EXPLORING TEACHERS' EDUCATIONAL MUVE VIDEO GAME INTEGRATION PROCESS: FOUR EXPLORATORY CASE STUDIES

Patrick Kenneth Pettyjohn

Submitted to the faculty of the University Graduate School in partial fulfillment of the requirements for the degree Doctor of Philosophy in the School of Education, Indiana University

April 2015

Accepted by the Graduate Faculty, Indiana University, in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

Doctoral Committee

_____
Barbara Bichelmeyer, Ph.D.

_____
Melissa Gresalfi, Ph.D.

_____
Joshua Danish, Ph.D.

_____
Raymond Haynes, Ph.D.

_____
Serafin Coronel-Molina, Ph.D.

November 7, 2014

Patrick Kenneth Pettyjohn

EXPLORING TEACHERS' EDUCATIONAL VIDEO GAME INTEGRATION PROCESS: FOUR EXPLORATORY CASE STUDIES

Immersive educational games have continued to grow in popularity; however, there is a growing need in the field of game research to gain a clearer picture of the process by which teachers integrate these games to promote student achievement. The focus of this exploratory case-based research was to gain a clearer picture of the relationship between a teacher's desire to use an immersive game for a particular use and the process of realizing that purpose in his or her classroom through an implementation. Due to a lack of immersive game integration research, this study drew upon the large corpus of research on educational technology to conceptualize an immersive educational MUVE game as a type of instructional tool. The manner in which a game is used is largely influenced by a teacher's pedagogical preferences and classroom factors; therefore, this research has built a series of cases that observed and analyzed how four 7th and 8th grade teachers, working within a publicly-funded charter school, implemented the educational immersive game called Quest Atlantis. Video and interview data were collected each day teachers implemented QA in their classrooms. Video data was transcribed and coded using a grounded constant comparison method. The results of the analysis generated a number of themes that affirmed that teachers had a strong influence on how the game was used, and that a game implementation was a complex and brittle process. The conclusion of this study suggested that administrators and game scholars should shift their focus toward promoting the benefits of using games for teachers instead of students, and recommended that teachers are provided significant professional development and implementation support in order to realize the power immersive games can provide.

_____
Barbara Bichelmeyer, Ph.D.

_____
Melissa Gresalfi, Ph.D.

_____
Joshua Danish, Ph.D.

_____
Raymond Haynes, Ph.D.

_____
Serafin Coronel-Molina, Ph.D.

TABLE OF CONTENTS

CHAPTER 1 - INTRODUCTION

Today, more than ever, educational video games have the potential to reshape teaching and learning as we know it. With schools gaining greater access to technology, and video game creators making advances in game design, there are now immersive video games that offer rich opportunities for students to think critically, promote collaboration, and engage in real-life problem solving activities (Lee, 2009; Barab, Zuiker, Warren, Hickey, Ingram-Goble, Kwon, & et al., 2007; Barab, Barab, Gresalfi, Ingram-Goble, 2010a; Dalgarno, Lee, 2010).

On May 2, 2012, a thirteen-year old, home-schooled student, Lewis Tachau, gave a TED talk about his profound experience from playing a game called *World of Tanks* (http://worldoftanks.com/). TED (Technology, Education, and Design) talks, facilitated by the non-profit Sapling Foundation, are free online conferences dedicated to disseminating powerful ideas connected to technology, education and design. Past presenters have included, former US president Bill Clinton, Google founders Larry Page and Sergey Brin, Microsoft CEO Bill Gates, and several Nobel Prize winners (www.ted.com). On this esteemed stage, Lewis explained that by playing an online virtual video game, he learned about why Allied forces won World War II.

The type of game Lewis played was set in a multi-user virtual environment (MUVE). Educational MUVE games require players to use avatars, (i.e., their physical representation within the virtual space) and to navigate and interact within a three-dimensional virtual world. Game play involves players engaging in an artificial conflict, defined by rules, to satisfy the system's requirements that result in a quantifiable outcome (i.e., win state) (Salen & Zimmerman, 2004). In an educational game, the win state is related to educational objectives and outcomes (Barab et al, 2007; Barab et al., 2010a;)

Instead of requiring students to memorize specific facts about WWII or creating a multimedia presentation, this educational game afforded Lewis the opportunity to learn about the war by designing tanks. In his TED talk, Lewis explained how he manipulated similar sets of factors that WWII tank engineers considered in their designs (e.g., 1940s technology, firepower, speed, terrain) in order design a tank fleet that would win simulated virtual battles. The game afforded several opportunities for Lewis to test his designs in a virtual context, which simulated the realistic and grueling demands of a WWII battle. The game also afforded Lewis opportunities to collaborate with other online players by asking questions, and sharing strategies, insights, and tank designs. At first glance, learning about history through a game that allowed students to build tanks and simulate battles may seem unrelated, but Lewis told a different story.

Like the German engineers of WWII, Lewis initially assumed that the most advanced and powerful tanks win would battles. This assumption led Lewis to design his first tank iteration utilizing the latest WWII-era technologies and equipping it with the strongest firepower. The outcomes of numerous virtual battles challenged Lewis' assumptions about his tank design and ultimately about certain realities of WWII. He quickly learned that his tanks were not effective. The advanced technology required a large work force of highly specialized mechanics. New tanks required a long manufacturing process, and were very complicated to repair. Additionally, training mechanics to build and repair tanks required a lot of time and training. In other words, the simulated demands of war greatly outweighed Lewis' ability to manufacture and maintain his tank fleet. As a result of this virtual feedback, Lewis learned that possessing the most powerful weapon on the battlefield was meaningless if that weapon was broken down and heavily outnumbered.

Through his game play, Lewis was able to grasp how superior logistics enabled the less advanced US tank fleet to disband the more technologically advantaged German opponent. The simpler US tank design required fewer parts, which allowed for faster tank manufacturing and deployment. The simpler design allowed for quicker frontline repairs thus increasing each tank's efficiency compared to their German counterpart, which required highly specialized mechanics. This allowed US forces to deploy more tanks to frontlines faster, thus providing superior support for soldiers and supply lines. Through Lewis' play, he learned that these logistical advantages were paramount in the allied victory.

Much like Lewis' story, the way in which researchers tell successful educational game stories (i.e., the details that are given along with the details that are omitted) can shape educators' beliefs and expectations about how games are related to learning and instruction. In this case, Lewis' story represents a key tension facing educational game research. On one side, Lewis' story represents the realized educational potential several have theorized that video games can afford. Scholars who have theorized how the affordances of virtual games can enhance learning have dominated educational game research (Gee, 2003; Williamson, Squire, Halverson, & Gee, 2005; Squire, 2006, Barab, Gresalfi, & Ingram-Goble, 2010a; Gamage, Tretiakov, & Crump, 2009; Lee, 2009; Lee & Hew, 2010). In addition, there is growing evidence that educators have a generally positive attitude to using games in education (Hew, & Cheung, 2010; Dalgarno, Lee, Carlson, Gregory, & Tynan, 2011). There is also evidence that educational games have been linked to positive academic achievement in language learning and history (Young, Slota, Cutter, Jalette, Mullin, Lia, Simeoni, Tran, & Yukhymenko, 2012). In other words, we should not be surprised that a 13-year-old boy learned what he learned from playing an immersive 3D MUVE game, and it is important to note that facilitators of TED conferences found Lewis' story worth

sharing. This is an indication of the value and interest educators, researchers, and game designers have placed on promoting games for education (Hays, 2005; Van Eck 2006, Hew & Chung, 2010).

On the other hand, isolated success stories like Lewis' could unintentionally create unrealistic expectations for educators who seek to use games in their schools. For example, a story like Lewis' could convince an administrator to decide that an immersive video game curriculum could help his students achieve higher test scores. Unfortunately, Lewis' story offers no insight as to how administrators would transfer the learning success of one home schooled student into the context of a classroom with thirty to forty students. Additionally, Lewis' story offers no insight into understanding the process a teacher engages to integrate a new immersive game into the context of her existing classroom. Furthermore there is a lack of awareness of the content and activities needed to train teachers on how to use games to achieve educational goals. Teachers would likely not be given opportunities to link how their current pedagogical preferences with the instructional practices needed to implement a video game.

If educational games are to realize their potential in the context of schooling, there is a need to produce stories that explain how teachers integrate educational digital games into their classrooms. This knowledge could then be applied to larger implementations within schools and districts. Previous game research has done little to understand how teachers' integration process affects the ways games are used and influence academic achievement (Hays, 2005; Thomas, Barab, & Tuzun, 2009; Dalgarno, Lee, 2010, Young et al., 2012). Instead, in an effort to prove that games can positively influence learning posttests learning gains, many game scholars have designed studies that intentionally eliminated contextual confounds, such as the influence of the teacher (Young et al., 2012). This form of research can promote a technocentric view of games,

which would likely overlook the process of how teachers use immersive games in their classrooms. Technocentricity is the belief that an isolated technology (e.g., computer, software program, Internet) can affect cognition and learning in unique ways unrelated to a classroom context and teachers' pedagogy (Papert, 1987; 1990; Harris, Mishra, & Koehler, 2009). In other words, technocentric assumptions, applied to educational games, means that this form of technology can teach students in ways that teachers, other technologies, and instructional strategies cannot.

