received Kelly’s feedback failed to complete Assignment 16. In contrast, the three Tinkercad groups spoke with a design and 3D printing expert from a local design museum and all completed Assignment 16. Given the upcoming deadlines for the presentation, students began to prioritize what worked, was most important, and spent their time accordingly. Therefore, deemed Assignment 16 as not as important since four of the groups, the ones that did not use Tinkercad, did not complete the assignment and the three groups that did use Tinkercad and completed the assignment asked why they needed to in the first place. Groups were ready to use the expert feedback and incorporated into their prototypes, but did not want to take the time to complete Assignment 16.

**Summary of Prototype and themes.** Overall, by this point, groups were excited because they finally made their prototype; they had passed one of the major hurdles of the design challenge! Along with this excitement there was looming anticipation and stress for the upcoming
presentation and completing the WalkLine art installation application held over from Assignment 14.

**DS: Feedback loop.** Similar to previous phases of DtL, feedback was important for groups. DS: Feedback loop was pivotal theme in this phase. As groups received expert feedback, they incorporated it into their prototype. Groups willingly sought feedback from Kelly, a Tinkercad expert, and me. As they drew quick mock-ups of their idea, exchanged ideas, and incorporated feedback, they brought their idea to life via a prototype. Like the Ideas phase, student saw feedback as a way to evolve their ideas rather than concerning themselves with the “one” right idea.

**SE: DT vs Traditional SS.** In addition to participants describing the DtL process as fun as Clark’s joyful exaggeration suggested, several participants and groups began to connect the design challenge with the larger work of the social studies – taking informed action, activism, and social justice. This was an interesting thread that connected to the theme SE: DT vs. Traditional SS, that seemed to garner more attention by participants during the Prototype phase of DtL. Additionally, groups demonstrated social studies content by utilizing the D4: Communicating conclusions and taking informed action (National Council for the Social Studies, 2013) through the creation of their prototype as they combined it with their explanation of symbolism and user experience from the Research phase. While participants saw the design challenge as producing something beyond the classroom, they realized that their work could raise awareness for a human rights issue. For some, they began to believe that maybe they could be part of the solution to solve that human rights issue.
Present

Groups assembled all their work and prepared a presentation to a panel of experts. In the presentation, groups showcased their art installation prototype, POV, and justified their human rights organization to honor. Groups were assessed via rubric and given feedback from a panel of experts, twice. Experts consisted of community members, school administration, design professionals, and several of the speakers that came to speak to the students at the beginning of the design challenge.

Journal 6. In Journal 6, comments from participants echoed similar thoughts from previous journals and video journals. Most striking about this set of journals was the lack of depth of the answers. While Mac and Wolfgang provided some insight into the collaboration and prototyping process, most of the writing was short. Again, students began to prioritize work. Work that did not help group’s presentation, WalkLine art installation proposal, or their prototype did not receive strong effort.

- The best part was finally finishing our project and feeling good about it. Our group has evolved the prototype a lot and made it better. Our group has gotten more on task the farther we go. (Mac, Journal 6)

- The best part of the prototyping phase was making the prototype. I say that because making the prototype allowed me to work on something different other than the assignments and the assignments were starting to get hard and boring. (Wolfgang, Journal 6)

However, given the fact that participants’ stress levels were high because of the upcoming presentations, participants decided to focus on preparing for the presentation. This was like Pe-
trina’s comments about her journal from Journal 3 in the design challenge. Journal 6 did not provide data, it became clear that participants were at their threshold for the amount of work they willing or could successfully to take on.

**Assignment 17: Script and presentation.** As groups moved closer to presentation day, they embarked on Assignment 17. In this assignment, groups were charged with making their presentation via Google Slides and writing a script. In addition to the slide deck and script, Assignment 17 included several resources for participants. These resources provided in-depth information on how to give an excellent presentation and the use of storytelling in a presentation. The recommended length for presentations was eight to ten minutes.

On presentation day, six of the seven groups presented to a panel of experts. Each panelist used a rubric (see Appendix Y and Z), asked questions, and provided verbal feedback (Kolodner et al., 2003; Sara & Parnell, 2004). Additionally, each presentation was video recorded. Shades of Blue, Mannequins, and Together were missing one person from their group, but still presented. When the missing member was back in school, the individual who was absent presented a five-minute presentation and it was video recorded. The Essential Bench group had two members of the group not present on presentation day. The groups gave their presentation to me early the following week and it was video recorded.

As groups completed their presentations, I used AirDrop to send the video recording of their presentation to each group. Before they could receive the feedback from the expert panel and from me, they had to watch their presentation and assess themselves and the group using the same rubric as the experts had. After self-assessment, they compared rubrics and feedback. Overall, participants were much more critical of their presentations than the panel or me.
What participants did not know was that their first presentation was a prototype too. After presenting, groups had one week to revise their presentation, they were to present again in front of a different panel of experts. When groups found out that they were going to present again they were relieved. In the same manner that participants critiqued the recording of their pitches in Assignment 10, participants immediately saw opportunities to improve their presentation. In several cases, participants apologized to me for having to sit through such “awful” presentations.

Just as groups prototyped their art installation idea, they prototyped their presentation. Since they had the video recording of their first presentation, the feedback from the expert panel, and me, they used the critique to improve their presentation over the course of a week. During the week, considerable improvements were made to presentations. Each group’s presentation was better than their first. During the second presentations, I observed a steady confidence from the groups, stronger organization, and satisfaction that they presented better the second time around. As each group finished their presentation, there was a visible weight lifted off the shoulders of each group.

**Summary of Present.** In the frenzied pace that led up to the first presentation, groups came together and worked hard. Even groups that were easily distracted used their time wisely during the Present phase of DtL. In moments when a group member was starting to get off track, the other group members were quick to pull them in and remind them of their goal. Groups presented twice to two different panels of experts. Groups experienced for the first time that a presentation could be prototyped and it was beneficial for their learning.

**DS: Presentation as prototype, DS: Feedback loop, SE: Collaboration, and DS: Social studies content.** Several themes, DS: Pretention as prototype, DS: Feedback loop, DS: social studies content, and SE: Collaboration helped me to understand students’ experiences during the
Present phase. Groups experienced presentation as prototype because they presented their work twice to two different panels of experts in a seven-day period. Using their experiences from the first presentation, feedback from the panel of experts in the form of a rubric, my feedback via rubric, their own feedback after viewing their video recorded presentation, groups identified areas for improvement. In the week between presentations, groups adjusted, added to, and rehearsed their presentations.

During the presentations, groups defended why they chose the organization/group to honor, explained how their art installation evolved over time, and discussed the user experience and art installation symbolism which demonstrated the acquisition of social studies content. Groups used the social studies disciplines of civics, history, geography and economics (D2) to gather evidence and developed claims (D3), and communicate conclusions and take informed action (D4) of the C3 Framework (National Council for the Social Studies, 2013). They demonstrated D2 and geographic thinking by incorporating the physical features, light, man-made structures of the WalkLine into their art installation. Through a civic and historic lens, D2 students had to justify why the person/group/organization deserved to be honor for their work promoting human rights. Additionally, students created a budget (D2 economics) for the materials, installation, and take down of their work economics. Groups accomplished this while collaborating – using the strengths of each member to make their presentations better.

**SE: Students’ feelings and SE: DT vs Traditional SS.** The last two theme identified in the Present phases were SE: Students’ feelings and SE: DT vs. Traditional SS. There was a sense of exhilaration and accomplishment when groups finished presenting. Students were proud of their work and were amazed how they completed so many difficult tasks. Many were relieved that the presentation was finally over. The difference between these presentations and those they
gave in previous social studies classes was these presentations were outward focused – to a panel of experts, the WalkLine, and their art installation was intended for the public. In this design challenge their work extended beyond the classroom, my feedback, and beyond the school community. Students recognized this difference and it was one of the main reasons why they were excited, optimistic, and engaged during DtL.

**Reflect**

The goal for the Reflect phase of DtL was for participants to reflect on their experiences and all the work they had completed and come to a new understanding. Groups discussed what they learned, how they could improve if they did the design challenge again, and how the experience changed how they would solve problems in the future. Journal 7, Video Journal: Present/Reflect, and Group Check-in 2, the Reflect phase of DtL provided a wealth of rich data on participants’ experiences of the design challenge, the DtL process, and how they grew/changed from the experience.

**Journal 7.** In Journal 7, participants reflected on their experiences of their group’s presentation and the entire design challenge. This set of journals helped to explain how participants experienced the design challenge overall. Much of the comments in Journal 7 revolved around writing the script, presenting a second time, problem-solving, and the DtL process.

With just a few exceptions, (Laura, Sol, and Jason), participants stated that writing the script was helpful for the presentation. Overwhelmingly, participants commented on the positive experience between their group’s first and second presentations. Participants mentioned that having the opportunity to present twice allowed their group to take the feedback they received as
well as their own to make their second presentation markedly better. Similar to recognizing possibilities of raising awareness, some participants began to see the value of DtL as a problem-solving process. These excerpts from Journal 7 highlighted the sentiment from the participants.

“Assignment 14…was the hardest thing I have ever done schoolwork wise. No lie. It made me realize that design thinking really helps me and results in a better product” (Laura, Journal 7). Laura, who over the course of the design challenge waffled on whether she liked or disliked the DtL process and all the assignments, mentioned in Journal 7 that the assignments and the process helped to organize her thoughts which in turn helped her group produce a better product.

Similarly, Sol remarked how the DtL process and the design challenge changed how he might approach problems in the future. “The way the whole process changed my thinking about approaching problems is that now when I run into a problem I know that I can fix it if I put in the work because that’s what I had to do during this process” (Sol, Journal 7). While some participants discussed using the DtL in the future for design problems, Sol suggested that he would use the DtL process for all types of problems he might encounter in the future.

Jolie agreed with Sol about the DtL process changing how she might approach future problems. Also, she commented on her experience of presenting twice:

It has changed my thinking about problems that will help in the future because this is a way more organized type of thinking and it was more helpful way of thinking that led to good progress. Our presentation changed a lot. The first presentation was terrible. We stuttered and somebody sat down and we were shaking nervously. Also, we kept putting on the wrong slide and skipping each other turns. This presentation though was so much
better because we knew what we were doing, we did the right slides, we conquered our
nerves, and we were very enthusiastic. (Jolie, Journal 7)

During the second presentation for Jolie’s group, The Essential Bench, they improved on almost
every aspect of the presentation. It was clear they had taken all the feedback to heart. They made
the necessary adjustments in their script, Google Slides, and delivery.

Martin remarked that the design challenge changed the way he solves problems. More
importantly, he believed he was better able to identify problems than before the design challenge.

This has changed how I look at problems because I can now identify problems
and then fix them. I have learned to be creative and resourceful but most importantly effi-
cient…. Writing our script was very helpful because we got to really know our script be-
fore we presented and we could make adjustments to our script whenever we wanted.
That helped our team a lot because we changed our script little by little making small ad-
justments. Our presentation was so much different the second time. We didn’t rely on our
note cards. We were well rehearsed. We spoke louder. We had a clear voice. We talked a
lot… smooth[er]. We stood up straight. We didn’t sway. We were well prepared for ques-
tions. (Martin, Journal 7)

When Martin and his group, Together, wrote the script, they created a foundation for their
presentation. Each time they adjusted, tweaked, or added to their script, their presentation be-
came stronger as it was for their art installation prototype. As his group continued to refine their
presentation, they prepared themselves to answer any questions the experts had after their
presentation. Lastly, it was clear from Martin’s remarks that watching the video of their first
presentation provided valuable feedback, they made sure to speak louder, didn’t sway, and talked
confidently.
Again, Journal 7 highlighted the positive energy and optimism that participants had for the design challenge. Participants and their groups took the feedback they received from the expert panel and from watching their recorded presentation to improve their second presentation. Participants lamented that they wished they had gone through the DtL process before or knew better what to expect so that they could have been more successful during the design challenge. This exemplified how many novice design thinkers reflect on their first experience with design thinking (Goldman et al., 2014; Koh et al., 2015; Razzouk & Shute, 2012a; Zielezinki, 2016).

Lastly, participants discussed how the organization of the design challenge was helpful when looking back on the entire design challenge, but going through it was frustrating at times. For some, this was the hardest task they had accomplished in school. Yet, participants remarked how much they learned during DtL regarding social studies content, academic skills, and design thinking knowledge. Interestingly, participants did not express this until they were near the end of the design challenge.

**Video Journal: Present/Reflect.** As part of the Reflect phase of DtL, participants completed Video Journal: Present/Reflect. Similar to the previous video journals, participants could answer the prompts or were allowed to discuss something else that was on their mind regarding the design challenge. While journals provided rich detail into how the participants experienced the design challenge, the video journals, and particularly this video journal, highlighted many of the overall experiences that participants had throughout the design challenge.

When creating this design challenge, I anticipated that participants would reveal more of their experiences via the video journals because they could record themselves on their iPad instead of typing their responses. This proved to be true. Sol explained to me after completing this video journal that he “was becoming too comfortable with the video journals and was telling me
too much.” Due to the comfort level that participants had to discuss their experiences in the video journals, the completion of the design challenge, and that participants could record themselves with their iPad, this set of video journals was detailed. When compared to the other video journals, participants more were willing to openly discuss their thoughts and feelings. Of the twenty-three participants, five provided unique responses to the video journal prompts which helped to understand student experiences of the design challenge. What follows are excerpts from those five participants, some in great detail.

Laura’s and Jabir’s Video Journal: Present/Reflect discussed how many aspects of the design challenge were iterative. While Jabir was fully committed from the beginning of the design challenge, even though he struggled to turn assignments in on time, Laura wavered on whether she liked the process or not. Yet, each connected their learning and their success during the design challenge to the iterative nature of DtL.

- How does this design challenge compare to other forms of learning? And my answer is I just think that in other forms of learning, you would just like, learn something out of a textbook, take a test, get an OK, bad, good, whatever grade and be done with it. But in this form of design thinking, and um, PBL, you actually like learn a lot more in a short period of time. Well, it's not exactly short but, you know, you learn a lot, you learn how to problem solve and it's just, it's just a better experience for me. Um, and so what's frustrating about it is that there's like so many assignments. It's like one day, oh look, assignment 14. The next day, uh, 15 assignments, how is this fair?

So, like I really enjoyed design thinking, but I still think that there are a lot of parts that are frustrating and um, one of them is all the assignments. One of them is how much feedback we have to get. It's like my version of things. Do something, get a grade
on it, done. Design thinking form of things, do something, get a grade on it, do it again, get another grade, do it again, get another grade, do it again, get another grade, and the process repeats again and again and again and again. And it's just like so much feedback that sometimes it makes me feel stressed out but the good parts about it are, it makes me learn more. It makes me think, it makes me think much more than just taking an actual test. Um, and yeah, I actually pretty much enjoy the design thinking process. I liked the design challenge. (Laura, Video Journal: Present/Reflect)

• But was it [presenting twice] worth the time and effort? Yes, that's 'cause it was worth the time and effort because the fact that like, the first presentation got you all prepared for what you were going to experience. The second presentation was kind of like drafts. You got your first draft to get you prepared for your final draft. And then yeah, so, kind of like it got me prepared for the second presentation. So yes, it was worth the time and effort.

Before starting this [design challenge], I wish I knew how like, I really wish I knew how the DTL [process worked] before we even started it. 'Cause it would be really helpful and I kind of wish I knew that before, I mean but that was the point of like teaching it to us, but if I already knew how to do it I think I would have been better at it and we could have generated more ideas. But, you know, what happened and our presentation is awesome, in my opinion.

How does this design compare to more traditional forms of learning? It's a lot different 'cause you actually go out and get the experience and visit and then that people come and talk to you so then you've got your mind set on your problem. You already know what you're going to do when you, see, 'cause you actually got it's more immersive, so you have a better idea and a better understanding of human rights. The most helpful
thing was the discovery phase was pretty it was fun, like that might have been my favorite one just 'cause of the fact that I didn't really know what to I did like going out and seeing it yourself gives you a better idea and the, and the whole brainstorming, it was like the brainstorming was like the hardest part about it was narrowing down the ideas from our brainstorming. And in my opinion if we could have generated more ideas and uh like maybe the we might have made an idea that was just like clear cut definite you know like yes. Instead we had to do this whole research and vote but no, no, 'cause researching is part of the design thinking process so I take that back. I enjoyed the design thinking process. Yeah, this was an all-around fun project, this was this was a really fun experience to do and I hope we can do more of it later next year and stuff in seventh grade. (Jabir, Video Journal: Present/Reflect)

Laura and Jabir discussed how they came to see the iterative nature of DtL and design thinking (Brown, 2008, 2009; Brown & Wyatt, 2010; Carroll, 2014; Carroll et al., 2010; Cross, 2006, 2011; Dewey, 1938; Di Russo, 2016; Goldman et al., 2012; Hasso Plattner Institute of Design at Stanford, 2007; Kelley & Littman, 2001; Kimbell, 2011; Koh et al., 2015; Long, 2012; Rowe, 1998; Schön, 1983; Spencer & Juliani, 2016). Yet, they had to experience the entire design challenge and the DtL process to understand that once their group completed an assignment or their presentation, they were not finished. Instead, it was an opportunity for them and their group to make their work better. The iterative nature of DtL and design thinking continues to be one of the hallmarks of the design thinking process and what makes it different to other problem-solving processes and the distributed scaffolding makes it successful for students at this developmental stage.
Nathan added to the iterative nature of the design challenge that Jabir and Laura spoke of in their video journal when he discussed the difference between a novice design thinker and someone who uses the design thinking process regularly (Goldman et al., 2014; Koh et al., 2015; Razzouk & Shute, 2012a; Zielezinki, 2016). Additionally, he discussed how much he enjoyed the process, the organization of the design challenge, and that the teacher could not control what his group created:

When I started the design challenge I was very iffy about it. I haven't done an actual design challenge before, like, I've made things, but I haven't really gone through it before. And just doing it was very difficult, but after you do it, it's good once you get into it. It's sort of fun. It's hard at the beginning, but it gets really easy and really, really fun. If I could have a second chance to do it again, I would maybe do it a little differently, mostly because I had no clue what I was doing earlier. And, um, it was very difficult going without knowing anything, but now that I do know things it's a lot easier and, um ... I don't know.

It is, um, this design process is a lot more different than normal learning because normal learning, you just walk into a classroom, you sit down, and you learn something you're probably never going to use, but DtL was very helpful, like, it was very hands-on and then you would actually use stuff, like you would make an art project to make on the WalkLine, you would actually go out into the world and experience things and you wouldn't be held back by the boundaries of a classroom. The design thinking process is, I think, one of the most effective processes. It goes through each critical thing that you need to do and puts it together in a way that you get everything done quickly and efficiently. And it's not boring, it's really fun, it's, like, the thinking process. You brainstorm
and then after that you make a prototype that can be anything you want. It could have anything to do with what you're doing. Basically, you make it. The teacher has little to no control over what you do. You can make it however. You can do an art, you could do a model, you could do a video. You could do anything. And you make it. You don't like it, you do something different. And every time you're doing something different, you're also learning more. (Nathan, Video Journal: Present/Reflect).

Nathan remarked that the design challenge was real-world and extended beyond the classroom, which was important for him. He stated earlier in the Video Journal: Discovery that he believed he would remember this design challenge when he was in high school. In his Video Journal: Present/Reflect, he extended these remarks. Because Nathan and his group, Shades of Blue, were in control of what they created, they were at the center of their own learning experiences – student-centered learning. I, as his teacher, did not have control over what his group decided to create as an art installation. Lastly, he mentioned that the DtL process walked him through all the necessary components so that he and his group could produce an art installation that honored a group that promoted human rights in the city.

As Nathan discussed how the DtL process and design thinking created a student-centered learning opportunity for him and his group, Wolfgang echoed these sentiments but added how the organization for the design challenge provided him a path to follow which he found helpful:

What's different about the design challenge than a traditional project? Well, a lot. The design challenge is much more organized. It has got all these different phases and assignments and it's. You've got like you kind of know what you're going to do next. And traditional, it's kind of like um, you walk into the class, you talk about one thing, blah, blah, blah, then you walk into the next class and talk about something different, still related to
the topic. And in the end you have to create some project. It's just very different and it
feels different. It feels kind of less important, that sort of thing.

Describe the design process and what I did in it. What was the most helpful and
what was the most frustrating? Well, the design process, hmm? I don't really know how
to describe it. It's infuriating at times. Um, it's nerve-racking at others. It's feels easy,
straightforward at times. Um, it's annoying at times. It's a lot of different things. Um, but
I would say the main thing about it is that, well, if I'm comparing it to traditional again I
would say it's less boring. So overall, I like this, the design process a bit more than then
the other process. Now, the most helpful was probably. The most helpful thing, the most
helpful thing in the design process was probably having it [the design challenge] be so,
being so organized. As I said, it's much more organized than traditional [social studies
experiences] and that, that's really helpful. I know what I'm going to do next. I know how
it's going to work out. I know what I'm going to do and I know how to prepare and that
sort of thing. (Wolfgang, Video Journal: Present/Reflect)

For Wolfgang, the organization of the DtL process was one of the main aspects that set the de-
sign challenge apart from a more traditional social studies class experiences. Yes, he found parts
of the design challenge fun and others infuriating and frustrating, but he remarked that without a
roadmap to follow, the DtL process, he and his group would not have been able to produce such
a strong art installation prototype or presentation. He, like the rest of the participants, found the
design challenge fun, yet difficult, because it pushed him to think deeply, connect ideas, and col-
laborate with his group.

Lastly, Jolie summarized the sentiments of Nathan, Laura, Jabir, and Wolfgang in her
Video Journal: Present/Reflect.
How does this design challenge compared to more traditional forms of learning? I think it's compared to traditional forms of learning because you're still doing like the homework, you're still writing, you're still learning a lot like a traditional way. But, you're just putting doing it more out there. So, I really like the design thinking process. It was really helpful in this challenge and we went, step by step really helped instead of just like rushing through making everything like really fast. Cause like taking a long time on this actually really helped and yeah the design thinking helped with that. (Jolie, Video Journal: Present/Reflect)

Jolie remarked that she still wrote and still had homework even though it was not a traditional social studies class. The difference for her was the organization of the design challenge, the DtL process, and that her group’s work was real-world and outside of the classroom. Thus, Jolie was still learning the social studies content, developing academic skills, collaborating with her group, and she was learning DtL and design thinking. Her concluding remarks demonstrated that she had fun during the design challenge. She found the time and effort needed to complete the design challenge worthwhile and believed that the DtL process helped her and her group.

**Group Check-in 2.** Participating in Group Check-in 2 concluded the design challenge. Similar to Group Check-in 1, it took the form of a group interview, with a protocol (Appendix X). As discussed in Chapter 3, this group check-in was the last component of the design challenge, but it was the first set of data that I analyzed. In following the analysis strategy of progressive focusing and its abductive nature (Sinkovics & Alfoldi, 2012), it allowed me to follow my instinct to start with Group Check-in 2 because I was not generating theory or testing theory, I was developing and refining a theory. Additionally, starting at the end allowed me to see how participants had experienced the entire design challenge and begin to determine where shifts took
place during the study. By listening to and reading the answers given by groups to the questions in Group Check-in 2, I gained greater understanding of the participants’ experiences as they finished the design challenge, which led to greater insights during data analysis.

Group Check-in 2 provided a rich description of the participants’ overall experiences of the design challenge. Based on the responses to the prompts, participants focused on the difference between their experiences of the design challenge compared to other social studies classes, how their presentation changed over time, if they were engaged in the design challenge, and the easiest/hardest aspects of the design challenge.

Overall, participants described that they had positive experiences during the design challenge. While aspects of the design challenge were difficult to complete, participants affirmed that they enjoyed the design challenge more than social studies classes they have had in the past. Additionally, participants agreed that presenting twice was worth the time and effort because their second presentation was dramatically better than their first. Lastly, participants described aspects of the design challenge which they found easy or hard to complete. Interestingly, most participants had similar answers for the prompts. Below are several excerpts from the Group Check-in 2 that highlight these similarities across groups.

Martin: In a more traditional social studies class, we'd just be like, remembering dates and like, writing essays… but in here we actually get to really learn, and, um, actually experience things for ourselves, instead just hear about it, and we're really focusing on what's happening now, what's happening in the past ... What happened in the past that can affect now, and what can happen in the future rather than just being like, "Blah blah blah happening, this and then this," we're actually really learning all of this and, in ... Yeah.
Todd: Would you guys say that you're more or less engaged? So are you more engaged in this type of work, or in a more traditional setting?

Wolfgang: Um, I ... I feel like I'm much more engaged in this, because we are ... In another more traditional, normally we have, um, we're kind of bouncing around, kind of talking about random things related to the subject, and, um, we're kind ok ... We're not really doing much, in those classes, we're doing much more in this class. We aren't filling out assignments, we are doing all sorts of things. In a traditional class, we might have a whole day of just listening to the teacher talk about a certain something, or write on ... Or be writing on, like, a piece of paper, like taking notes and stuff on a video, or something.

Martin: I prefer this form of social studies a lot more, but at the same time, I do like the more traditional social studies too. But this social studies is, for me, a lot better. 'Cause it's more engaging, and it's more interactive, so that for me I can actually learn it and I won't just forget it in a few days.

Todd: Describe the best part of the prototype phase.

Sol: Um. The best part of the prototype phase. Um, I think the best part of the prototype phase would be, um ... I want to say when you're ... When you finish it, um, which is uh ... Still a bit ... Or, I guess, um ... The best part of the prototype phase is probably, um, seeing it after you make it and seeing it finished and seeing, like, "Oh wow, that's what it ... If I make it bigger, that's what it'll look like."
Todd: So, would you say that your second presentation was much better than your first one?

Sol: Yes.

Wolfgang: Yes.

Martin: Yeah. (Martin, Sol, and Wolfgang, Group Check-in 2).