It has been argued that technocentricity is not a theoretical perspective explicitly held by researchers, but often a byproduct of nearsighted research (Papert, 1987, Clark, 1994). Technocentric research questions do not seek to understand the process teachers negotiate in order to utilize the affordances of certain educational technologies, but simply ask if a technology worked to produce higher learning gains than a control curriculum (Kulik & Kulik, 1991; Earle, 2002; Harris, 2005, Hays, 2005). Zhao et al., (2002) explain:

> "Traditionally, studies on educational technology have been largely interested in finding out, in horserace fashion, the relative success of particular technological innovations as it affects student learning…Because many of these technology specific studies did not explore more fundamental issues in technology and education…the research community is having a difficult time offering desperately needed suggestions to policy makers and practitioners." (p. 483)

When studies done in this manner are published, educators are left guessing about how teachers are to use an immersive game to produce desired academic outcomes. Not having access to this critical information leaves administrators ill-equipped to ensure teachers, technology, and classroom conditions can support instruction through games. Nonetheless, hundreds of educational technology integration and game studies were conducted in this manner (Kulik, Kulik, 1991; Papert, 1987; Harris, 2005; Hays, 2005; Hew & Brush, 2007).

In the current state of educational game research there is limited peer-reviewed empirical evidence that has investigated how teachers use immersive video games in their classrooms (Hays, 2005; Wilson et al., 2009; Dalgarno, Lee, 2010; Young et al., 2012). As explained above, many have theorized about the affordances of video games, but these claims have yet to be empirically tested (Hays, 2005; Wilson et al., 2009; Young et al., 2012). Hays (2005) conducted an educational game meta-analysis to determine the instructional effectiveness of using games. His results indicated that existing empirical research gave inconclusive results as to whether or not using a game could better accomplish specific educational goals compared to other instructional means. He warned educators to be cautious of implementing games solely based on select studies that reported positive learning gains without discussing how the classroom conditions (e.g., teachers' integration processes) influenced academic outcomes. Five years later, Dalgarno & Lee (2010) conducted a meta-analysis on the theorized learning affordances of 3D virtual games but failed to find research that demonstrated how certain game affordances led to learning. In another meta-analysis, Young et al. (2012) surveyed over 300 educational video game articles but was unable to find empirical evidence that linked game affordances with classroom contextual factors that influenced academic achievement. Based on the current state of educational game research, there is reason to believe that educational video games can positively influence student academic achievement. One reason why educational game research could have been inclusive is because of the lack of appreciation and focus of teacher's integration process.

Scholars have suggested several reasons why game research should focus on investigating teachers' integration process. First, the majority of game studies leverages a technocentric methodology, in which the teacher's influence is intentionally removed from the study in order to allow students to play in isolation (Young et al., 2012). The problem with this

approach is that some games are not designed to be stand-alone curricula. Kirriemur and McFarlane (2004) noted that reluctant teachers who were not willing to learn about game technologies strongly affected how students received a game. Teachers, instead, are needed to facilitate meta-cognition and the transfer of academic content, used in the game, with their previous lessons. Crookall (2010) argued that learning does not come from a video game but from debriefing about game play. Thomas et al. (2009) produced a set of case studies, which followed four teachers and revealed that each teacher had different reasons for using the game, which subsequently influenced four very different appropriations of the game with their students. Gresalfi, Barnes & Pettyjohn (2010) showed how teachers had a strong influence in the ways that students engaged with academic content while playing.

Scholars have suggested future research focus on teacher's game integration process. Hew & Cheung (2010) expressed the need for game research to focus on how socio-cultural factors, such as how teacher pedagogical preferences (e.g., teacher-centric vs. student-centric) influence the ways games are used. Young et al. (2012), failed to find previous game research that uncovered the complex interaction between teachers' pedagogical preferences, classroom contexts, and game affordances with student learning. They strongly recommended that game scholars investigate how gaming, combined with the facilitation of a veteran teacher, could affect student engagement, behavior, and academic outcomes. If future educational game research does not capture stories that highlight the process teachers engage in order to utilize the affordances of educational virtual games, then researchers could likely repeat many mistakes made in early large-scale technology implementations (Snyder, Bolin, Zumwalt, 1992).

It is my desire to understand how video games can be successfully implemented on a large scale; however, the current state of our understanding of what high-quality video game

implementations look like makes it difficult for researchers to measure, in any substantive way, the context in which a game is implemented. In other words, what would the researchers who conducted studies examining effectiveness have looked at in order to characterize the video game implementations? Because of the lack of fixed operational definitions and methods for examining the effectiveness of implementations, video game researchers, as a field, currently lack a vision of what high-quality implementations look like, specifically, the classroom contextual conditions that best enable teachers to smoothly integrate video game curricula to accomplish their educational goals.

Before scholars can create a fidelity plan, we need a clearer picture of what makes up the complex and multifaceted integration process teachers engage to utilize a video game curriculum. In other words, we need to take a step back and first gain a better understanding of what a teacher has to do in order to implement a video game in her classrooms. Gaining this knowledge would offer researchers critical insight into the instructional demands an immersive video game requires of teachers. This knowledge would be essential to understanding the relationship between a teacher's integration process and students learning gains. Without this knowledge, educators may fail to recognize the critical role a teacher plays in using technology to aid instruction. Furthermore, this knowledge would be instrumental for designing future studies that could empirically investigate which classroom conditions and teaching actions produce the highest student learning gains, then later could be used to design large-scale game implementation models; however, in the current state of educational game research, scholars have only suggested the need to study teachers' integration process (Hays, 2005; Wilson et al., 2009; Young et al., 2012) and unfortunately have not created any empirical cases to launch future research. Young et al. (2012) explained that no one has yet to research how teachers and

their classroom context influence the way the games are used. This study seeks to take an initial and essential step toward creating a high-quality video game implementation by investigating the implementation component of a teacher's immersive video game integration process.

Due to the lack of research focused on teachers' game integration process, I have drawn upon the large body of research focused on educational technology integration.In this study, technology integration is defined as the process teachers engage in order to transform a foreign educational technology (e.g., computers, multimedia software, educational games) into a useful instructional and administrative tool (Zhao et al., 2002, Zhao & Frank, 2003; Hew & Brush, 2007). Research conducted in this field has been committed to understanding what teachers do to use a new curriculum or technology to accomplish their educational objectives, in order to intelligently engineer large scale technology integration initiatives with fidelity (Snyder et al., 1992; Hew & Brush, 2007).

One common theme addressed in the integration research is the need to understand why specific types of educational technologies were not utilized or failed to transform instructional practices as originally hoped (Fullan & Pomfret, 1977, Cuban, 1986; Fullan, 1993; Harris, 2005). Results from hundreds of integration studies have revealed the importance of considering a teacher technology integration process. First, the results of hundreds of studies indicated that technology integration required more than putting computers into schools (Cuban, 1998; Hew & Brush, 2007; Christensen, Horn, & Johnson, 2011) but involved additional consideration for the type of technology being integrated, the types of tasks the technology would achieve, teachers' pedagogical beliefs, and the school's social context (Zhao et al., 2002; Ertmer, 2005; Hays, 2005; Harris, 2005, Harris, Mishra, & Koehler, 2009). Second, a strategy researchers have used to control these various contextual factors was to mandate a top-down fidelity plan. Fidelity

implementation plans instituted strict protocols, which dictated how teachers were to implement a new curriculum (Hall & Loucks, 1976; Snyder et al., 1992; Slavin, Madden, & Wasik, 1996). For example, in the 1970s the Rand Corporation conducted a large set of new curricular integration studies (Fullan & Pomfret, 1977; Berman & McLaughlin, 1974, 1975, 1978), but researchers were disappointed at the lack of instructional and pedagogical transformation from these initiatives (McLaughlin, 1990). In retrospect, the major flaw of those fidelity plans was that they were designed without consideration of teachers' autonomous role that allows them to choose the instructional means that would best achieve their objectives (Baron, Kemker, Harmes, & Kalaydjian, 2003). Specifically, there was a lack of appreciation of the complex process teachers engage to utilize a technology for their purposes (Snyder et al., 1992; Zhao & Frank, 2003). Scholars lamented that mandating a top down fidelity protocol cut teachers out of the quality control process and sabotaged educational policy makers' strongest connection to understanding how policy could enable and facilitate effective teaching (McLaughlin, 1990). Furthermore, the success or failure found in these previous technology integration studies were ultimately tied to the teacher's role in implementing the technology.

Instead of preemptively assuming that classrooms were contexts for integration resistance, another group of integration scholars intentionally sought to understand the classroom conditions in which educational technologies were best utilized (Fullan & Pomfet, 1997; Randi & Corno, 1997; Zhao & Frank, 2003; Squire, Makinster, Barnett, Luehmann, Barab, 2003; Thomas et al., 2009). The results of this line of research revealed that teachers engaged in a complex and messy process to use a new technology to accomplish their objectives (Zhao et al., 2002), and curriculum designs created iterative design cycles to match new designs with the needs of teachers (Barab & Luehman, 2003).

This study has been built on the latter tradition of integration research, which views technology integration as a complex process. This study seeks to explore what is involved in the implementation component of a teacher's immersive 3D MUVE game integration process.

CHAPTER 2 - RESEARCH QUESTIONS

In its current state, educational game research has yet to explore teachers' educational MUVE game integration process: the relationship between a teacher's intended use of a game and the process of realizing that use in his or her classroom. For example, does every teacher experience the same process, or is each individual teacher's integration process unique? In order to answer these questions, this study captured four middle school teachers' implementations of an immersive educational 3D MUVE game into their classrooms. The goal of this research was to begin identifying the connection between a teacher's desired use of a game and the process of realizing that purpose within his or her classroom. In this study, by exploring how each teacher sought to implement the games I began to shed light on what other teachers would need when seeking to integrate educational video games into their classrooms. In the context of developing each case, I addressed the following research questions:

RQ1 - What was involved in each teacher's integration process for using the game?
RQ2 - How did each teacher use Quest Atlantis in his or her classroom?
RQ3 - What was the relationship between each teacher's expressed pedagogical preferences and the ways he or she used QA?
RQ4 - What were the shared implementation themes found across cases?

As stated above, Young et al. (2012) explained that no one has yet to research how teachers influence the way immersive games are used. I wanted to use these cases as a means for building a clearer picture of a 3D MUVE game integration process. The research questions listed above were directly aimed to investigate a teacher's immersive video game integration process, and were influenced by the literature on technology integration that assumed that technology was a tool, used by a teacher, to fulfill a specific set of classroom goals (Zhao et al., 2003). This assumption was in contrast to the body of integration research that has assumed educational technologies could affect cognition in unique ways that other forms of instruction could not

duplicate (Pea 1987). Built from the former set of assumptions, I captured data as teachers implemented games in their classrooms. To build this connection, I established the composition of each teacher's implementation. Research question #1 was aimed to uncover the progression of classroom actions enacted by each teacher throughout the implementation. Next, based on the implementation data, Research Question #2 categorized how each teacher used the game in their implementation. The results from Research Questions #1 and #2 were used to answer Research Question #3, which identified the potential connection between a teachers' stated pedagogical preferences with the ways the game was used. Pedagogical preferences were the routines and practices each teacher used to frame and deliver content. In order to identify any potential connection, I compared and contrasted each teacher's pedagogical preference with the implementation data. Furthermore, answering Research Questions #1, #2 and #3, exposed how teachers actually used the 3D MUVE games.

Lastly, I wanted to explore whether there were common implementation themes amongst cases, or if each case (i.e., integration process) was truly unique. Would each teacher's unique set of pedagogical preferences and classroom contexts yield four completely different sets of integration themes, or would there be common themes amongst cases despite the differences in teachers and classroom contexts? Research Question #4, therefore, sought to establish whether or not there were specific implementation concepts present in each case. The implications from the results of this question could help us begin addressing the impact a teacher's desired use of a game has on students' academic outcomes. We could use these results to begin understanding the needs involved in creating large-scale game implementations. For example, if there are common themes amongst cases, we could then begin verifying these themes in future research and could begin to design a plan that incorporated these themes. On the other hand, if each game

integration process was truly unique, then we could begin conducting future research that would verify this reality and understand how to best create large-scale implementation plans that considered the unique needs of teachers.

This research sought to build a series of cases that observed and analyzed how four teachers, working within a publicly funded charter school, implemented QA. This is in contrast to designing a research study that confirmed whether or not a prescribed list of implementation factors were present. Building a fidelity plan that neglected the teacher's integration process would likely repeat similar disappointing integration results previously sited (e.g., McLaughlin, 1990; Snyder et al., 1992). Therefore, by first designing a research study that focused on observing how each teacher implemented and used a game, without the need to judge whether a prescribed fidelity plan "worked," was essential in discovering critical insight into understanding how teachers implemented an immersive game in a particular manner for a particular purpose. The games used in this research were a part of the Quest Atlantis (QA) project. QA is an international online MUVE educational game project for children ages 9-15. By enlisting technologies associated with online immersive video games (Gee, 2003; Squire, 2006), QA was intentionally designed to instantiate a situative theory of learning into an immersive virtual game (Resnick, 1987; Lave 1988; Brown, Collins, Duguid, 1989; Lave & Wenger, 1991). From this perspective, learning is viewed as a special type of social engagement (Lave & Wenger, 1991). Individuals are socially motivated to learn a new skill or practice in order to assume or maintain a significant role within a particular affinity group (Olson & Torrance, 1996; Gee, 2003). Knowledge is viewed, not as a type of substance to be acquired through instruction, but as tools, which are socially used and shared for action by a particular domain for a particular domain (Brown, et al., 1989, Greeno, 2006).

In QA, students are immersed into a knowledge rich virtual world where they are given opportunities to show their understanding of academic content through their active participation (e.g., decisions, actions, hypothesis testing, reflections) (Barab, Hay, Barnett, & Squire 2001; Barab, Zuiker, Warren, Hickey, Ingram-Goble, Kwon, & et al., 2007). Much like navigating through a maze, these games are designed to allow students to choose many different paths to overcome the main narrative problem and win the game. Though not all paths or choices will directly lead to a win state, every choice alters the virtual world in some way and offers students critical feedback toward the direction they are heading. In order to resolve the main narrative problem, students have to intentionally use their academic understandings to interpret the best path of action. Observing students' play, teachers can quickly discern their students' current academic understanding by observing the students' trajectories within the game. The academic content in each QA game is different, (e.g., math, science, language arts), but the objectives and structure of each game are meant to foster experiences in which students learn from their active participation within the virtual world (Barab, Gresalfi, & Ingram-Goble; 2010).

Understanding how each teacher used QA was important when considering the context of the study. The schools and teachers in this research study were significant in that they resembled likely conditions in which large implementations of immersive video games could take place. The context of this study took place in two public funded charter schools in a large southwestern metropolitan city. Four teachers were selected from two university-sponsored charter middle schools. Much like the pervious large-scale technology scaling studies the decision to implement QA did not come from the teachers, but from the school's top administrators. Historically, publicly funded charter schools are granted autonomy from many state or local rules and regulations that other public schools experience. These freedoms afford the administrators and

other educational decision makers autonomy and flexibility to quickly implement new innovative curriculum. According to a recent US Educational report, (Kena, Aud, Johnson, Wang, Zhang, Rathbun & Kristapovich; 2014), in the last twelve years there has been a 5.8% rise in number of charter schools across America. There has also been a consistent rise in charter school enrollment. In between the school years of 1999-2000 to 2011-2012 the number of students attending charter schools has risen from 300,000 to 2.1 million. In high poverty settings, enrollment has risen 75%. The schools used in this research fit within each of these trends, and the growth trends of charter schools, especially in urban settings, could position charter schools as ripe contexts for future large-scale immersive video game implementations.

In this study, the charter's administration decided to intentionally eliminate the use of textbooks, and instead wanted to create an instructional context that relied heavily upon the latest educational technologies. Throughout all grades in each school, there was a ratio of two computers for every three children, with funding proposals sent to have one computer per student. On a daily basis, teachers in each school were expected to use educational technologies in their classroom for both administrative and instructional purposes. These technologies included online grade books and the daily use of multiple online curriculum subscriptions from content providers like Pearson and Scholastic.

The instructional context in which this study was conducted could represent an ideal type of setting for future large-scale immersive video game implementations. The charter's administration had the flexibility and autonomy to quickly implement new and innovative educational technologies, and a significant amount of resources had been allotted to build a strong technology infrastructure needed to support a large-scale immersive video game implementation. Teachers were accustomed to using educational technologies on a daily basis. In

such a context, Quest Atlantis was perceived as an innovative curriculum, and the administrators were highly motivated to offer the immersive video games to their students.

Due to the exploratory nature of this study, the methods used to capture teachers' stories required me to be a participant observer (Strauss & Corbin, 1990; Yin, 2009). The lack of research on implementing MUVE video games into K-12 classrooms motivated me to offer a level of support and encouragement to teachers as they implemented a new curriculum into their classrooms. My participation in each implementation involved informing, equipping, and supporting teachers as they attempted to use the QA games with their students. My support was intended to eliminate certain general technology barriers without hindering teachers' freedom to decide how to best use Quest Atlantis with their students. By observing and supporting teachers through their implementation, I was able to gain a clearer picture of the connection between how teachers wanted to use QA and the ways it was implemented.

Before we can create a high-quality implementation plan and consistent contextual measures, scholars need a clearer picture of the complex and potentially messy integration process that teachers engage to use a video game curriculum. Gaining a clearer understanding of the process in which teachers use a video game would likely help educators, on all levels, understand the conditions in which video games help teachers accomplish their goals. This knowledge would be critical for structuring successful large-scale game implementations while avoiding making the same costly mistakes past integration researchers experienced when they failed to consider the influence teachers possess when shaping the outcome of an implementation.

In the same way that Dorothy looked behind the curtain in the Wizard of Oz, this study sought to move beyond the current trend in game research to help researchers realize that games,

alone, may not magically help students learn. Hays (2005) urged for further game research that could help educators discern whether or not games would benefit their students, and why. And so with this research, I hoped to help educators appreciate how a teacher's integration process (e.g., time for preparation, teacher's preferences) could influence students' academic achievements. Capturing teachers' processes of appropriating QA will begin to outline what an integration process could look like for the larger genre of educational MUVE games. This information could be converted into a type of check list that could help educators take inventory of their current resources in order to discern whether or not educational games would be a good investment of time and resources (e.g., teacher training, technology upgrades, software purchasing, compatibility of teacher pedagogy) for their school and district.