As a group, Together, Martin, Sol, and Wolfgang, expressed how the design challenge went beyond reading strictly a textbook which they associate with “traditional” social studies classes. They were immersed in a real-world scenario where their work could be on public display. For them, this was a far cry from their previous social studies experiences. Additionally, Martin, Sol, and Wolfgang stated how completing the prototype was an important step for them in the design challenge because it allowed them to see what their art installation would like in real life. Their idea became tangible. Lastly, as all seven groups discussed that their second presentation was better than their first because they had an opportunity to practice and adjust based on the feedback they received.

Like the group Together, Mural of Acceptance, Laura, Jason, and Mac, highlighted how the design challenge allowed them to learn in a way that they deemed was best for them.

Todd: How would you compare the work in this design challenge to other social studies classes that you've had?

Mac: I think this is unique, 'cuz at my old school, all we did was read out of textbooks, and read occasional little, um, projects. And this is unique and a lot better.

Todd: Why is it a lot better?
Mac: Because it allows you to go more in depth on the topic, and it's, it's fun and you learn more, and it's fun, and at my old school it wasn't as fun, and I didn't like it as much, because like, I just kept forgetting everything.

Laura: Um, I think that it's better because it helps me learn in a way that's right for me, and it's like last year, our teacher sort a just gave us a textbook and we all read in a group. And the next day, I had forgotten what we had been reading about, unless it was like really important, and every once in a while, we got a test, but it feels like we're getting a test every day in this, in a good way.

Todd: Can you explain that?

Laura: Yeah, like. So, I don't really know how to explain it, other than just, it's like, it's sort of just ... I don't know how to explain it, but like-

Jason: Like, you're being tested, like can you do this, can you do that?

Laura: Yeah.

Jason: Test, yeah.

Todd: Okay.

Laura: But you're always learning something. It's like not, just reading out of a textbook.

Jason: Um, I like it a lot better because I feel that it's a better in depth way of learning, and you learn more because you experience more. (Jason, Laura, Mac, Group Check-in 2)
For Jason, Laura, and Mac they defined the major difference between social studies classes they had in the past and the design challenge was that they were always learning. Their learning continued to evolve and built on what they had already learned. Mural of Acceptance demonstrated how design thinkers think about their work – as iterative (Brown, 2008, 2009; Brown & Wyatt, 2010; Carroll, 2014; Carroll et al., 2010; Cross, 2006, 2011; Dewey, 1938; Di Russo, 2016; Goldman et al., 2012; Hasso Plattner Institute of Design at Stanford, 2007; Kelley & Littman, 2001; Kimbell, 2011; Koh et al., 2015; Long, 2012; Rowe, 1998; Schön, 1983; Spencer & Juliani, 2016). They learned new things and combined it with previous knowledge. As a group, they collaborated to come up with a stronger art installation idea and second presentation than had they used their first idea or not incorporated the feedback they received on their work.

Jabir, from Shades of Blue, highlighted that the Discovery phases helped him and his group to point them in the right direction.

I felt the discovery phase. Because if you don't know what you're ... 'cause when you go out, and get immersed in everything that you're doing, like you're making a project about human rights, so then, a certain right, so then you go over and learn about human rights going through the discovery phase was most important because you actually learn about what you're supposed to be doing. (Jabir, Group Check-in 2)

Jabir recognized that the phases of DtL provided his group with a process and a vision for the design challenge that allowed for his group to overcome several obstacles they encountered over the course of the design challenge.

In addition to Jabir’s insights, during Group Check-in 2, there was a marked difference in tone between the previous two Group Check-in 2 excerpts and Shades of Blue’s contributions. Both Together and Mural of Acceptance identified how the DtL process helped them during the
design challenge because it gave them opportunities to fail, reflect, and collaborate in a comfortable learning space. Shades of Blue highlighted similar traits, yet the tone of their group check-in was different; it was conversational and playful. This change in tone from the beginning of the design challenge was notable. In the beginning of the design challenge Geneva expressed concern if her group could positively collaborate and, at times, there were some heated moments. Yet, Shades of Blue found a way to use the talents of the group to produce a strong art installation prototype.

Todd: So would you guys say you're more engaged in the design challenge of PBL than other types of ...

Nathan: We're a lot more engaged.

Todd: How did your group excel when you were making the prototype?

Geneva: I think this one the small idea that we had of girls, you know, kind of expanded over time, it became better and at first. We were gonna have eyes on them and noses and whatever, and all the facial features, but we decided not to. So, that kind of helped with a little bit of our symbolism.

Nathan: I think a reason we decided not to was mostly because with the details, it kind of, like, shows who you are in a way of like, like you're the certain person and the details make you that. But without the details, you can be whatever you want, and that you're equal no matter what.

Todd: How did your group struggle with your prototype?

Edwin: It was hard. Like, think I had to start over more than once. Like, we, we all had to. I had to start over on my websites six or seven times. No joke, I did.
Nathan: Changing the URLs?

Edwin: Oh my God, that was a pain in the neck. Each time we had to change like I always delete this one letter. I just URL I gotta do that link, like, it was a pain.

Geneva: Yeah, 'cause he didn't have capital letters on some of the pages.

Edwin: Was I the one writing? No, I was not.

Geneva: Okay, I was just saying.

Nathan: I think we worked through it.

Edwin: Yeah, we worked through it.

Todd: How did you work through it? How did you work through the hard part?


Nathan: Edwin, Edwin. We kind of assigned each other parts and we trusted each other that we'd do it and we all did it and we had everything ready, we put it together and it made a really good prototype. We kind of assigned each other parts.

Geneva: Yeah, Jabir was writing the story, Edwin, Nathan was, yeah I did one, and Nathan was drawing and Edwin was making the website and I was working on the slides, you know, so it kind of all worked out.

Geneva: I think all the phases were equally needed and difficult, but we got, not like, that difficult, but it was like something that was needed to be a part of in order to have a good outcome.
Todd: So if you didn't go through each of those phases, could you have the outcome that you did when you were, your art installation idea in your presentation?

Geneva: Probably not.

Nathan: Most likely not.

Edwin: I think maybe, we could skip couple little phases, like ...

Geneva: As in?

Todd: Phases or assignments?

Edwin: Assignments.

Nathan: Yeah, some of the assignments were just were doing what we did.

Edwin: It was like, well you guys need to do one plus one is two, like I could skip all the journals, like I don't even think they were important to me.

Nathan: Well the journals are our reflections. It's not like it's ...

Edwin: I don't reflect very often.

Jabir: It's where you talk about what you've done.

Edwin: What are we doing right now?

Jabir: Reflecting.

Edwin: Exactly. And so we could just do, like all that as a group. Instead of just having to do it one by one.

Jabir: Yes, but I actually always wondered. Why do we have to fill something out? Why can't we just go talk to you, Todd, and ...

Edwin: Exactly.

Geneva: Oh god.
Edwin: I don't have to send you emails and say like, "I'm sorry that I did this," instead of why can't we just go straight to you with that?

Nathan: I love how we're talking about what we're talking about.

Todd: Which phase of detail was easiest to complete?

Nathan: Easiest?

Edwin: I think the discovery phase, because like ...

Nathan: The discovery phase.

Jabir: We just went on field trips.

Edwin: We went on field trips, yeah, like "Oh yeah, field trip, let's go."

Jabir: And then we learned something from it though.

Geneva: Yeah, I mean, it's not like we just went on a field trip just like, "Oh, we're going to a place and we're not gonna learn anything today." I mean, we got an outcome from it and we learned stuff, but it wasn't necessarily as hard as some, as some of the presentation phase or the prototype phase.

Todd: Did the discovery phase point you in a direction for the rest of your work?

Edwin: Yes.

Nathan: Yes. Yeah, told us what we had to do and how to do it and gave us.

Geneva: It gave us knowledge about the human rights and stuff like that.

Edwin: Knowledge.

Jabir: It made it so that we didn't have to go searching around the internet more.

(Nathan, Jabir, Edwin, Geneva, Group Check-in 2)

As the group discussed their experience, they highlighted several key aspects. The group found a way to collaborate even when they recognized that they were more likely to encounter conflict.
Shades of Blue figured out that they needed to assign each other tasks and hold each other accountable for completing said tasks. This was not explicitly part of the DtL process, but they recognized that they needed to divide the tasks to be successful. Additionally, they highlighted their love/hate relationship with reflecting and feedback. While they were frustrated at times by both, they recognized how reflecting and feedback strengthened their work. However, it was only after going through the DtL process that they realized the importance of both. Lastly, similar to several groups, Shades of Blue needed to talk through their work. As Geneva, Jabir, Edwin, and Nathan answered the prompts during Group Check-in 2, their discussion led to greater insight about the design challenge, the DtL process, and how design thinking helped them create their art installation prototype, presentation, and WalkLine art proposal. As they shared their individual thoughts of the design challenge, this led to the group gaining better understanding of their work, what they had learned, and how they collaborated.

**Summary of Reflect and themes.** The Reflect phase of DtL created space for participants to think about their learning and experiences over the entire design challenge. The combination of a journal, video journal, and group check-in afforded me the opportunity to compare responses from individual participants and group responses. Additionally, I could compare responses across groups. All the themes identified in Chapter 3 were relevant in this phase of DtL because the Reflect phase required that students look back at their design challenge experience.

**SE: Students’ feelings and SE: DT vs. Traditional SS.** Participants expressed excitement and relief upon finishing the design challenge. Most students suggested that they would use DtL or another form of design thinking in the future to solve problems. If students’ experiences were not positive, the likelihood of them even suggesting that they would use the process in the
future would be minimal. After the study was concluded, I observed several instances where students formed groups and agreed to use aspects of DtL to help them identify problems and generate solutions in social studies. As participants described their experiences in the Video Journal: Present/Reflect and Group Check-in 2, they discussed how they went from novice design thinkers to those who would use the process again when posed with a problem. Additionally, most re-stated that they preferred using DtL to learn social studies as compared to their other social studies experiences. Participants recognized the value of the design challenge and its numerous activities even though they were not always a fan of completing so many.

**DS: Presentation as prototype and DS: Feedback loop.** Feedback and presenting twice were highlighted as important components of the design challenge which enabled groups to achieve greater success. While students did not recognize the value of multiple feedback loops at the beginning the design challenge, by the Reflect phase they saw it as a necessary evil in the worst cases (Assignments 8 and 14) and in best case scenarios, helpful in making their work stronger, propelling groups to stronger outcomes. Two presentations and feedback loops provided opportunities for groups to fail fast and fail forward without jeopardizing the art installation prototype, presentation, or WalkLine art proposal.

**SE: Collaboration and DS: Social studies content.** Students described in their Journal 7 and Video Journal: Present/Reflect, and expressed, in the Group Check-in 2, how their group collaborated. Collaboration became a key part of the design challenge as groups progressed through the DtL phases and students recognized its importance. Through collaboration groups demonstrated social studies skills – specific dimensions of the C3 Framework were D2, D3, and D4 (National Council for the Social Studies, 2013). Groups incorporated disciplinary knowledge,
D2, to develop their art installation, WalkLine art proposal, and presentation. After using disciplinary knowledge, they used D3 to gather and evaluate sources and develop claims using evidence. Groups communicated their conclusions and took informed action that extended beyond the classroom into the community. Lastly, there was a sense of relief and can-do attitude by the groups because they had completed “the hardest thing they had ever tried” in a school setting.
5 DISCUSSION

Summary of the Study

The purpose of this qualitative case study research was to understand how students experienced design thinking and distributed scaffolding during a design challenge in a middle-level social studies classroom. Guided by a theoretical framework of sociocultural theory (Vygotsky, 1978), experiential education and art as experience (Dewey, 1934, 1938), and design as discussed by Buchanan (1992), Cross (2006, 2011), Schön (1983), and Simon (1969), this research created an opportunity to analyze and interpret the collected data to answer the research questions.

Building off design thinking in education research (Carroll et al., 2010; Estrada & Goldman, 2016; Goldman et al., 2012; Goldman & Kabayadondo, 2016; Goldman et al., 2016a, 2016b; Koh et al., 2015; Noweski et al., 2012; Scheer et al., 2012) and the recognized gaps in the literature: students’ experiences of design thinking and distributed scaffolding in design thinking (Carroll et al., 2010; Davis & Littlejohn, 2016; Koh et al., 2015), this study sought to answer the following research questions:

- What role does distributed scaffolding play in students becoming design thinkers in a middle school social studies classroom?
- How does distributed scaffolding incorporated into design thinking allow students to demonstrate their understanding of social studies?
- What are students’ experiences of, and how do students respond to, distributed scaffolding in a design thinking unit?
Throughout the seven-week study, 23 sixth-grade participants were divided into seven groups of three or four students. Students used a design thinking process called DtL (Wass, 2015) to identify a person/group/organization that promoted human rights in a southeastern city and created an art installation to honor their work with the hopes of having the installation placed on the WalkLine – a multiuse outdoor trail in the city. Groups produced three major components for the design challenge: a prototyped art installation, presentation, and a completed WalkLine art proposal application. The research study used case study method (Stake, 1994, 1995, 2005) and progressive focusing (Parlett & Hamilton, 1972, 1976; Sinkovics & Alfoldi, 2012; Stake, 1981) coupled with strategies for data analysis espoused by Ezzy (2002) and Miles et al. (2014) to analyze the following data: student artifacts, journals, video journals, and group interviews.