CHAPTER 3 - LITERATURE REVIEW

In this literature review, I will situate how educational video game research fits into the larger body of literature focused on educational technology integration. The amount of excitement and buzz that has been generated about the potential of video games is similar to when computers first entered schools. Yet, in all of the excitement and anticipation to prove that games improve learning and instruction, we could easily repeat history and generate a large but fractured research base on educational games (Hayes, 2005; Wilson et al., 2009; Dalgarno, & Lee, 2010). This study sought to take a first step toward creating high-quality game implementations by uncovering the complex and messy process teachers have to engage in order to convert a foreign educational MUVE game technology into a pedagogically useful tool. A game research literature base did not exist to address teachers' integration process; therefore, I situated this study into the larger educational technology integration literature. The second half of this review outlined several conditional factors that have been found to influence a teacher's integration process. I then applied how those conditional factors would apply to integrating an educational MUVE game.

Situating this work into the larger field of K-12 educational technology integration research was no trivial task; the literature base was large and diverse. There was no single, standard definition for classroom technology use or technology integration, and different theories have been used to explain how educational technologies influence learning and instruction. By surveying the literature, four themes emerged that were essential for applying games to the larger integration research base: level of access to technology; theory explaining the relationship

between technology, instruction, and learning; definition of technology use; and a definition of technology integration.

I first will recount the story of how the optimistic belief that technology could positively influence learning led to billions of dollars being allocated to equip schools with computers and Internet access. The major push to put computers in schools, however, did not radically transform instruction as originally hoped, but it, instead, revealed the need to understand what influenced the ways teachers used technology in their classrooms. Game research could be in danger of repeating these previous technology integration trends if there is not an articulation of theory explaining the connection between educational games, learning, and instruction.

Next, I will review the different theories that explain how technology influences learning and instruction. From this discussion I will argue that educational MUVEs are specialized cultural tools. I will then list and discuss the several ways scholars have defined technology use followed by a discussion that analyzes the different ways technology integration has been defined.

In the second half of this review, I will discuss how previous technology integration literature points to certain conditional factors that have been shown to significantly influence the ways technology was used in classrooms. This study will specifically focus on understanding the process of how four teachers used immersive games in their classrooms, while also seeking to extrapolate some more general integration patterns and concepts that spanned through each case.

Access to technology: Only the first step

From the invention of the computer in the mid 1970s, educators have been fascinated with understanding how technology is related to student learning (Pea, 1985; Honey, Culp, & Carrigg, 2000, Hew & Brush, 2007). This idea has significantly influenced educational policy

and funding in the United States. In the national educational report called A Nation At Risk, it was argued that increasing students' overall technological literacy was a strategic step in securing the United States' powerful position in the global economy (National Commission on Excellence in Education, 1983). The United States government responded by creating policies and providing funding to equip students to be technologically competent. In 2001, the Bush administration reaffirmed the emphasis for including technology in schools in the No Child Left Behind Act, which outlined a plan that would make every student technologically literate by eighth grade. From 1993 to 2004 it was reported that the US government invested upwards of $40 billion dollars in educational technology infrastructure, technical support, and professional development toward building a technically literate force (Dickard, 2003). In 2010, the belief that technological literacy is essential to educational effectiveness was preserved with the National Educational Technology Plan. The ambitious plan sought to increase the number of college graduates from 41% to 60% by the year 2020, and outlined how leveraging modern technology and the learning sciences would help to create engaging, relevant, student-centric, and personalized learning experiences for all learners (United States Department of Education, 2010). The Secretary of Education, Arne Duncan, suggested that a constructive means for achieving the ambitious technology plan was to promote research in technologies such as simulations, virtual worlds, cognitive tutors, and games to be used to engage learners while assessing complex skills (United States Department of Education, 2010).

The results of these policies have led to more teachers and students gaining access to computers and the Internet (Cattagni & Westat, 2001, US DOE, 2003). According to the Market Data Retrieval (MDR, 2002) the ratio between students and computers had risen from 125:1 in 1981 to 4:1 in 2001. A similar trend has been observed with Internet access. Where in 1994 three

percent of schools had Internet access, in 2001 98% of schools and 77% of classrooms had access (Cattagni & Westat, 2001, US DOE, 2003). The US DOE report (2003) stated that 81% of teachers had moderate or high levels of access to technology for instructional purposes. Additionally, the US DOE report found that the percentage of teachers who indicated feeling "somewhat well prepared" to use technology for instruction rose from 53% in 2000 to 85% in 2003.

Despite the widespread belief that technology can create positive learning outcomes, numerous studies revealed that the large investment to introduce technologies into schools did not produce the types of changes that were envisioned (Cuban, 2001, Ertmer, 1999, Cuban, Kirkpatrick & Peck, 2001, Earle, 2002). Research uncovered that there were other factors beyond having access to technology that influenced how technology was used in classrooms. Furthermore, these data pointed to the need for educators to ask new questions, such as, "What is the role of technology in the classroom?", "How do classroom technologies and computers influence learning?", and "What are the factors and barriers to technology integration?"

Expanding upon this work, there is reason to believe that educators should consider factors other than granting access to game technologies in order to integrate games into their schools. Introducing educational MUVE games into classrooms is much easier now compared to ten years ago. Funded government policies have enabled school districts to develop technology infrastructure that offers teachers and students unprecedented access to computers and the Internet; however, greater access to technology and favorable views of educational games are only the first hurdles educators must consider (Kickmeier-Rust, Steiner, & Albert, 2011). Technology integration research suggests educators should also articulate their theory of how educational technologies are related to current models of instruction and learning. There are

different theories that explain this connection, and each theory has significant influence on the potential ways a technology might be integrated into classrooms.

In the following section, I will discuss the different theories scholars have used to explain the relationship between educational technologies, instruction, and learning. It will become clear that the way scholars define this relationship significantly influences research agendas and, in turn, significantly influences how a technology is positioned within a classroom (i.e., technology as a teacher or as a tool). Articulating the different theories of educational technology highlights why educational MUVE game integration requires more than granting access to computers with high-speed Internet access.

Technology Use Defined

From the first introduction of computers into the classroom until now, the capabilities and uses of computers have constantly changed; however, scholars have not always been explicit about differentiating the various ways teachers use technology. In an effort to create consistent measures, researchers have often lumped all of the uses of technology into a single construct labeled "technology use" (Bebell, Russell, & O'Dwyer, 2004; Hew & Brush, 2007).

Lumping every use of technology into one construct has complicated research efforts to accurately measure the actual use of technology in classrooms, which, in turn, has complicated policymakers' and educators' efforts to create constructive strategies that promote increased classroom technology use. In 1995, the US Congress requested the Office of Technology Assessment (OTA) "to revisit the issue of teachers and technology uses in K-12 schools in-depth" (OTA, 1995). The report revealed that scholars used different definitions of technology integration, which were a main cause for the conflicting and contradictory results about teachers' actual use of technology. For example, the 1992 International Association of the Evaluation of

Educational Achievement Report defined technology use as a teacher who sometimes uses computers with their students (Bebell et al., 2004). Two years later, Becker (1994) narrowed the definition of technology use to mean students' use of computers. The perception of how much teachers were using technology was significantly different based on the scholar's definition of technology use. For example, in 1992, an IEA report indicated that 75% of the teachers researched fell within the criteria of computer use, while Becker's (1994) report only indicated computer use at 25%.

Over time, the definition of technology evolved into two distinct camps: technology used for instruction and technology used for administration. NESC's (2000) national study indicated 85% of teachers used technology for some aspect of administrative practice (e.g., record keeping, lesson planning at home, and email communication amongst colleagues, administrators, parents and students), whereas only 51% of teachers reported using computers during instruction. Becker's 1999 report indicated that the majority of teachers' use of computers was for non-instructional, professional use based on their day-to-day needs. Between the years of 1997-1998, 71% of teachers surveyed indicated that they used technology for instructional purposes. In the group of teachers who did not use technology for instruction, 75% indicated that they use computers for non-instructional purposes (e.g., lesson planning, record keeping, communication between colleagues). Bebell, Russell, & O'Dwyer, (2004) challenged Cuban's 2001 report, Oversold and Underused, by distinguishing the difference between using technology for class use versus out of class use. When defining how technology had been underused, Cuban referred to technology use as in-class instructional devices. Babell et al. commented that this definition was too narrow because it did not place value on how teacher-required administrative roles could influence instructional practices with technology.

Despite the lack of consistency in technology use definition, educational 3D video game technology represents another advancement in educational technology and its potential use in the classroom; however, it would seem premature at this point to attach educational games to the definition of technology use that places a higher value on the instructional affordances than to its administrative functionalities. Unlike Cuban (2001), I find value in including both instructional and administrative functions into a definition of technology use. There is reason to believe that administrative and instructional uses of a game like Quest Atlantis are closely related. For example, in QA when students play, they are required to submit essays and reports. Those reports are sent to an online learning management system called the Teacher Toolkit. Once student work is submitted, a teacher logs into the Teacher Toolkit and grade her classes' reports. The act of grading can be considered an administrative function, but if a teacher takes advantage of this management system, and allows students to learn by redoing their work, this would influence the overall instructional use of the game. A likely case would include a teacher who observes that several students are misrepresenting a particular concept in their reports. In the next class, before students start playing, the teacher could conduct a discussion or a short lecture about the particular misunderstood idea or concept. Therefore, in this case, a definition of technology use that would only include instructional uses of games could overlook how the game's administrative affordances could influence a teacher's experience integrating the games into her classroom. In addressing the larger question of how teachers integrate MUVE games in their classroom, it seems essential that technology use of educational MUVE games include both instructional and administrative uses.

Relationship between educational technology and learning and instruction

Technology integration scholars have theorized, to varying degrees, how technology is related to learning and instruction. On one end of the spectrum lies technocentricity, a theory that educational technologies are independent entities that can teach children if properly managed (Papert 1987, Lim, Teo, Wong, Khine, Chai, & Divaharan, 2003; Lim & Khine, 2006). On the other end of the spectrum researchers theorize that educational technologies are cultural tools used by teachers to mediate their various teaching objectives. This latter view acknowledges that the ways teachers use a technology are closely connected with their pedagogical beliefs and classroom constraints. Below, I will explain why working for a theory that views educational technologies as tools explains why educators need to consider integration factors beyond granting access, and why this theory is better equipped to acknowledge a teacher's technology integration process.

Technocentricity. Educators who have adopted a technocentric view of educational technology could begin to explain why there is such a strong focus on granting educators access to technology. Educators who hold this belief, assume the unique affordances of an educational technology directly influence student cognition in ways that are isolated from teachers, pedagogy, or other classroom contextual factors (Harris, 2005; Harris et al., 2009). Furthermore, denying student access to various educational technologies intentionally limits their ability to learn.

The term technocentric first appeared in Papert's (1987) article that critiqued a 1984 Psychology Today article by James Hassett. Hassett claimed that Pea and Kurtland's (1983) study of the educational software program, LOGO, demonstrated that it did not work (Papert, 1990). Papert coined the term technocentricity to highlight the mode of technology integration

research that only focused on determining if a particular technology worked. Papert borrowed Piaget's term, egoism, as the basis of technocentricity by paralleling how egoism, in developmental psychology, was like a primitive and less-developed form of educational research in that it focused solely on the technology, and not how the cl--assroom ecology shaped the ways the technology was used. For example, Piaget's term egoism did not mean "selfish," but meant that a child had not reached a level of development in which he or she had-- the capacity to think beyond themselves. In the same way, when critiquing educational technology research, Papert argued that scholars were unable to see factors beyond the educational technology. He was concerned that if researchers only asked "Did it work?" then scholars would overlook how other cultural factors influenced the different ways teachers actually used technology. Studies working from a technocentric side of the spectrum have mainly been interested in finding out whether particular technology was successful to produce higher learning gains (Zhao et al., 2002; Harris, 2005).

It was difficult to assess the degree that technocentric assumptions had directly informed educational research. Pea (1987) offered a critique for Papert's technocentric rationale arguing that only a straw man would support technocentricity in its purest sense. Furthermore, Pea argued that as a research enterprise developed and grew, the questions would become more specialized and focused. Pea's critique did not deny that prior research was colored in a technocentric lens (i.e., Did the technology work?), only that there was not evidence to support scholars intentionally building their research questions from an explicit technocentric perspective.

Nevertheless, technocentric assumptions were evident in a large number of educational technology studies. Hundreds of studies asked technocentric research questions; "Did it work?"

or “Did the computer improve test scores?” (Kulik & Kulik, 1991; Honey et al., 2000; Harris, 2005). In a meta analysis, Kulik & Kulik (1991) reported that between the years 1972 and 1986, 248 experimental studies compared computer-based instruction (CBI) with non-technical control curriculum, and found that 202 (81%) studies reported that CBI groups scored higher on post tests. In another study, Harris et al. (2009) indicated evidence of technocentric assumptions through an analysis of teacher training in many large technology initiatives. They revealed that the content of the training highlighted that the affordances of new technologies provided and stressed mastering the skills needed to operate them but denied teachers opportunities to discern how their existing classroom constraints related with the new technology.

It was argued that research conducted from a technocentric approach produced a largely unusable literature base (Clark, 1983, 1987, 1994; Honey et al., 2000; Harris, 2005; Harris et al., 2009). Zhao et al. (2002) explained how research that analyzed the success of educational technology without the consideration of the more fundamental issues related to technology and education made it difficult for the research community to offer constructive suggestions to policy makers and practitioners. Clark (1983, 1987, 1994) challenged the main technocentric assumption that technology had a unique effect on learning. He conducted a series of studies in which he was unable to isolate any specific learning outcome with a specific technology that could not be reproduced by another type of media, pedagogical, or instructional strategy. Clark argued that educational technologies were, “mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition" (1983, p. 445). Papert (1987) argued that in the same way that a house’s construction could not be solely judged based on its lumber, educational technologies were, in

fact, cultural products that should not be judged as ineffective without a consideration of a teacher's skill and the classroom context.

My research questions would be much different if I had applied a technocentric view of technology. For example, I would not have sought to uncover a teacher's integration process when using Quest Atlantis. Instead, I would have created another comparison study to test whether or not students playing Quest Atlantis could out perform students in comparison curriculum, solely based on pre-tests and post-tests gains. I was not denying the value in understanding how certain curricula compare and contrast to others. I was, however, stating that simply looking at pre-post test gains would offer no insight into understanding the connection between a teacher's desired use of a game and the process used to implement the curriculum.

Technology as a tool. Another tradition in educational technology integration research was to theorize educational technologies as instructional tools. This tradition was built from Vygotsky (1978) who theorized humans were unique from all other animals because of our ability to create and use tools to interject between ourselves and the object of activity. Applying Vygotsky's concept of tool mediation to educational technologies, Zhao et al. (2002) argued that many of the problems of technology integration research would have been resolved if educators acknowledged that no educational technology was an isolated entity independent from the beliefs of teachers or the contextual constraints of a classroom and school. In this study, technology was viewed as a tool that was created with certain philosophical and pedagogical convictions and used for specific purposes. Papert (1990) acknowledged that teachers' and students' ways of thinking were likely to change when computers were introduced into classrooms. Yet, he insisted that to understand *why* changes occurred, one would need to focus on the culture and not on

computers. He asserted that culture, not an isolated technology, was the context for human development and learning.

The research questions in this study were inspired by the idea that educational MUVE games were instructional and as administrative tools. This assumption recognized that the ways in which a teacher used video games were likely to be influenced by several factors: educational affordances of the game, the teacher's pedagogical preferences, his or her knowledge of how to operate the game, knowledge of students, student achievement goals, and other classroom constraints. Furthermore, each teacher had to actively engage in a process to convert the new game technology (i.e., QA) into a pedagogically useful tool (Zhao et al., 2002; Zhao et al., 2003). As a first step in understanding this process, my second research question sought to uncover the ways in which teachers used an educational MUVE game (i.e., QA) as a classroom tool. My third research question attempted to uncover the process that teachers enacted to convert the foreign MUVE game technology into a pedagogically relevant tool. The fourth research question sought to find similarities between cases, so that I could begin to map out the next steps in educational MUVE game research.

In the next section, I will discuss the different ways *technology integration* had been defined, and argue why I built this study from a definition that acknowledged integration as a process and not a product.

Technology Integration Defined

There was no established or standardized definition of technology integration for K-12 schools. Over time, and as educational technologies became more advanced, so had definitions of technology integration (Bebell, Russell, & O'Dwyer, 2004; Hew & Brush, 2007). Surveying technology integration research, a spectrum of definitions emerged, ranging from any type of use

of technology (i.e., computers, laptops, software and Internet), to effectively managing classrooms so technology could shape cognition; however, not every definition acknowledged that teachers engage in a process that utilized technology for his or her goals. I, therefore, situated this study within the larger body of technology integration research that acknowledged integration as the complex and messy process a teacher engaged to use technology within his or her classroom (Zhao et al., 2002).

Technology integration defined as shaping cognition. For educators who, intentionally or unintentionally, built research upon the technocentric tradition, which presupposed a technology had a unique effect on cognition (Papert, 1987, 1990), technology integration was defined in terms of successful classroom management (Lim, Teo, Wong, Khine, Chai, & Divaharan, 2003). It was assumed that if classrooms were properly managed, then a technology would have enabled students to engage new cognitive operations that were previously inaccessible (Lim & Khine, 2006). Furthermore, this definition assumed that integration was achieved when classroom distractions and barriers were effectively managed so that student had the cognitive space to think critically and problem solve (Fisher, Dwyer, & Yocam, 2001).

The advantage this definition provided researchers was the acknowledgement that teachers needed new skills to manage classrooms that implemented technology (Hew & Brush, 2007). For example, Wang, Haertel, & Walberg, (1993) found that classroom management was one of the strongest factors that influenced student learning. When teachers introduced technology into classrooms, some of the existing non-technology integrated classroom rules and procedures applied, but teachers needed additional knowledge and skills to ensure students had equal opportunities to learn and overcome technological problems (Lin et al., 2003).