I ultimately identified two themes described in Chapter 4: distributed scaffolding and students’ experiences and three subthemes for each theme. Distributed scaffolding included presentation as prototype, feedback loop, and social studies content. Students’ experiences included collaboration, students’ feelings, and design thinking versus traditional social studies. The identified themes created new insights into how middle school students experienced design thinking and distributed scaffolding in a design challenge.

**Real-world and Outward Facing**

Throughout the study, students expressed enthusiasm for the design challenge because they were working on real problems. Unlike in their previous experiences in social studies classes where they simply submitted final projects to their teacher – and only the teacher or the class would see their work. Students recognized that their work extended beyond the classroom to the community. Students expressed “agency, confidence, and identities as change agents as they respond[ed] to real-world interdisciplinary challenges” (Estrada & Goldman, 2016, A Praxis
Model for Design Thinking, Conceptual Background, para. 7). Moreover, when groups got off topic the easiest way to refocus the group was to remind them of the design challenge question because it promoted the real-world nature of their work. The outward facing nature of the design challenge and the excitement that accompanied their work helped students learn the design thinking process and kept them motivated even when students struggled with some of the assignments.

Early in the design challenge, students took time to embrace the iterative nature of the design thinking process (Brown, 2008, 2009; Brown & Wyatt, 2010; Carroll, 2014; Carroll et al., 2010; Cross, 2006, 2011; Di Russo, 2016; Goldman et al., 2012; Goldman & Kabayadondo, 2016; Goldman et al., 2016b; Hasso Plattner Institute of Design at Stanford, 2007; Kelley & Littman, 2001; Kimbell, 2011; Koh et al., 2015; Long, 2012; Spencer & Juliani, 2016). As students became more comfortable in the design challenge they saw iteration as a way to make their work stronger. Students highlighted receiving feedback, especially from experts such as their art teacher and other panels of experts, during their presentation as instances that helped them to improve their art installation prototype.

Students described how DtL (Wass, 2015), a design thinking process, allowed them to take ownership of their learning, what they created, and how they were not held back by the boundaries of the classroom. Furthermore, several groups recognized that their art installation that they created for the public went beyond just a class grade, or recognition for their work. In the process, groups were raising awareness for a human right, becoming an activist, and promoting social justice. This understanding started with one individual in the group and spread to a group understanding; collaboration fostered this shared understanding of the real-world and outward facing nature of the project.
Collaboration, Ideas, and Outcome

An indication of group success and a shared understanding during the design challenge occurred at the intersection of good collaboration and good ideas. Kangas et al. (2013, p. 31) defined good collaboration as: “mutuality, joint focus of attention, and shared task alignment” (p. 31). For this study, good collaboration was observed when individuals put aside their egos and their own ideas to do what was best for their group. It became a shared task for the group; the group would only succeed if all members believed that they were better off working together then working to promote their ideas or their agenda. Groups such as Together and Essential Bench had good ideas and collaboration. Even when an idea did not work out, the group relied on their collaboration to generate and iterate different ideas. Additionally, good ideas was observed during this study as the ability of the group to actively use the d.School’s brainstorming rules and honestly discuss ideas with each other. Moreover, after a group came up with an idea, groups that were willing to challenge their ideas to make them better came up with even better ideas. Another part of good ideas was how groups responded to feedback from experts. When groups actively sought out feedback and were willing to set aside their individual and collective egos for the betterment of the group and their idea, their ideas improved too. Conversely, when a group did not collaborate well or did not have good ideas they struggled to have strong outcomes at the end of the design challenge (see Figure 38).

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<tr>
<th>Ideas</th>
<th>Collaboration</th>
<th>Outcome</th>
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<td>Good Collaboration</td>
<td>Strong Outcome</td>
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<tr>
<td>No Ideas/Disagreement</td>
<td>Good Collaboration</td>
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<td>Good Ideas</td>
<td>Rough/No Collaboration</td>
<td>Good/Fair Outcome</td>
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<tr>
<td>No Ideas/Disagreement</td>
<td>Rough/No Collaboration</td>
<td>Weak/Poor Outcome</td>
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</table>

Figure 38. Ideas, collaboration, and outcome.
In instances where groups struggled to collaborate or were not coming up with ideas, I took the opportunity to step in and closely facilitate the process with the additional distributed scaffolding these groups needed. While there were instances where groups experienced no ideas or disagreement and rough difficult or no collaboration, for the sake of the participants’ learning, I actively sought ways to help the group. I did this through whole group discussions, individual discussions, asking groups to talk with an expert or to emphasize the goal for the design challenge. In the Reflect phase of Dtl, participants recognized how important collaboration was to success – this was true even for groups that struggled to collaborate effectively. Despite successful collaboration for some groups, they still had to navigate other tensions, such as academic skills, social studies content, design thinking, and time throughout the design challenge.

**Tension – Content, Skills, Design Thinking, Time, and Socialization**

Carroll et al. (2010) acknowledged tension when teaching design thinking and academic content to younger students. This phenomenon was especially present and challenging in this study because participants were novice design thinkers and young students (Koh et al., 2015; Razzouk & Shute, 2012a; Zielezinski, 2016). Students had not yet acquired the “T-shape” attributes of design thinkers (Brown, 2009; Brown & Wyatt, 2010). The vertical axis of the T represented the expert knowledge of one or several fields. The horizontal axis of the T represented the “empathy for people and for disciplines beyond one’s own. It tends to be expressed as openness, curiosity, optimism, a tendency toward learning through doing, and experimentation” (Brown & Wyatt, 2010, p. 34), and the authors argued that the top of the T was “where a design thinker was made” (p. 34). In addition to the tensions highlighted by Carroll and her colleagues (2010), added tensions for this study included social studies content, academic skills, social behavior of
students, and time. Unlike many design challenges that take place in higher education, where students come to a design challenge with some level of mastery in content, academic skills or both, that was not the case with the middle school students in this study. Students needed time to learn the social studies content (human rights), design thinking (DtL) and its processes, and academic skills (writing, thinking, researching, presenting, collaboration, reflecting, and organizing) to accomplish this challenge. As classrooms continue to be complex environments (Puntambekar, 2015), dealing with unforeseen social dynamics that played out during the design challenge, it added another tension to the study. Time constraints to complete the design challenge were an additional tension. Therefore, it is important to use distributed scaffolding in a design challenge that uses design thinking for novice design thinkers to help navigate these tensions.

Part of the issue for educators incorporating design thinking into K-12 education and specifically in younger grades is that students are learning a set of skills that will help them execute design thinking in addition to required content knowledge and academic skills. Specifically, students are learning how to write, present, and use the disciplines of social studies to understand the world around them. Outside of K-12 education, when people use design thinking, they bring separate and more mature expertise to the table. They may have degrees in different fields that allow for them to use previous knowledge to execute a design challenge. In K-12 education students are simultaneously learning design thinking and learning to use the tools and acquire knowledge to be successful in school and in life. As they learned these skills and content during the design challenge, there were instances where groups struggled within these tensions and frustration set in.
Scaffold frustration

Scaffold frustration was described as instances during the design challenge where despite the presence of scaffolding during an activity, students still expressed or experienced frustration in achieving the task. Moreover, it was in those moments when participants expressed that no matter what they did, they were not going to be successful in completing a component of the design challenge; they felt defeated. Dewey (1934) suggests that new experiences that upend equilibrium cause tension and frustration. In these moments of tension and frustration students work to create a new sense of equilibrium. The process of achieving a new equilibrium post-frustration was where learning took place. Therefore, there is value in students’ frustration or disequilibrium if students can navigate to an enhanced state of equilibrium, therefore development.

In Chapter 1, I argued that design thinking was part of PBL and part of the larger field of student-centered learning. The PBL literature suggests the need for scaffolds for students to achieve greater success (Azevedo & Hadwin, 2005; Belland et al., 2013; Brush & Saye, 2002, 2013; Choo et al., 2011; Doering & Veletsianos, 2007; Ertmer & Glazewski, 2015; Gallagher & Gallagher, 2013; Hmelo-Silver, 2004; Hmelo-Silver et al., 2007; Hung et al., 2008; Lee & Kolodner, 2011; Puntambekar, 2015; Puntambekar & Kolodner, 2005; Savery, 2006 2002; Saye & Brush, 2002). This extends to design thinking too; especially for novice design thinkers. In this study, every phase of the design challenge was a carefully curated experience that included distributed scaffolds as part of the design of the Human Rights Design Challenge. Even when taking into account curricular scaffolds and teacher facilitation to navigate inquiry, structure tasks, support communication and foster reflection (Hsu et al., 2014), there were times when students still struggled, thus necessitating more scaffolds.
I identified scaffold frustration expressed by participants as dissatisfaction with their level of ability to successfully complete a task and continue working with their group on the design challenge. Some participants did not know what to do next. Others did not possess the academic, design thinking skills or social studies content and therefore struggled. While there were scaffolds present in all the assignments, journals, video journals, and group check-ins, they may not have been the right or best scaffolds for all students. Charles said, “The hardest part for me during this project was keeping up with all the assignments like sometimes I was just about to lose it with all these assignments (Charles, Journal 7). Students’ experiences with Assignment 14, the WalkLine art proposal application, and Assignment 8, writing the POV, exemplified scaffold frustration.

In other instances, like Assignment 14 the WalkLine art installation proposal, I left the application as close to the original that they would complete at the end of the design challenge based on my understanding of my students and their abilities. In that assignment, there were few scaffolds present and it became an obvious problem. Two specific examples of scaffold frustration came from Laura and Edwin. Laura discussed her frustration with how hard the design challenge was to complete while Edwin commented how frustrated he was with me, his teacher. Laura clearly expressed, “That [the design challenge] was the hardest thing I have ever done schoolwork wise. No lie.” (Laura, Journal 7), and data indicated that many of the participants felt the same way. Participants not only had to utilize all the skills they had learned in and out of school in the design challenge, they had to learn new skills too. Because they concurrently used multiple skills while collaborating with their group, it made sense that participants became frustrated during the design challenge. Edwin suggested that my input was the reason he felt frustrated throughout the design challenge: “No offense Todd, but you push us just enough to make
us mad but ... well make me mad but still be able to produce a good product” (Edwin, Video Journal: Present/Reflect).

A different example of participants experiencing scaffold frustration occurred during Assignment 14, the WalkLine art proposal application. One of the questions in the assignment asked groups to create a detailed list of materials, the cost, and step-by-step installation and uninstallation instructions. As I observed groups work through Assignment 14, which took the longest amount of time to complete, participants conducted considerable “researching”. They were researching “things that they didn’t know where to find the answer” (Shades of Blue, Group Check-in 2). Repeatedly, groups researched buying paint for their art installation for their materials list. However, they were not familiar with how to buy paint. Instead of estimating the quantity and kind of paint needed for outdoor structures, they spent time trying to find the right color paint in various sizes. Students needed help deciphering the difference between a quart, gallon, and five-gallons of paint and the respective costs. Groups did not know the difference between interior and exterior paint or about the five different textures of paint (flat, eggshell, satin, semi-gloss, and gloss). Groups became frustrated with the amount of time it took them to find the right paint. Unfortunately, paint was only one line item for their materials list.

In Assignment 14 there were scaffolds to help groups fill out the application, yet these prompts in the application assumed that the participants were familiar with installing and uninstalling an installation, creating a materials list, and had previously written grant proposals. As sixth graders, groups were not familiar with any of these skills; therefore, the more they struggled to complete the application, the more they became frustrated with Assignment 14, the more the frustration spilled over to the entire design challenge.
Groups expressed their scaffold frustration differently. Wolfgang discussed the design process, “Well, the design process, hmm? I don't really know how to describe it. It's infuriating at times. Um, it's nerve-racking at others. It's feels easy, straightforward at times. Um, it's annoying at times. It's a lot of different things” (Wolfgang, Video Journal: Present/Reflect). On two ends of the spectrum were The Big Six and Together. When The Big Six experienced scaffold frustration during the design challenge, they tended to bicker and lash out because they were unsure of right course of action. This caused group friction, a loss of collaboration, and the inefficient use of time resulting in a sense of hopelessness. In contrast to The Big Six, when members of Together experienced scaffold frustration, they came together as a group and discussed options. While they did not always know the next move, and felt like they may not succeed, the group continued to collaborate. By turning inwards to the group, Martin, Sol, and Wolfgang threw out ideas and together they formulated a plan. In many instances, they checked in with me to see if their plan would keep them on track. Whereas The Big Six expressed hopelessness when they became frustrated, to the contrary, Together formulated a plan and recognized that if the plan did not work they would come up with another plan. Together epitomized the iterative nature of design thinking and the power of collaboration. No matter the level of collaboration, all groups experienced scaffold frustration.