The introduction of educational MUVE games into classrooms will likely create a need for teachers to establish new classroom management knowledge. Many educational technologies were designed to foster higher order thinking and complex problem solving. These student-centric technologies required teachers and students to drastically change their roles from a more traditional based curriculum (Harris, 2005) to a more technologically ready classroom and environment. Educational MUVE games are no different. Gresalfi et al. (2010) explained how educational game curricula differed greatly from common non-technological curricula and required that all teachers alter their instructional practices to some degree. The authors articulated that teachers who preferred instructional practices that supported drill and practice strategies required training about inquiry-based techniques (e.g., ones that guided students' learning versus leading students through various activities). On the other hand, teachers who preferred inquiry-based instructional techniques faced new pedagogical challenges in the MUVE games, when they addressed technical issues, supported students playing at different speeds, and helped students connect the game narrative to learning academic content. Therefore, the definition of technology integration used in this study affirmed that the complex and messy process teachers engaged to use a new technological tool (Zhao et al., 2002) was beneficial because the definition acknowledged the need for specialized classroom management knowledge and skills. Teachers needed to know how to control their classrooms with the game technology so that their educational objectives were met.

The implications of using a technocentric definition of integration in this research created many points of conflict in capturing a teacher's integration process, and so there was a strong temptation to overlook the role of the teacher (Papert, 1987). As mentioned in the previous section, technocentric research focused on assessing whether or not a technology "worked"

without considering the teachers' integration processes and other contextual factors (Papert, 1987, Zhao et al., 2002; Harris et al., 2009). The intent of this research was not to determine whether or not Quest Atlantis (QA) "worked," but to create a series of cases that uncovered the messy and complex process four teachers negotiated to use QA.

Technology integration defined as tools. On the other side of the technology integration spectrum, scholars conceptualized educational technologies as specialized tools. These scholars defined integration as the various ways teachers used classroom technologies as tools; however, scholars who viewed integration in this way differed in *where* they looked for evidence of integration (Hew & Brush, 2007). The difference between these two groups was distinguished in terms of product and process. The larger group of scholars used surveys and interviews to differentiate, compare, and contrast the different ways large numbers of teachers used educational technologies (Zhao et al., 2002). A smaller group of scholars focused on creating case studies that provided rich descriptions of teachers' messy processes to use and integrate a new technology to meet their goals (Cuban, 1985; Cuban, 2001; Zhao et al., 2002; Zhao & Frank, 2003; Thomas et al., 2009).

Technology integration as a product. When computers first entered schools, technology integration was synonymous with any type of technology use (Cuban, Kirkpatrick, & Peck, 2001). Researchers sought to determine whether or not teachers were using computers at all (Hennessy et al., 2005; Hey & Brush, 2007). Technology integration was defined in the following ways: used computers as instructional aids while teaching; used computers as a facilitating learning tool to help student create products, multimedia presentations, and conduct research projects; and used computers as administrative tools for creating lesson plans, record

keeping, communicating with administrators, other teachers, parents, and students through email (Hey & Brush, 2007).

The development and introduction of advanced student-centric educational technologies influenced researchers to modify how they defined technology integration. The definition for integration changed from meaning any type of technology use to mean the level at which teachers promoted student centered instruction (e.g., problem based instruction, inquiry based instruction) (Harris, 2005). Scholars compared and contrasted the different ways teachers used technology as being either instructional tools or administrative tools (Hey & Brush, 2007). This distinction allowed researchers to place a higher emphasis on the use of technology to enhance inquiry-based instruction (Cuban et al., 2001), which was argued as an essential component to technology integration.

The definitions mentioned above, though varying in degree of clarification, share a common motive: characterize and classify the ways in which teachers used educational technologies. For example, research by Twian and Hsiung (2011) surveyed 1130 teachers and found a large inconsistency between teachers' expressed pedagogical beliefs and their teaching practices. Inan et al.'s, (2009) survey study showed that there was a relationship between the frequency of computer use and teachers' pedagogical strategy. In both of these studies, scholars found reason to differentiate between low-level and high-level uses of computers. Low-level uses were thought to replace textbooks with a computer (e.g., filling out worksheets on computers, Internet searches), whereas high-level uses consisted of more complicated tasks and assignments (e.g., students creating multimedia presentations, knowledge building, collaborative problem solving) (Hennessy, Ruthven, & Brindley, 2005; Harris et al., 2009). Other scholars defined technology integration as teachers using technology to carry out similar instructional

tasks more efficiently (Cuban, 1985; Cuban 2001). Terms used by this group of scholars assessed and rated the level of technology integration as extension devices, amplifications devices, and transformative devices (Marcinkiewicz 2003; Dede, 1998, Dexter, et, al., 1999; McCormick & Scrimshaw, 2001; Christensen et al., 2011).

Applied to educational game research, the aforementioned definitions of integration would be appropriate if scholars were interested in gathering qualitative and quantitative data on teachers' existing instructional game practices or when seeking to determine the level teachers used games to transform their teaching practices (Park & Ertmer, 2007). For example, Dalgarno et al. (2011) surveyed and interviewed 179 professors in Australia and New Zealand to determine the current and expected uses of immersive virtual games. Their results indicated that university faculty members saw a higher frequency of game use in higher education. For this study, I was interested in gathering data on the relationship between teachers' desired use for a game and the process for realizing that use. The difference between these two agendas was the focus on uncovering teachers' integration process, not determining whether or not teachers integrated a technology in select *a priori* ways. Merely classifying the ways in which games had been used (i.e., low-level vs. high-level uses) without understanding the conditions and factors that teachers engaged to use educational MUVE games, offered little insight when designing high-quality implementation strategies.

Technology integration as a process. Research in technology integration was dominated by survey studies that identified, examined, and measured factors that influenced the ways teachers used technology (Zhao et al., 2002; Ertmer, 2005). The large lists of integration factors, generated from previous research, were unusable because it was unclear how the numerous integration factors influenced each other (Hey & Brush, 2007). Zhao et al. (2002) noted that,

with the expectation of a few integration studies (i.e., Ringstaff, & Sandholtz, 1991; Fisher, Dwyer, & Yocam, 1996), there was a "conspicuous lack of attention to the complexities and intricacies of how classroom teachers actually incorporate technology in their teaching" (p. 483). The authors' comment highlighted the need to investigate the interaction and relationship between particular educational technologies (e.g., game based curriculum) and the realities in schools (e.g., time and resource constraints, teachers' pedagogical strategies).

Earle (2002) argued that technology integration should not solely focus on the technology (i.e. hardware and software) being integrated, but also on the process of incorporating content and effective instructional practices. He wrote:

> Technology involves the tools with which we deliver content and implement practices in better ways. Its focus must be on curriculum and learning. Integration is defined not by the amount or type of technology used, but by how and why it is used. (p. 7)

Earle addressed, in the quote above, how the goal of technology integration was not to determine whether or not technology "worked," but that technologies were tools, used by teachers, who needed to employ specific pedagogical and classroom management strategies in order to create classroom conditions that promoted learning gains. Researchers from this tradition argued that if the integration process was been neglected, then, we gained little insight into understanding how technology influenced learning gains (Zhao et al., 2003). Therefore, working from the assumption that educational technologies were tools, and that integration was a process, scholars were driven to ask a different set of questions other than, "Did it work?" or "How did educational technologies produce learning gains?" Instead different questions were posed such as, "How was the technology used?", "Why did the teacher use the technology?," , "How did the classroom context shape the ways the teacher used the technology?", and "What were the

conditions that certain technologies can be effectively used?" The focus of research shifted from solely investigating the particular technology (i.e., educational game) to investigating how a technology fulfilled a niche within classroom ecology (Zhao et al., 2003). This shift in research focus changed technology integration from a product to a process.

Zhao et al. (2002) defined technology integration as the "the messy process in which teachers engage to incorporate technology with their teaching" (p. 483). Zhao & Frank (2003) used an ecological metaphor to explain the integration process as, "…the introduction, survival and dispersal of an alien species into a new environment…" (p. 808). The authors reasoned that a technology needed to be used, despite its educational affordances, before learning was impacted. Secondly, the survival of a new technology in an established classroom was determined if a teacher could use the new tool to fill a niche. The advantage for using this definition attuned scholars to realize that the ways in which a technology was used (e.g, high versus low uses, for administrative purpose versus instructional purposes) would be largely related to the ways a tool was used by a teacher. Furthermore, researchers had success capturing and reconstructing teachers' complicated integration process when data was gathered from entering into classrooms and observing teachers' behavior using technology (Zhao et al., 2002).

In this study, I applied Zhao et al.'s (2002) definition of technology integration. This definition was compatible with this research because it acknowledged, in the context of real classrooms, teachers actively utilizing game affordances to use a game to meet their classroom purposes. Second, this definition highlighted that the type of technology being used (i.e. QA) had a unique effect on a teacher's integration process; I will discuss this point further in the next section. Third, this definition pointed to the need for capturing real classroom data by directly observing teachers implementing QA.

In this study, the ways that teachers used QA differed; therefore, it was important to identify how each teacher used QA and identify the process in which they enacted to use the game in his or her particular way. Having established these needs, this study fit within the larger technology integration literature by drawing on the technology integration traditions, which assume that educational MUVE games do not teach students but are specialized tools, used by teachers, to help students learn. Secondly, it was assumed that the functionality of QA afforded teachers both instructional and administrative uses. Lastly, in this study, technology integration was defined as a complex process in which teachers transformed a foreign curriculum into a useable tool.