**Distributed Scaffolding to Mitigate Tensions and Scaffold Frustration**

Purposefully implementing distributed scaffolding throughout mitigated design challenge tensions (Hsu et al., 2014; Puntambekar, 2015; Puntambekar & Kolodner, 2005; Tabak, 2004). Recognizing that sixth-grade students did not come to the design challenge with T-shaped expertise – field and design thinking knowledge (Brown, 2009; Brown & Wyatt, 2010), was important to support students in gradually laying the groundwork for social studies content, academic
skills, and learning design thinking. By incorporating distributed scaffolding, students had a variety of opportunities to engage with the design challenge through multiple ZPD (Brown et al., 1993; Brown & Campione, 1994; Puntambekar, 2015; Puntambekar & Kolodner, 2005; Tsai et al., 2014; Vygotsky, 1978) and learn social studies content, academic skills, and the design thinking process. Accordingly, students built on previous experience in the design challenge to create stronger prototypes, presentations, and WalkLine art installation proposal – pulling on different areas (content, academic, and design thinking) to fulfill the design challenge requirements in an iterative process. The use of distributed scaffolding to teach the design thinking process to novice design thinkers promoted a positive experience for the students.

An example of distributed scaffolding in the design challenge was the numerous activities groups completed to prepare them for their final presentation. Students needed opportunities to try out and work through parts of the design thinking process and practice academic skills such as research and writing before they turned in their work for to be assessed. With multiple opportunities to practice, learn, and demonstrate, starting with the first scaffold of writing an individual pitch, and with the following steps: group pitch, first presentation script, presenting, watching the recording of their first presentation, and finally their final presentation script, students used the distributed scaffolding placed in the design challenge to demonstrate their growing understanding of the design thinking process, academic skills, and social studies content. Without distributed scaffolding, novice design thinkers neither knew the process nor did they have the field expertise to fall back on to accomplish the task. In most cases, without proper, intentional, scaffolding, students became frustrated and found design thinking too difficult to successfully execute. The use of distributed scaffolding in design thinking can mitigate tensions that exist for novice design thinkers.
Limitations of the Study

There were several limitations of this study. First, this study was conducted in an independent school that fosters the freedom to create such a curriculum. While it is possible, and I would argue needed, to implement design thinking in public education settings, educators need time and the flexibility to try, fail fast, and fail forward, design thinking in their classrooms in a low-stakes manner, supported by the administration and community. Moreover, in the current accountability climate, educators must carefully consider and implement summative assessments, “to prove learning took place,” related to any design thinking project used in the classroom. Will students be assessed in social studies content, academic skills, or their knowledge of design thinking? Or all areas? Most of the assessment that took place during this study was formative and required timely, in many instances real-time, oral and written feedback loops so that students could adjust their work accordingly (Kwek, 2016). Third, while not a limitation of this study, a limitation in K-12 education is a lack of expertise in design thinking of teachers and administrators (Carroll et al., 2010). Incorporating design thinking into social studies or middle school curricula has the potential to fail – not in a design thinking way, but in ways could make learning for students and teachers difficult. A co-taught model where the teaching team has expertise in design thinking and content works as Carroll and colleagues (2010) demonstrated, but it is better to have expertise in both. The final limitation is that none of the WalkLine art proposals were accepted. This was a frustration for all of us. There should be a secondary plan in place if the informed action is not successful; for example, in this study, perhaps the top three art installations could be placed somewhere on school grounds after a second round of review.
Implications for Action and Future Research

This research adds to the pool of design thinking literature in educational settings. Specifically, on the use of distributed scaffolding in design thinking and students’ experiences of design thinking and distributed scaffolding in a middle school social studies. Overall, students’ design challenge experiences were positive. After finishing, students expressed that DtL and design thinking could prove a useful approach to solve ill-defined problems in the future and were enthusiastic about applying this process to new challenges they may encounter. The difference between students’ previous experiences in social studies compared to the design challenge experience indicate that design thinking may have the potential to be used to develop relevant and rigorous curriculum, instruction, and assessment in social studies.

I suggest several areas for future research related to this study’s findings in the areas of: design thinking, social studies, and distributed scaffolding. As design thinkers use the design thinking process, it is important to identify the right problem and express the problem with the right question. As a design thinker, here are future areas of research posed in the form of design thinking formatted questions.

Design thinking

- What barriers exist for educators to use design thinking in classrooms?
- How is design thinking connected to disciplinary standards so that educators utilize the design thinking process as a tool to enact and execute their curriculum?
  - In the discipline of the social studies, how might the Inquiry Design Model (IDM) in social studies (Grant et al., 2015; Grant, Swan, & Lee, 2017; Swan, Lee, & Grant, 2015) be connect and design thinking?
• How do students become design thinkers – through experience of parts of the design thinking process or do students need to experience the entire process?

• How do students execute a point of view statement (POV) or needs statement in K-12 education when distance or travel is prohibited to the user/stakeholder?

• How might video journals be used in design thinking as a way for students to reflect on their experiences, learning, and mindshift, especially those who are reluctant to write?

**Social studies**

• How might design thinking be used in conjunction with the C3 Framework (National Council for the Social Studies, 2013)?

• How might design thinking be used to execute Dimension 4: communicating conclusions and taking informed action of the C3 Framework since Dimension 4 tends to be the most difficult of the C3 Framework to execute (Kulmer & Vosburg-Bluem, 2014; Middleton, 2016)?

• How does design thinking be used to enhance the Inquiry Design Model (IDM) (Grant et al., 2015; Grant et al., 2017; Swan et al., 2015) to enact the C3 Framework to create “knowledgeable, thinking, and active citizens” (National Council for the Social Studies, 2013, p. 82)?

• How do educators navigate the existing tensions when teaching social studies content, academic skills, and design thinking?

• How does design thinking engage and motivate students compared to a traditional teacher-directed model of teaching or scripted curricula?
Distributed scaffolding

- How might we use distributed scaffolding to mitigate scaffold frustration for novice design thinkers?
- How might we understand the changing need for distributed scaffolding from novice design thinkers to design thinkers over time?
- How might we identify best practices of distributed scaffolding in design thinking?
- How might we understand the impacts of distributed scaffolding on student-centered learning and problem-based learning?

Conclusion

These findings support current research of design thinking in educational settings (Carroll et al., 2010; Estrada & Goldman, 2016; Goldman et al., 2012; Goldman & Kabayadondo, 2016; Goldman et al., 2016a, 2016b; Koh et al., 2015; Noweski et al., 2012; Scheer et al., 2012). This study narrows the gap recognized by (Carroll et al., 2010; Davis & Littlejohn, 2016; Koh et al., 2015). This design challenge provides one way to integrate design thinking, educational standards, social studies content, and academic skills. The use of distributed scaffolding in design thinking provides one way to design and scaffold the design process in education. Lastly, this study relied heavily on students experiences of the design challenge and design thinking.

This study of 23 sixth grade social studies students was developed to explore students’ experiences of distributed scaffolding and design thinking in a middle-level social studies classroom. Based on the analysis of the data, the findings suggest a need for distributed scaffolding in design thinking to help novice design thinkers navigate the design thinking process. Additionally, findings suggest that students had positive design thinking experiences with the design chal-
lenge because of their expressed excitement, optimism, motivation, and engagement. These experiences largely stem from the real-world and outward facing nature of design thinking. Furthermore, students recognized how feedback loops and presentation as prototype allowed them to take risks, failing fast and failing forward, without jeopardizing all their work on the three final outcomes: art installation prototype, presentation, and WalkLine art proposal. Students appreciated that with DtL they were in control of their creation and their own learning, and were not held back by the boundaries of the classroom. While there were instances of scaffold frustration, nevertheless, students described their experience as positive and better than previous experiences in social studies. The use of distributed scaffolding in design thinking show promise as a way to enact curricula, instruction, and assessment in middle school social studies because it is student-centered and allows students to work with real-world and outward-facing problems.
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school: How the technology of design can transform teachers, learners, and classrooms.

APPENDICES

Appendix A

Human Rights Design Challenge

The Challenge:
How might we create an art installation that recognizes and/or raises awareness of a person/group/organization in the city of Edison who has worked to further human or civil rights?

Overview:
Over the next seven weeks, your group will complete various tasks to complete the phases of DtL, and lastly giving a pitch to stakeholders in the form of a TED Talk that includes your group’s solution.

On this document, you will find helpful hints, the daily plan, various rubrics, and the steps your group needs to complete to be successful. The various activities, which your group will complete in class, will help your group gain the background information and the insight your group needs to create an artifact that honors a human rights advancement or advocate in Edison. Organization is key to success during this design challenge.

When your group finishes an assignment, please turn in the assignment or inform your teacher that it is complete. In most cases, your teacher will provide feedback, and guide the group moving forward. However, if the work product does not meet the expectations of the assignment or will not be useful for the presentation, your teacher will return the assignment back to your group for the group to complete again.

In addition, we expect all students to be productive members of the group and spread work evenly between members. If a group member chooses not to engage in the design challenge and be a collaborative group member or fails to complete work on time, the following events will take place:

- Level 1 intervention - a conversation with the group leading to an action plan
- Level 2 intervention - an email home to parents reiterating and/or updating the action plan
- Level 3 intervention - conference with student, parents, and teachers to develop a plan for successful completion of the design challenge. This may include finishing the design challenge individually.

HELPFUL HINTS:
- Keep up with your work! Check in with your group members. Champion your group members. Name everything correctly and place it in the correct folders as you go.
- Refer to DtL as you work through this design challenge.
- Refer to the Design Constraints.
- See the design thinking rubric and standards-based rubric.

Group presentations start on March 9th
- Refer to the Resources Google Document. Here you will find many of the resources that will be helpful to the group.
- Google Powersearch Shortcuts/commands This will make searching more powerful.

### The Design Challenge

<table>
<thead>
<tr>
<th>HRDC Journal Immersion</th>
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<tbody>
<tr>
<td><strong>Discovery:</strong></td>
</tr>
<tr>
<td>Explore different issues, events, and problems. Locate resources and interview experts. Build knowledge. Ask questions: What do you know? What questions do you still have?</td>
</tr>
</tbody>
</table>

- Trip to the Carter Center

- Assignment 1
  - One person create a Google folder
    - Title the folder
    - First Names HRDC
    - Place the folder into your PBL folder
    - Share with your group members
    - Make sure all members have editing privileges

- Trip to the National Center for Civil and Human Rights

- Assignment 2 - UDHR 3rd Grade Version

- Introduction to art terms and art installation with Kelly

- Journal 1

- Assignment 3 - Lies Across America excerpt

- Assignment 4 - Danger of a Single Story

- Assignment 5 - WalkLine

- Video Journal Discovery

### Focus/Direction:

Go from a broad field to a specific set of questions. Look beneath the surface to develop deeper understanding. Choose a user/stakeholder and develop empathy for the user/stakeholder by observing and interviewing them. Synthesize information. Choose a direction for future work. Compose a “needs” or “point of view” statement.

- Journal 2

- Assignment 6 Topic Selection
<table>
<thead>
<tr>
<th>Assignment 7</th>
<th>Pitch Article</th>
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<tbody>
<tr>
<td>Assignment 8</td>
<td>POV</td>
</tr>
<tr>
<td>Assignment 9</td>
<td>Pitch</td>
</tr>
<tr>
<td>Assignment 10</td>
<td>Group Pitch to a Panel at TCS</td>
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</tbody>
</table>

**Ideas:**

Brainstorm ideas. Generate wild and crazy ideas and share them.

- Journal 3
- Assignment 11 - Art Installation Article and Brainstorm Solutions
- Assignment 12 Moving forward with Feedback from Kelly
- Video Journal Ideas

**Research:**

What does the research suggest? What other solutions exist? From whom and where else can you learn more?

- Assignment 13 - Symbolism
- Assignment 14 WalkLine Art Proposal
- Group Check-in
- Journal 4

**Prototype:**

Create an artistic representation through a physical or digital model which is low resolution for fast feedback and iteration. Identify problems with the current idea. Get feedback from peers, experts, and the user/stakeholder. Refine the original idea and adjust your prototype.

- Journal 5
- Assignment 15 Prototype
- Assignment 16 Feedback of prototype
<table>
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<tr>
<th>Present:</th>
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<tbody>
<tr>
<td>Demonstrate your expertise on the topic. Show how the solution, your idea and your prototype</td>
</tr>
<tr>
<td>will solve the identified problem. Get feedback from the audience and the user/stakeholder.</td>
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<tr>
<td>● Journal 6</td>
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<tr>
<td>● Assignment 17 Presentation/Proposal to a panel of experts</td>
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<td>● Group Check-in</td>
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</tbody>
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<table>
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<tr>
<th>Reflect:</th>
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<tr>
<td>What did you learn? Where did you succeed? Where could you improve? How will this experience</td>
</tr>
<tr>
<td>change your actions in the future?</td>
</tr>
<tr>
<td>● Journal 7</td>
</tr>
<tr>
<td>● WalkLine Art Proposal</td>
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<tr>
<td>● Video Journal Reflection</td>
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Appendix B

Human Rights Design Challenge
Assignment #2
“3rd Grade” version of UDHR.

Instructions
1. Watch What are human rights and an animated version of human rights.
2. Watch the history of human rights.
3. Create a document (on paper or digitally) that explains each human right according to the UDHR so that a 3rd grader could understand.
4. You must include each article in your product.
5. Illustrations and graphics are required - minimum of 4.
6. The following items should be considered when producing your product:
   a. Overall appearance
   b. Organization
   c. Vocabulary
   d. Modifying concepts of each article into simple explanations
   e. Use of illustrations and graphics

Resources
- The UDHR - all of the articles.
Appendix C

Human Rights Design Challenge
Assignment #3
Lies Across America

Directions:

● **One person** in each group make a copy of this document, title it correctly: First Names Assignment #3 and place it into your HRDC

● Read the following section of *Lies Across America* about Stone Mountain

● Create a citation for this book

● Answer the following question

Citation:

1. GEORGIA Stone Mountain
   a. What new knowledge do you believe to be the most important to this article? Provide eight examples.
      i.
      ii.
      iii.
      iv.
      v.
      vi.
      vii.
      viii.
Appendix D

Human Rights Design Challenge
Assignment #4
The Power of a Single Story

Directions:
● Make a copy of the Google document, title it correctly: First Names Assignment #4 and place it into your HRDC
● Watch the following TED Talk
● Create a citation for this TED Talk
● Answer the following questions.

1. What is the danger of a single story?
   a.
2. What is the connection between this TED Talk and Loewen’s *Lies Across America*?
   a.
3. How can you make sure that your solution does not have a single story?
   a.
Appendix E

Human Rights Design Challenge
Assignment #5
WalkLine Art

Directions:
● One person copy this Google document, title it correctly, First Names Assignment #5 and place it into your HRDC
● Watch the following videos individually on the WalkLine and WalkLine Lantern Parade
● Watch the TED Talk by Ryan Gravel
● Create a citation for each video and document
● Discuss the following questions as a group
● Answer the following questions as a group on the Google doc

1. What is the WalkLine?
   a.

2. Have you been on the WalkLine?
   a.
   b. If so, what sections?
      i.

3. Did you know about the Lantern Parade?
   a.
   b. Would you have gone if you knew about the parade?
      i.

4. What questions about the WalkLine do you still have?
   a.

5. How might your group create a monument/memorial/art instillation to celebrate an event/story/person for the WalkLine Art Exhibition? Individually brainstorm five ideas based on your knowledge gained from the Discovery Phase of DtL.
   a.
   b.
   c.
   d.
   e.
Appendix F

Human Rights Design Challenge
Assignment #6

Today you will be deciding on the person/story/event to be honored by your group through the Human Rights Design Challenge. Understand that once you choose your focus/direction it cannot be changed and you will have to see it through to the end of the Design Challenge. Therefore, make sure your chosen subject it is something that your group believes in and is committed to honoring.

Directions:
- One person copy this Google document, title it correctly, First Names Assignment #6 and place it into your HRDC
- Discuss and answer the following questions as a group. You may not split up questions.

**Topic Constraints**
- Your selection must be directly related to Edison
- Must be from the 20th or 21st Century
- Cannot have been honored yet through a monument, memorial, building, street, etc.
- The person/group/organization that will be honored must have promoted human or civil rights.

Part I.
1. While looking through the [WalkLine Art](https://www.walklineart.com) which three art installations stand out to your group the most? Take a screenshot of each and place them below.

Part II.
2. Read the following article about [Brainstorming](https://www.brainstorming.com) and watch the following the video [https://www.youtube.com/watch?v=W1h5L_0rFz8](https://www.youtube.com/watch?v=W1h5L_0rFz8)
3. What are the rules of brainstorming? Define each rule.
   - a.
   - b.
   - c.
   - d.
   - e.
   - f.
   - g.
   - h.

Part III.
4. Grab some Post-it notes and brainstorm ideas for the person/group/organization that your group decided on in Focus/Direction
   - Follow the rules of brainstorming
   - Take sixteen minutes (set a timer) and brainstorm as many possible ideas
   - After brainstorming, go back and organize the ideas
Part IV.
5. As a group, what person/group/organization is your group going to focus on moving forward?
6. Why is this the most significant person/group/organization that has promoted human or civil rights? Provide at least 3 specific pieces of evidence to justify your selection.
   a.
   b.
   c.
7. Once you have decided, one person go to your teacher to receive approval of your selected subject for your group.
Appendix G

Human Rights Design Challenge
Assignment 7
The Pitch Article

Directions: Read the article below.

What's An Elevator Pitch?
At its core, an elevator pitch (aka elevator speech, elevator presentation, or elevator story) is several things. Of course, an elevator pitch is a communication tool; it will help you articulate your message. An elevator pitch is also a sales tool; it will help you raise the money, and close the deals, you need to be successful. However, and most importantly, an elevator pitch is a teaching tool.
While it’s of course important that you eventually close the deal, there is no point in trying to close the deal if the audience doesn’t understand what you are talking about and why they should care. As a result, an elevator pitch is designed to play the role of a primer; as a high-level and basic introduction to whatever it is that you are selling.
Given that, an effective elevator pitch is designed to give the audience just enough information that they will have a sense of what you are talking about and want to know more. Second, and just as importantly, it is designed to not give The Audience so much information so that they feel overwhelmed (and tune you out).
Think drinking fountain, not fire hose.

If you are going to be successful, you’ve got to ease the audience into your subject; you’ve got to give them a chance to catch up to you and all of the thinking you have done over the past months or years.

Why You Need An Elevator Pitch
While you no doubt love, are fascinated by, and are passionate about what you are doing and could spend hours talking about it, most people aren’t like you.
In all likelihood, when it comes to the people whose help you will need to bring your Solution to life, they aren’t going to be nearly as knowledgeable about or as interested in it as you are. As a result, they are unlikely to appreciate -- or even notice -- the intricacies, subtleties, and details of it. Instead, they will only understand and -- initially at least -- be interested in the big picture.
Even if they do share your interest in and knowledge of your field, the odds are that they are extremely busy. Just like you, they have too many things to do and too little time to get them done. That means that they must constantly -- and quickly -- decide what to pay attention to and what to ignore.
What’s more, it never fails that the more potentially helpful a person is, the busier they are likely to be. As a result, you must come up with a way of explaining your Product that will grab the attention of someone who has seventeen other things on their mind. You must assume that people are looking for a reason to tune you out, not that they want to hear what you have to say. You must explain your idea in a manner that requires The Audience to do the least amount of work.
Above all else, you must get to the point. Only by doing that will you get the attention of The Audience and even have a chance of getting into the details of what it is that you are selling.

**Elevator Pitch Definition**

Now that I’ve given you a high-level overview -- or in other words an elevator pitch -- of what an elevator pitch is and why you need one, let me give you a definition... *An elevator pitch is an overview of an idea, product, service, project, person, or other Solution and is designed to just get a conversation started.* While that definition is fairly self-explanatory, let me take a moment to discuss exactly what the most important of those words mean.

**Overview**

The point of an elevator pitch isn’t to get into every detail of your Solution. Instead, all you want to do -- and all you have time to do -- is to **make sure the audience understands what you are talking about and what’s in it for them.**

**Idea, Service, Project, Person, or Other Solution**

**The Nine C’s of an Effective Elevator Pitch**

After working with hundreds of would-be entrepreneurs, and studying hundreds of effective and ineffective elevator pitches, I have found that an effective elevator pitch is nine things.

1. Concise
2. Clear
3. Compelling
4. Credible
5. Conceptual
6. Concrete
7. Customized
8. Consistent
9. Conversational

I discuss each of The Nine C’s at length elsewhere, but in the interests of repetition -- and one of the themes of this book is that repetition is good -- let me give you quick sense of what I mean.

1. Concise
   An effective elevator pitch contains as few words as possible, but no fewer.
2. Clear
   Rather than being filled with acronyms, MBA-speak, and ten-dollar words, an effective elevator pitch can be understood by your grandparents, your spouse, and your children.
3. Compelling
   An effective elevator pitch explains the problem your solution solves.
4. Credible
   An effective elevator pitch explains why you are qualified to see the problem and to build your solution.
5. Conceptual
   An effective elevator pitch stays at a fairly high level and does not go into too much unnecessary detail.
6. Concrete
   As much as is possible, an effective elevator pitch is also specific and tangible.
7. Customized
   An effective elevator pitch addresses the specific interests and concerns of the audience.
8. Consistent
   Every version of an effective elevator pitch conveys the same basic message.
9. Conversational
   Rather than being to close the deal, the goal of an elevator pitch is to just set the hook; to
   start a conversation, or dialogue, with the audience.

Works Cited

Appendix H

Human Rights Design Challenge
Assignment #8
POV (Point of View Statement)

Directions
● One person copy this Google document, title it correctly, First Names Assignment #8 and place it into your HRDC
● Discuss the following questions as a group
● Answer the following questions as a group on the Google doc

We were tasked with...
(fill in what your group was tasked to do)

We were amazed to discover…
(what did you see, hear, or research that struck you?)

It would be game changing if we…
(what is your ultimate goal to be accomplished in this challenge?)
Appendix I

Human Rights Design Challenge
Assignment #9
Writing the Pitch

Directions:
● Create a copy of this Google document, title it correctly, and place it in your Unit 4 folder
● Refer back to this article you read for homework Pitch https://docs.google.com/document/d/1sioXTWcsuD19EoXz13Wg8K1dtMN-NU07PO5coGr9-Y/edit
  ○ Use the 9 C’s of giving a pitch
● Watch the following pitch https://www.youtube.com/watch?v=i6O98o2FRHw
● Each group member will create their own individual two-minute pitch explaining why your group has chosen this person/group/organization
● Here are some options/ideas on what you can include:
  ○ If your topic is a person/group/organization than
    ■ Who is the person/group/organization that your group plans to recognize and/or raises awareness for?
    ■ What is their history/story?
    ■ What is their significance to Edison?
    ■ How do they stand out in a city of other historic figures?
● Keep in mind that the entire purpose of this pitch is to convince possible financial backers and civic leaders that this is absolute most important person/group/organization that needs to be honored/memorialized in Edison.
● Write your pitch below.
Appendix J

Human Rights Design Challenge
Assignment #10
Group Pitch

Directions:
● One person copy this Google document, title it correctly, First Names Assignment #10 and place it into your HRDC
● Each member of the group must present their pitch to the group.
● As your group members are presenting take notes on the best aspects of their presentation
● As a group you all must decide the most significant/impactful aspects of each pitch and combine them into one whole group pitch.
● Create a group pitch that is 90 seconds long.
● Each member of the group must have a speaking role in the pitch.
● Rehearse your pitch as a group and be prepared to present to the entire class.

Requirements for the pitch:
1. Each member of the group had an active speaking role
2. Eye contact, poise, professionalism, clear speaking voice, volume
3. Persuasive
4. 90 second time limit (5 second grace)
5. Thoroughly explains and supports the chosen topic.
Appendix K

Human Rights Design Challenge
Assignment #11
Art Installation and Brainstorming

Directions:
● One person copy this Google document, title it correctly, First Names Assignment #11 and place it into your HRDC
● Read the article about art installations
● Answer the following questions as a group
● Grab some Post-it notes and brainstorm ideas for how to honor and represent in an art installation the person/group/organization that your group decided on in Focus/Direction
  ○ Follow the rules of brainstorming
  ○ Take pictures of your brainstorming process and add them to this document
  ○ Take 16 minutes and brainstorm as many possible ideas
  ○ After brainstorming, go back and organize the ideas
    ■ Vote using hot/cold to narrow potential ideas

1. Insert your brainstorming pictures here.
2. Describe your art installation.
3. Each group member should draw a quick sketch of your installation. This should take no more than 5 mins to draw.
4. How do you plan to utilize the planning process to create your art installation?
5. What part of the planning process do you believe will be the most important and why?
6. What part of the planning process do you believe will be the hardest and why?
Appendix L

Human Rights Design Challenge
Assignment #12
Moving Forward with Feedback from Kelly

Directions:
● One person copy this Google document, title it correctly, First Names Assignment #12 and place it into your HRDC
● Answer the following questions as a group

1. What feedback did you receive from Kelly? Be specific as you can on all of the feedback that she gave you!
2. What specific parts of your art installation did she suggest improvements or hints to help make it even better?
3. Discuss with your group how you might improve your art installation idea after getting feedback from Kelly.
4. In what ways did your group decide to change your idea? Be specific in your explanation?
5. Each group member should draw a new quick sketch of your installation. This should take no more than 5 mins to draw.
6. Take pictures of each group member’s drawings. Add the pictures to the document.
Appendix M

Human Rights Design Challenge
Assignment #13
Symbolism

Directions:
- One person copy this Google document, title it correctly, First Names Assignment #13 and place it into your HRDC
- Based on the research of your selected topic, answer the questions below.