Implementation Leads to Integration

In the previous section, I surveyed the breadth of the educational technology literature. The definitions of integration and methods employed to research this topic were large and diverse. One recurring and disheartening trend in this field was the noted lack of appreciation for the process teachers engaged in using a new technology (e.g., Snyder, 1992, Ertmer, 2005, Marcinkiewicz, 1993). There was a growing concern that if game research did not intentionally seek to understand the process in which teachers engaged to convert foreign immersive games into useable classroom tools, then we would likely repeat many of the same mistakes in video game research (Young et al., 2012) that were encountered by previous technology integration studies (e.g., Berman & McLaughlin 1974, 1975, 1978; Marcinkiewicz, 1993). This research sought to steer the conversation one small step away from this impending disaster by investigating what was involved in a teacher's immersive game integration process. I drew upon the traditions of technology integration that affirmed the ideas that teachers played a major role

in shaping the ways educational technologies were used (Cuban, 1986; Ertmer, 2005), and that integration was a messy and complex process (Zhao et al., 2002).

As noted earlier, there was a shortage of previous literature focusing on a teacher's immersive game integration process; however, there was reason to affirm that change management literature could offer critical insight into identifying what was involved in a teacher's messy integration process. Change management focuses on creating and executing processes, which can move a group of people, situated in a particular context, toward a desired end (Kotter, 1995). It has been well documented in business that change is not an event (Hall & Hord, 2006) but a process that involves many steps. If these steps are not followed in a particular sequenced order, then the change process will undoubtedly fail (Kotter, 1995). Furthermore, in this line of literature, it was well researched and accepted that a successful change initiative could occur as the result of a properly supported change implementation (Rodgers, 1995; Kotter, 1995; Hall & Hord, 2006). In this research, I wanted to apply this well-known change management concept to technology integration by applying the idea that a properly supported immersive game implementation was an essential element of a teacher's messy integration process. Applied in this manner, a teacher's initial game implementation could be conceptualized as a testing phase to determine whether or not a particular technology would reinforce or threaten a teacher's ability to manage his or her classroom. In the section below, I have applied the decision-making process from Rodgers' (1995) *Diffusion of Innovations* and Hall and Hord's (2006) *Implementing Change* to illustrate the role of an implementation and how it would likely play out in a teacher's integration process.

In his book, *Diffusion of Innovation*, Rodgers (1995) outlined a five-step, decision-making change process that all people, in any change initiative, experience before a change initiative is fully realized. (See Table 3.1)

Table 3.1.

Rodger five stage decision-making process

Decision Making Stage	Description of the stage
1. Knowledge Stage	Occurs when an individual (or other decision-making unit) is first exposed to a change initiative's existence and gains an understanding of how it functions
2. Persuasion Stage	Occurs when an individual (or other decision-making unit) forms a favorable or an unfavorable attitude toward the innovation.
3. Decision Stage	Takes place when an individual (or other decision-making unit) engages in activities that lead to a choice to adopt or reject the change initiative.
4. Implementation	Occurs when an individual (or other decision-making unit)
5. Confirmation	Takes place when an individual seeks reinforcement of an innovation-decision already made, but he or she may reverse this pervious decision if exposed to conflicting messages about the innovation

Note. Adapted from Diffusion of Innovations, p. 169, by E. M. Rodgers, 1995, New York: Free Press.

Rodgers (1995) wrote, "Most diffusion (i.e., change) researchers who have probed the innovation-decision process for their respondents have arrived at a somewhat similar set of stages (pg. 169)." When applied to this study, I could see that Rodgers' first three stages related to the teacher's decision-making process to evaluate whether or not they should *adopt* a particular technology like an immersive game. Adoption was the decision to *implement or test* a

new technology (e.g., immersive game) into their classrooms. During stage 4, the implementation was when a teacher put a new tool into use. By gaining experience using the new technology within their live classroom context, a teacher would gain the practical experience required to confirm (i.e., Stage 5) whether or not a new technology could help them achieve their intended goals in the future. According to Rodgers, it was only after a teacher had made a confirmation to continue using a certain technology that it became incorporated into their existing practice (i.e., integrated). In this study, I gleaned from Rodgers' innovation-decision process that an implementation offered teachers the necessary opportunity to gain experience that would allow them to confirm whether or not these games would offer future instructional benefit. Furthermore, it was plausible that a game implementation was a critical and required component of a teacher's messy integration process.

Similar to Rodgers, Hall and Hord (2006) affirmed that a change initiative could not occur until after the end user (e.g., teachers) had an opportunity to implement the innovation (e.g., new technology). Their outlined process for change had twelve principles, and principles one and two were relevant to this study. Principle one corresponded with Zhao et al.'s (2002) definition of integration by stating that a change was not an event, but a process. I applied Hall and Hord's first principle to an integration process by stating that a game integration was not an event but a process. This meant that before a teacher decided to continue using an immersive game, they would have had to already gone through a series of steps or stages. Hall and Hord's second principle for change built on the first principle and stated that the development (i.e., planning) of a change initiative was distinctly different than its implementation (i.e., testing the plan). Separating the planning stage from the implementation stage stressed that once a change plan was initiated (i.e., tested), the change managers needed to be aware and quickly respond to

unexpected and hidden distractions. If this principle were applied to an integration project, the authors would likely affirm how implementations were messy processes filled with unexpected and hidden disruptions. The authors acknowledged that a change implementation was difficult and often painful; however, they challenged this conventional wisdom on the basis that when an implementation was properly supported, the fear and risk of trying something new was greatly reduced. Hall and Hord's second principle helped me appreciate the importance for recognizing that implementations could be messy processes but are absolutely necessary for a change initiative to be realized. If we are unable to see the messiness that teachers experience when seeking to implement an immersive game, then our ability to understand and support how these games are integrated is cut off.

In both Rodgers' and Hall and Hord's models for change, the implementation was a crucial part of the change process required to move a group of people toward a desired end. In this study, integration involved the messy process in which a teacher transformed a foreign tool into a useful tool; however, this study could not make any definitive claim as to whether or not these games where integrated. That would require a longitudinal study in which I could observe whether or not these games were used after their initial implementations. Instead, the scope of this study was to gain a first glimpse into a teacher's immersive game integration process by intentionally observing four teachers' game implementations.

In spite of these limitations, when Rodgers' and Hall and Hord's processes of change were applied to this study, I saw the plausibility that a teacher's immersive game integration would likely be realized after its implementation, and therefore, it was vitally important that each teacher's implementation be observed and analyzed. Neglecting what occurred during each

teacher's game implementation would greatly inhibit the progress of future researchers' ability to understand what was involved in a teacher's integration process.

The importance of investigating a teacher's game implementation as an essential part of his/her integration process becomes abundantly clear when we examine the history of technology integration research. Cuban (1986) investigated the trends in classroom technology use for over 70 years and concluded that teachers integrated classroom technologies to the degree that the technology supported his or her existing teaching practices and purposes. Cuban explained:

> The technologies that teachers adopted buttressed their authority, rather than undermined it. Thus, those technologies incorporated into routine teacher practice responded to daily classroom needs without undercutting the teacher's control of class….Teachers have altered their practice when a technological innovation helped them do a better job of what they already decided had to be done and matched their view of daily classroom realities. (p. 65)

On the other hand, school administrators have historically sought to integrate the use of advanced technologies without the consideration of the teachers' implementation needs. Cuban (2001) unapologetically claimed that the goals of administrators blinded them to the importance of a teacher's implementation process. Instead of considering the implementation needs of teachers, Cuban (1986) noted how administrators saw the integration of technology into classrooms as fulfilling what Alfred Whitehead's educational goal had to offer as the best education by, "gaining the utmost information from the simplest apparatus" (p. 3). Relating this view to educational technologies in classrooms, Cuban wrote, "Many educators have dreamed of making instruction both productive and enriching; wishing that children some how could learn more and faster while teachers taught less" (p. 3). It was this promise that made educational technologies so appealing to administrators (Postman, 1992).

The administrators in the studies that Cuban referenced, displayed what Rodgers (1995) coined as technology determinism, a belief that if technology were simply introduced into classrooms, then teachers would automatically become more efficient at teaching students in a shorter amount of time. Postman (1992) pointed out that the problem with technology determinism was that organizational leaders, like school administrators, embraced a view of technology that could:

> create the illusion those decisions were not under their control. Because of its seeming intelligence and impartiality, a computer has an almost magical tendency to direct attention away from people in charge of bureaucratic functions and toward itself, as if the computer were the true source of authority. (p. 115)

The nearsightedness of technology determinism blinds administrators from the teachers' need to develop the software component of a technology. Rodgers (1995) defined technology as a design for the instrumental action that reduced the uncertainty in achieving a desired outcome. Every technology contains both a hardware and software component. The hardware component could be considered the tool itself (e.g., computers, servers, internet access or the game). The software component consists of the knowledge which confirms that using a particular educational technology would buttress a teacher's existing classroom authority and help her do her job better, as perceived by the teacher herself. As we look at the change management literature referenced above, it is plausible that teachers can only get access to develop the software component of a technology (e.g., immersive video game) through its use in an implementation.

The results of hundreds of integration studies revealed that when school administrators (i.e., non-teachers) adopted to put computers into schools, they did not plan to accommodate or consider teachers' need to develop the software component of that technology (Cuban, 1986; Cuban, 1998; Hew & Brush, 2007; Christensen, Horn, & Johnson, 2011), or provide the

appropriate freedom inherent with teachers' roles that allowed them to choose the instructional means that would best achieve their objectives (McLaughlin, 1990, Baron, Kemker, Harmes, & Kalaydjian, 2003; Snyder et al., 1992; Zhao & Frank, 2003). Furthermore, the success or failure found in these previous technology integration studies was ultimately tied to the teacher's role in implementing the technology.