1. What are the five most important facts/ideas that you want to convey to the user?
2. What symbolism does your group plan to use in your art installation?
   a. Why?
3. What is the intended experience of users? Explain in detail.
4. How does the intended experience honor your chosen subject?
Appendix N

Human Rights Design Challenge
Assignment #14
WalkLine Art Proposal

Directions:
- One person copy this Google document, title it correctly, First Names Assignment #14 and place it into your HRDC
- Read the WalkLine Art 2017 Proposal

EVALUATION CRITERIA Each proposal submitted will be evaluated on the following criteria:
Partnering Concept Is the artwork/performance original? How does the work reflect the concepts of adventure, discovery, and exploration? Does the work fit in with the overall concept of the Art on the Edison WalkLine project?

Artistic Merit/Quality Does the project demonstrate high artistic merit? Is it artistically engaging and stimulating? Will it be appreciated by the general public? Do the other examples of work submitted support the artistic merit/quality of the proposal?

Feasibility Is the proposed budget reasonable? Can the project be executed for the requested amount? Does the artist have the experience to execute the proposal? Would the piece negatively impact the public’s health & safety in any way? (e.g. no sharp edges or elements which might present a possible danger to the public)

Visual Will the structural and artistic integrity be maintained for the duration of the exhibition or the intended duration of the proposal? Performance Is the proposal feasible based on experience, budget, and infrastructure/tech requirements?

Community Engagement How does the work engage its audience? Does it impact the way a viewer thinks or feels? Is it interactive, produced on site, use the neighborhood or volunteers?

Use this document to fill out the application (below).
1. Title of the piece
2. A one sentence summary describing the proposed work;
3. Contact information for all team members including name, address, telephone, email address;
4. Biographical information for principal team members;
5. A written narrative describing your proposal, performance, or existing piece – What is the piece and what does it mean? (NOT TO EXCEED 250 WORDS);
6. List of materials and step by step installation plan. For performers, list technical requirements and a step by step load-in and strike plan;
7. Detailed budget showing how much is being requested, how the budget will be used, source for materials, and artist's fee.
8. Visual Artists should submit at least three sketches, showing scale, dimensions, and elevation of the proposed or existing work; five images of previous work (JPEG or PDF) or related projects of recent artworks (not to exceed 1024 x 768 pixels at a minimum of 150 dpi provided on disk or uploaded) accompanied by a sheet with description of each work sample;

9. Performing Artists should submit a brief description and context for work samples. The samples should be on a DVD or provide a URL to an online source;

10. Musicians may submit a work sample on CD or a URL to an online source;
Appendix O

Human Rights Design Challenge
Assignment #15
Prototype

Directions:
• Create a prototype of your group’s idea.

For installations that will use Tinkercad (Hint: read all of the instructions and then break up tasks, just make sure it is the same idea moving forward.)
• Insert the agreed upon drawing of your art installation from Assignment 12.
• Create a new drawing with dimensions. You will use this for Art on the WalkLine Proposal.
• Based on your dimensions, figure out your magic number!
• Create a 3D model in Tinkercad.
• Take photos or a time lapse along the way while your group makes and prints your prototype. Attach them below. If it is a video put a link into this document below.
• Print your 3D model on the printer. (3D printed prototypes should be no more than 6” x 6”.)
• Those who are not using Tinkercad, work to finish Assignment 14.

For installations that will be drawn (Hint: read all of the instructions and then break up tasks, just make sure it is the same idea moving forward.)
• Insert the agreed upon drawing of your art installation from Assignment 12.
• Create a new drawing with dimensions. You will use this for Art on the WalkLine Proposal.
• Take photos of your drawing as you go. Attach them below.
• Those who are not drawing, work to finish Assignment 14.
Appendix P

Human Rights Design Challenge
Assignment #16
Prototype Feedback

Directions:

- One person copy this Google document, title it correctly, First Names Assignment #16 and place it into your HRDC
- Based on the feedback of your prototype and group conversation, answer the questions below.

1. What is the biggest success of your prototype? Why?
2. What specific feedback did your group receive from the experts?
3. How is your group going to use this feedback to make your solution better?
4. How has your group incorporated symbolism into this design challenge?
5. Moving forward, what is the approximate size of your real-life solution?
6. What materials will your real-life solution be made of? Remember to keep in mind the budget.
Appendix Q

Human Rights Design Challenge
Assignment #17
Presentation

Directions:
● One person copy this Google document, title it correctly, First Names Assignment #17 and place it into your HRDC
● Create a whole-group presentation which both proposes and explains the art installation your group has chosen to create. Your group will write a formal script of the presentation and give an oral presentation.
● As a group, you will decide which group members are responsible for each aspect of the presentation.
● Write the script on this document and put the name of the group member who wrote each section.

Requirements for Presentations
● Appropriate length (8-10 minutes)
● Presentation time should be evenly distributed between group members
● Include all parts of the format for the presentation (below)
● Cite information in the presentation
● The group presentation must be well rehearsed
  ○ Using notecards is acceptable, but reading off is not.

Format for the Presentation
● Introduction
  ○ Be creative
    ■ Hook your audience or start to tell the story
● Backstory
  ○ What person/group/organization is being honored and why your group feels that (s)he/they is most important?
● Needs statement/POV
● Prototype
  ○ How does the prototype fit the design constraints?
  ○ How has the idea progress over time?
● Describe the experience of a person who is seeing/visiting your art installation
  ○ Why the was prototype designed this way?
  ○ How does space, light, positioning, angles, play a role in the experience or symbolism of the monument?
  ○ What does your group hope that people will take away from this experience?
● Conclusion
  ○ Why is this the most important person/group/organization that Edison is missing out on?
  ○ Convince the audience that your design is worthy of coming to life.

Helpful resources:
How to give a killer presentation
https://hbr.org/2013/06/how-to-give-a-killer-presentation/

How to give a TED talk

Effective presentation style TED
http://www.ted.com/talks/nancy_duarte_the_secret_structure_of_great_talks
http://www.ted.com/talks/nancy_duarte_the_secret_structure_of_great_talks

**Script (Hint: time these out and make sure to give enough time to the prototype and the user experience.)**

- Introduction
- Backstory
- Needs statement/POV
- Prototype
- Describe the experience of a person who is seeing/visiting your monument or memorial
- Conclusion
Appendix R

Human Rights Design Challenge Journal Master

Directions:
● Create a copy of this document, name it correctly, and place it in your Human Rights Design Challenge Folder
   ○ First Name: HRDC Journals
● For each journal entry for the rest of the Design Challenge you will answer the assigned journal questions directly on the Google Document you created above
● Be sure you are answering ONLY the assigned questions each time (ex. Journal 2 questions only when assigned Journal 2)
● Type your answers directly below each question
● Remember to justify your answers; be sure to support your responses with specific examples, facts, and/or reasons.
   ○ Hint: thorough and thoughtful answers will help you during this design challenge
● If you would like to draw or take pictures and add them to your journal please feel free to do so
● Responses can be written in first person.

Immersion Journal
As the immersion portion of this PBL unit, we have visited several places and had multiple speakers come to talk to us. Here is the list of people, organizations, and places:

Here are the people, organizations, communities, and places we have visited or talked to.

<table>
<thead>
<tr>
<th>Communities, Organizations, and People</th>
<th>Places We Have Visited</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGBTQ: Edison Pride - Jamie Fergason, Lost n Found Youth</td>
<td>MODAhttps://www.jimmy-carterlibrary.gov/</td>
</tr>
<tr>
<td>Mental Health &amp; Teen Suicide: American Foundation for Suicide Prevention - Stuart Winborne</td>
<td>The Carter Center</td>
</tr>
<tr>
<td>Intellectual Disabilities: Special Olympics of Georgia - Elaina &amp; Meghan Daves</td>
<td>The National Center for Civil and Human Rights</td>
</tr>
<tr>
<td>Aging &amp; Elders: Thanks Mom and Dad - Jo Hodges and Maureen Kelly</td>
<td></td>
</tr>
<tr>
<td>Homelessness: Joe Hampton, Lost and Found Youth</td>
<td></td>
</tr>
<tr>
<td>Learning Disabilities: Learning Disabilities Association - Allen Broyles</td>
<td></td>
</tr>
</tbody>
</table>
1. What did you learn while at MODA? (prototyping, ergonomics, design, etc.)
   a. Describe how you learned this new knowledge.
2. What fascinated you the most during your visit to MODA? Why?
3. How did the Carter Center impact your understanding of human rights?
4. What was the coolest part of visiting the Carter Center? Why?
5. Which of the speakers resonated with the most? Why?
6. Each speaker spoke about several different human rights. What human right did you learn about from each speaker? What insight did they provide regarding that human right?
   a. LGBTQ: Edison Pride - Jamie Fergason, Lost n Found Youth
   b. Mental Health & Teen Suicide: American Foundation for Suicide Prevention - Stuart Winborne
   c. Intellectual Disabilities: Special Olympics of Georgia - Elaina & Meghan Daves
   d. Aging & Elders: Thanks Mom and Dad - Jo Hodges and Maureen Kelly
   e. Homelessness: Joe Hampton, Lost and Found Youth
7. After completing the 3rd grade translation of the Universal Declaration of Human Rights, what human right are you most interested in and why? 
   https://www.civilandhumanrights.org/

**Journal 1 Discovery**

Journal Questions:
1. What does human rights mean to you?
2. What is the difference between civil and human rights?
3. What was the most powerful experience you had at the museum? Why?
4. How did that experience make you feel/think?
5. Which human right would you most like to work on solving? Why?

**Journal 2 Focus/Direction**

1. As you move from the Discovery phase to the Focus and Directions phase of DtL, what are you most confident about regarding this design challenge?
2. What concerns you most about this design challenge?
3. How are you keeping up with your work?
4. How are your group members keeping up with their work?

**Journal 3 Ideas**

1. Have your ideas for the art installation changed since the beginning of the Human Rights Design Challenge?
   a. How has it changed?
2. Describe how your group narrowed from many topics to one.
3. What was the easiest part of the needs statement/POV?
   a. What was the hardest?
4. What was the easiest and hardest aspect of the Pitch?
   a. Why?
5. What knowledge/skill/tool do you wish you had right now to help you complete your work?

**Journal 4 Research**
1. Describe the brainstorming experience with your group.
2. What do you like about brainstorming in DtL?
   a. What would you change?
3. Now that you have your topic, a needs statement/POV, and an idea, what knowledge/skills/tools do you need to bring the group’s idea to life?
   a. Why?
4. Is your group working together towards a common goal?
   a. What is that goal?
5. Who deserves to be the MVG (Most Valuable Group Member) so far?
   a. Why?

Journal 5 Prototype
1. To date, which phase of DtL is most valuable to you so far?
   a. Why?
2. To date, how would you compare your work in this design challenge to a more traditional social studies class?
   a. Are you more engaged or less engaged in your work?
   i. Why?
3. If you could change some part of your or your group’s work, what would it be?
   a. Why?
4. Describe the easiest and hardest aspects of the research phase of DtL.

Journal 6 Present
1. How has your group’s idea changed during the prototype phase of DtL?
2. Do you believe that your group’s prototype fulfils the needs statement/POV?
   a. Why?
3. Describe the best part of the prototype phase of DtL?
4. How has your group excelled when making the prototype?
5. How has your group struggled making the prototype?

Journal 7 Reflect
1. Now that you have completed a DtL design challenge, how has this changed your thinking about approaching problems in the future?
2. Was writing the script for your presentation helpful?
   a. Explain
3. How did your presentation change from the first time you recorded the presentation and after your group presented live the second time? Be specific!
4. What would you change about your group’s presentation to be more effective next time?
5. What parts of the presentation were most difficult for you?
   a. For your group?
6. Who deserves to be the MVG (Most Valuable Group Member)?
   a. Why?
7. Which phase of DtL was the hardest to complete?
8. Which phase of DtL was the easiest to complete?
Appendix S

Human Rights Design Challenge
Video Journal

Directions:
● Record yourself using your iPad camera app in video mode.
● After finishing a video journal, upload it to Google Drive and place it in your HRDC Journal folder.
● Title the video First Name Phase HRDC
● Use the following prompts to create a video journal of your thoughts, feelings, successes, struggles, points of excitement, points of frustration during the design challenge.
● Feel free to record ideas, thoughts, etc. beyond just the prompts.

Discovery
1. Describe the discovery process.
2. What was the best part of discovery phase?
3. What do you want to change about the discovery phase?
4. What piece of information do you wish you knew before starting the discovery phase?

Ideas
1. What do you think of this style of brainstorming (with all of rules)?
2. How do you think that your group brainstormed?
3. What is the most annoying part of the ideas phase?

Present/Reflect
1. Describe your preparation for the first presentation?
2. Describe your preparation for the second presentation?
3. Was presenting twice worth the time and effort? Why?
4. What do you wish you had known before starting this design challenge?
5. If you could do the design challenge again what would you do differently?
6. How does this design challenge compared to more traditional forms of learning?
7. Describe the design thinking process? What is most helpful about the process? What is most frustrating about the process?
Appendix T

Human Rights Design Challenge
Assignment #14
WalkLine Art Proposal

Directions:
● One person copy this Google document, title it correctly, First Names WalkLine Art Proposal and place it into your HRDC
● Read the WalkLine Art 2017 Proposal

Use this document to fill out the application (below).
1. Title of the piece

2. A one sentence summary describing the proposed work.

3. Contact information for all team members including name, address, telephone, email address.
   - Contact Person 1:
   - Contact Person 2:
   - Contact Person 3:
   - Contact Person 4:

4. Biographical information for principal team members.
   - Contact Person 1:
   - Contact Person 2:
   - Contact Person 3:
   - Contact Person 4:

5. A written narrative describing your proposal, performance, or existing piece – What is the piece and what does it mean? (NOT TO EXCEED 250 WORDS).

<table>
<thead>
<tr>
<th>Materials</th>
</tr>
</thead>
</table>

Step by step instructions of installation process and removal.

<table>
<thead>
<tr>
<th>Materials</th>
<th>Price</th>
</tr>
</thead>
</table>

7. Detailed budget showing how much is being requested, how the budget will be used, source for materials, and artist's fee

8. Visual Artists should submit at least three sketches, showing scale, dimensions, and elevation of the proposed or existing work; five images of previous work (JPEG or PDF) or related projects of recent artworks (not to exceed 1024 x 768 pixels at a minimum of 150 dpi provided on disk or uploaded) accompanied by a sheet with description of each work sample.

This is end of the application! Please check that you have included all necessary materials.
EVALUATION CRITERIA Each proposal submitted will be evaluated on the following criteria: Concept Is the artwork/performance original? How does the work reflect the concepts of adventure, discovery, and exploration? Does the work fit in with the overall concept of the Art on the Edison WalkLine project?

Artistic Merit/Quality Does the project demonstrate high artistic merit? Is it artistically engaging and stimulating? Will it be appreciated by the general public? Do the other examples of work submitted support the artistic merit/quality of the proposal?

Feasibility Is the proposed budget reasonable? Can the project be executed for the requested amount? Does the artist have the experience to execute the proposal? Would the piece negatively impact the public’s health & safety in any way? (e.g. no sharp edges or elements which might present a possible danger to the public)

Visual Will the structural and artistic integrity be maintained for the duration of the exhibition or the intended duration of the proposal? Performance Is the proposal feasible based on experience, budget, and infrastructure/tech requirements?

Community Engagement How does the work engage its audience? Does it impact the way a viewer thinks or feels? Is it interactive, produced on site, use the neighborhood or volunteers?
Appendix U

**Human Rights Design Challenge Resources**

- Georgia Galileo [http://georgiainfo.galileo.usg.edu/](http://georgiainfo.galileo.usg.edu/)
- White Flight and the Making of Modern Conservatism (Book)
- WalkLine Article
- WalkLine Thesis [https://drive.google.com/file/d/0B_TQxJ2fTzqCT3hOUC1lZUFE/view?usp=sharing](https://drive.google.com/file/d/0B_TQxJ2fTzqCT3hOUC1lZUFE/view?usp=sharing)
- Lies Across America Book
- Concise History of Atlanta Start reading at “Forward Atlanta” section heading
- Art Installations [https://www.behance.net/search?field=134](https://www.behance.net/search?field=134)
Appendix V

Human Rights Design Challenge Constraints

- Create an artifact that celebrates an individual or group that has championed human rights in the city of Edison.
- Budget: $3,000
- Publically accessible
- Created to be placed outdoors
Appendix W

HRDC
Group Check-in 1

Group Interview 1

Thank you for taking time to participate in your group check-in with me today. My name is Todd Wass, and I would like to talk to you about your experiences with this design challenge and design thinking. The interview should take approximately twenty minutes to complete. Two recording devices will record our conversation because I do not want to miss any of your comments. Since we are being recorded, please speak clearly and in the direction of the microphones. Our conversation is confidential. I would ask that you keep comments by your classmates confidential too. If I use some of the responses from this conversation, you will not be identified as the interviewee. It is your choice to answer the questions and you are under no obligation to answer any question if you feel uncomfortable with providing that answer. In addition, you may end the interview at any time. Do you have any questions about what I have just explained? Are you willing to participate in this interview?

Directions:

- Open QuickTime Player on the laptop
- Under File, click New Audio Recording
- Next to the record button, click the downward facing arrow and make sure the microphone is the Snowball
- Speaking into the microphone, answer the questions below as a group
- When you are finished, go to File and click save. Save the file giving it the proper name and upload it to your shared HRDC folder
  ○ You are allowed to airdrop this file to your iPad and then upload to Google Drive

1. Please state your name.
2. What does human rights mean to you?
3. What concerns you most about this design challenge?
4. What excites you the most about this design challenge?
5. How are you keeping up with your work?
6. Is your group working together towards a common goal?
   a. What is that goal?
7. Have your ideas for the art installation changed since the beginning of the Human Rights Design Challenge?
   a. How has it changed?
8. Describe how your group narrowed from many topics to one.
9. What was the easiest part of the needs statement/POV?
   a. What was the hardest?
10. What was the easiest and hardest aspect of the presentation?
   a. Why?
11. What knowledge/skill/tool do you wish you had right now to help you complete your work?
Appendix X

HRDC

Group Check in 2

Group Interview 2

Thank you for taking time to participate in your group check-in with me today. My name
is Todd Wass, and I would like to talk to you about your experiences with this design challenge
and design thinking. The interview should take approximately twenty minutes to complete. Two
recording devices will record our conversation because I do not want to miss any of your com-
ments. Since we are being recorded, please speak clearly and in the direction of the microphones.
Our conversation is confidential. I would ask that you keep comments by your classmates confi-
dential too. If I use some of the responses from this conversation, you will not be identified as
the interviewee. It is your choice to answer the questions and you are under no obligation to an-
swer any question if you feel uncomfortable with providing that answer. In addition, you may
end the interview at any time. Do you have any questions about what I have just exp

Directions:
● Open QuickTime Player on the laptop
● Under File, click New Audio Recording
● Next to the record button, click the downward facing arrow and make sure the micro-
phone is the Snowball
● Speaking into the microphone, answer the questions below as a group
● When you are finished, go to File and click save. Save the file giving it the proper name
and upload it to your shared HRDC folder
   ○ You are allowed to airdrop this file to your iPad and then upload to Google Drive

1. Please state your name.
2. To date, which phase of DtL is most valuable to you so far?
   a. Why?
3. To date, how would you compare your work in this design challenge to a more traditional
   social studies class?
   a. Are you more engaged or less engaged in your work?
      i. Why?
4. If you could change some part of your or your group’s work, what would it be?
   a. Why?
5. Describe the easiest and hardest aspects of the research phase of DtL.
6. Describe the best part of the prototype phase of DtL?
7. How has your group excelled when making the prototype?
8. How has your group struggled making the prototype?
9. Was writing the script for your presentation helpful?
   a. Explain
10. How did your presentation change from the first time you recorded the presentation and
    after your group presented live the second time?
11. Which phase of DtL was the hardest to complete?
12. Which phase of DtL was the easiest to complete?
# HRDC Presentation Rubric

## Feedback Scale

<table>
<thead>
<tr>
<th>Scale</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Exceptional</td>
</tr>
<tr>
<td>3</td>
<td>Strength</td>
</tr>
<tr>
<td>2</td>
<td>Included</td>
</tr>
<tr>
<td>1</td>
<td>Partially Included</td>
</tr>
<tr>
<td>0</td>
<td>Not included</td>
</tr>
</tbody>
</table>

## Rubric Component

<table>
<thead>
<tr>
<th>Rubric Component</th>
<th>Description</th>
<th>Scale</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Professional Presentation</strong></td>
<td><strong>Eye contact</strong> - Consistently maintained eye contact with audience</td>
<td></td>
<td>Name &amp; Comment:</td>
</tr>
<tr>
<td></td>
<td><strong>Body Language</strong> - consistently made movements and gestures to enhance audience comprehension</td>
<td></td>
<td>Name &amp; Comment:</td>
</tr>
<tr>
<td></td>
<td><strong>Volume</strong> - Loud enough to be heard by the audience for the entire presentation with an engaging voice</td>
<td></td>
<td>Name &amp; Comment:</td>
</tr>
<tr>
<td></td>
<td><strong>Rehearsed</strong> - Well-rehearsed with smooth delivery that holds audience’s attention.</td>
<td></td>
<td>Name &amp; Comment:</td>
</tr>
<tr>
<td></td>
<td><strong>Equal parts</strong> - Each member contributes equally</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Organization</strong></td>
<td><strong>Presentation Style</strong> - Audience was able to understand the information because it was presented in a logical and interesting manner</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>DtL</strong> - Demonstrates knowledge of and uses the design thinking and learning phases</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Empathy/POV</strong></td>
<td><strong>POV</strong> - Explanation of Point of View so the audience understands the need</td>
<td></td>
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</tr>
<tr>
<td></td>
<td><strong>Empathy</strong> - Demonstrates empathy for topic and user</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Content knowledge</strong></td>
<td><strong>Knowledge</strong> - Deep knowledge of topic being honored</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Human Rights</strong> - Thorough explanation of which human rights the topic works to improve</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Honoring</strong> - Thorough explanation of why the topic should be honored</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Prototype</strong></td>
<td><strong>Explanation</strong> - Proper integration and explanation of prototype</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>User Experience</strong> - Thorough explanation of the user’s experience of the art installation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Symbolism</strong> - Provides in-depth justification of the art installation’s symbolism</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Evolution of prototype</strong> - Demonstrates how the idea evolved over time</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Prototype Feasibility</strong></td>
<td>Likelihood of art installation being on the WalkLine</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>Presentation is between 8-10 minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Appendix Z

**HRDC Presentation Rubric**

<table>
<thead>
<tr>
<th>Rubric Component</th>
<th>Description</th>
<th>Scale</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Professional Presentation and Organization</strong></td>
<td>Eye contact, Body Language, and Volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Organized and Rehearsed</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Empathy/POV</strong></td>
<td>POV - Explanation of Point of View statement</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Empathy - Demonstrates empathy for topic and user</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Content knowledge</strong></td>
<td>Knowledge - Deep knowledge of topic being honored</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Human Rights - Thorough explanation of which human rights the topic works to improve</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Honoring - Thorough explanation of why the topic should be honored</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DtL - Demonstrates knowledge of and uses design thinking</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Prototype</strong></td>
<td>Explanation and Evolution of prototype</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>User Experience - Explanation of the user’s experience of the art installation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Symbolism - Provides justification of art installation’s symbolism</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Prototype Feasibility</strong></td>
<td>Likelihood of art installation being on the WalkLine</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Appendix AA**

**Research Study Timeline**

<table>
<thead>
<tr>
<th>Month</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 2016</td>
<td>Submit Chapter 3 to dissertation committee</td>
</tr>
<tr>
<td>July 2016</td>
<td>Edit and Revise Chapters 1 and 2, Streamline Chapter 1, Revise and edit Chapter 3 after receiving feedback</td>
</tr>
<tr>
<td>August 2016</td>
<td>Submit Chapters 1 and 2 to dissertation committee</td>
</tr>
<tr>
<td>September 2016</td>
<td>Edit prospectus based on dissertation committee feedback, Send Prospectus for editing, Submit Prospectus to dissertation committee, Defend Prospectus, Complete IRB application, Submit and receive school approval, Meet with dissertation committee members</td>
</tr>
<tr>
<td>October 2016</td>
<td>Edit prospectus, Submit IRB application, Meet with dissertation committee members</td>
</tr>
<tr>
<td>November 2016</td>
<td>Edit IRB as needed, Edit prospectus (moving from future tense to past tense), Meet with dissertation committee members</td>
</tr>
<tr>
<td>December 2016</td>
<td>Edit prospectus, Meet with dissertation committee members</td>
</tr>
<tr>
<td>January 2017</td>
<td>Edit prospectus (moving from future tense to past tense), Meet with dissertation committee members</td>
</tr>
<tr>
<td>February 2017</td>
<td>Collect data, Begin analyzing data, Meet with dissertation committee members</td>
</tr>
<tr>
<td>March 2017</td>
<td>Data analysis, Begin writing chapter 4, Meet with dissertation committee members</td>
</tr>
<tr>
<td>April 2017</td>
<td>Continue writing Chapter 4, Data analysis, Meet with dissertation committee members</td>
</tr>
<tr>
<td>May 2017</td>
<td>Continue writing Chapter 4, Submit Chapter 4 to dissertation committee, Meet with dissertation committee members</td>
</tr>
<tr>
<td>June 2017</td>
<td>Begin writing Chapter 5, Edit Chapter 4, Meet with dissertation committee members</td>
</tr>
<tr>
<td>July 2017</td>
<td>Finish writing Chapter 5, Submit Chapter 5 to dissertation committee</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>September 2017</td>
<td>Submit dissertation to committee members</td>
</tr>
<tr>
<td>October 2017</td>
<td>Defend dissertation</td>
</tr>
<tr>
<td></td>
<td>Meet with dissertation committee members</td>
</tr>
</tbody>
</table>

**Figure 39.** Dissertation Timeline.