In conclusion, the picture we gained from the technology integration and change management literature was that a teacher's technology implementation is an essential element in a technology integration process. A teacher's perceived success or failure of a game implementation will likely have a large impact on whether or not that game becomes integrated, and in this study, integration is defined as the complex and messy process in which a teacher converts a foreign technology into a useful tool. One essential aspect of this process, and the focus of this study, is a game implementation. It is through an implementation that a teacher is able to test the new technology's ability to buttress her existing classroom authority by enabling her to achieve her goals in a more efficient manner. Applying this concept to this study, we should expect that if an immersive game is going to be integrated, it would only occur after a supported implementation.

Educational MUVE Games

Grouping all types of educational technology use into one construct proved to be unproductive, and it would be equally unproductive to assume that different educational technologies influence a teacher's integration process the same way; however, the type of educational technology has been found to significantly influence a teacher's integration process (Zhao et al., 2002). In the same way, grouping all educational games into one construct labeled "games" was equally problematic because not all educational games are created in the same way

or for the same purpose (Salen & Zimmer, 2004; Halverson, 2005; Arici, 2008). Educational games differ in characteristics and require different conditions to operate. For example, an immersive online video game requires updated computers, reliable Internet connectivity, and someone to download or install the game on each school issued computer. If those conditions are not met, then a teacher could not use that video game. In addition to this, the pedagogical advantages certain educational technologies generate could also create different sets of challenges for teachers who have never taught with games (Zhao et al., 2002). Supporting student learning with the use of certain educational games may require teachers to alter their classroom conditions in ways that differ from their established norm (Gresalfi et al., 2010; Dalgarno & Lee, 2010). Therefore, in this study, I differentiated MUVE games (e.g., QA) from other types of games and will discuss the defining characteristics that make these games unique.

Educational MUVE video games are a type of instructional and administrative tool. To distinguish the difference between different types of games, I will first define what makes a game and apply this definition to define an educational MUVE game and distinguish it as endogenous or exogenous. Lastly, I will apply Wartofsky's (1973) artifact hierarchy to highlight the unique immersive quality of MUVE games.

Games Defined. Salen & Zimmerman (2004) stated that every game shares the same basic features. They defined a game as "a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome" (p. 80). The authors broke down this definition as: a system is a group of parts, which were interrelated, interdependent, and interact with each other to form a complex whole. In games players are necessary because they need to consciously interact with the system, and it is through this interaction with the system that players experiences play. Though games have similar boundaries of time and space as everyday

activity, the interactions within the boundaries of the system have been artificially manufactured and or fanatical. Within the system of any game is conflict. Conflict, in its most basic form, is a contest for power, the player's desire and agency to act within a system bound by rules. To maintain the conflict in a game, rules provide a structure for interaction and play within the system and intentionally limit what a player can and cannot do. For example, in the game of soccer, the rules prohibit anybody but the goalie to use his hands. This limitation creates certain strategies for offence and defense. Lastly, every game requires an end, a goal, or a quantifiable outcome. At the end of a game the player has either won or lost in reference to achieving a desirable outcome. Players learn, through the course of their interaction within the system, what constitutes an appropriate score to win the game. The end state of a player's outcome oftentimes comes in the form of a score, a narrative conclusion, or a resolution of the main conflict.

When Salen and Zimmerman's (2004) definition of a game was applied to educational MUVEs, it became apparent that the same rules apply. What changes for MUVE games compared to other forms of games (e.g., board games, card games, sports) is the technology in which the system is embedded. According to Dickey (2005), MUVE games have three defining characteristics which distinguish them from other types of games: a visual three-dimensional space, avatars which are visual representations of the players interacting and inhabiting the system, and an interactive chat space for players to communicate with each other as they play. I combined Salen & Zimmerman's (2004) definition of a game with Dickey's three core immersive game features to create an operational definition of a MUVE game (Dickey, 2005). The definition of a MUVE used in this paper was a multi-user, virtual environment in which players used avatars to occupy and interact within a 3D virtual world (i.e., system), to engage in

an artificial conflict, defined by rules, to satisfy the requirements that resulted in a quantifiable learning outcome.

Distinguishing between types of games. The types of technologies integrated have been found to influence a teacher's integration process differently. Educational MUVE games are a unique type of educational technology; they differ greatly from other types of educational games in terms of technology requirements and teaching practices. In order to understand how an educational MUVE game will likely influence an integration process, I differentiated between exogenous and endogenous games. Next, I situated MUVE games into Wartofsky's artifact hierarchy to distinguish MUVE games from other forms of educational technologies. Situating MUVE games into the categories of endogenous games and tertiary artifacts highlighted how students' immersion into a virtual context (i.e., fantastical system) is foundational for the creation of unique learning affordances these games have been theorized to provide (Barab et al., 2010b).

Exogenous and endogenous games. Halverson (2005) distinguished between *exogenous* and *endogenous* educational games. The term *exogenous* means "from outside" and referred to an action or object coming from outside a system. Related to games, the activities in *exogenous* games, like *Battleship Numberline*, (www.brainpop.com) focus on skill and drill practices. Rules in exogenous games are structured to help students engage in activities of memorizing or practicing specific academic skills (e.g., practice multiplication tables, diagnose key elements in sentence structure, memorize elements in the periodic table). Win states are realized when students have clicked through different screens or manipulated different screen objects to achieve a certain score. *Exogenous* games are used by teachers to reinforce desired behaviors, help

students memorize facts, review procedural knowledge, and supplement skill development (Halverson, 2005; Arici, 2008).

In contrast to exogenous, *endogenous* means "from within" referring to an action or object coming from within a system. *Endogenous* games, such as MUVE games (e.g., QA) and simulations, are designed to immerse students into 3-D virtual contexts (Halverson, 2005). Complex problem solving is often the main activity students engage, and they are often required to use interpretation, agency, collaboration, discernment, justification, and reflection (Crookall, 2010).

Arici (2008) applied the term endogenous games to differentiate QA from other educational games. She explained that QA games immerse students into fantastical virtual worlds in which they are expected to interpret a problem space and decide the best way to employ academic content to resolve pedagogically relevant tensions. Students' understanding of academic content becomes manifested through the discernible changes in the context resulting from their actions (Barab et al., 2007; Barab et al., 2010a, Barab et al., 2010b, Barab et al., 2011).

Wartofsky's artifact hierarchy. Immersion into a new virtual context (i.e., new dynamic system) is one of the defining characteristics of endogenous games and is what creates the unique affordances for educational MUVE games. The emphasis on immersion can be further appreciated by applying Wartofsky's artifact hierarchy to distinguish MUVE games from other forms of educational technologies.

Wartofsky (1973) used the term artifact to emphasis that humans created tools to accomplish context-specific work. He wrote that artifacts were, "objectifications of human needs and intentions already invested with cognitive and affective content" (1973, p 204). Wartofsky

distinguished between three categories of artifacts: primary, secondary, and tertiary. Related to educational technologies, primary artifacts are items such as chalk, chalkboards, computers, SMART boards, PowerPoint, spreadsheets, and Internet access. They have been created and transformed through human activity to directly mediate teachers' administrative and instructional work. Secondary artifacts are representations and modes of using primary artifacts. Secondary artifacts are used to persevere specific modes of actions such as pedagogical beliefs, classroom management strategies, classroom norms, and routines. The third group of artifacts affords people the opportunities to express their autonomous nature. They come in the form of play, alternate reality, hypothesizing, imagination, theater, art, and role-playing. Tertiary artifacts alter, change, or replace the everyday rules of context with a new set of organizing constraints. This type of artifact offers one the ability to escape his current context or activity system and imagine new possibilities not allowed under the current context (Vygotsky, 1978; Gadamer, 1975). Cole (1996) explained that engaging with these tertiary artifacts allowed individuals to visualize new ways of acting or being, which can later be used to mediate primary and secondary artifacts. Engagement with these imagined worlds can alter how individuals perceive their everyday worlds, and serve as a tool for changing practice.

Educational MUVE games are a form of tertiary artifact and give students the opportunity to be immersed and play in a new context (Gee, 2003; Squire, 2006; Williamson, Squire, Halverson, & Gee, 2005). Vygotsky, (1978) theorized that play was a form of escape from the current rules and demanded of our primary contexts. In imaginary play, Vygotsky observed that children negotiated and took on roles that they were familiar with (e.g., Mommy role, Daddy role) and then altered them through their playful interactions. Children used these fantastical interactions to learn about their role in their primary context. Educational MUVE

games have been intentionally designed to encourage play in much the same way (Squire, 2006; Barab et al., 2010b). The technology of MUVE games allows students to visualize the fantastical context and reflect on the consequences of their actions in new and surprising ways beyond the imagination of the student and the constraints of a traditional classroom.

Many game scholars have pointed to the need to conduct research that moves beyond theorizing why games should be considered powerful learning tools, and begin working toward producing empirical research that uncovers the process teachers engage to use games within their classrooms (Hays, 2005; Dalgarno & Lee, 2010; Young et al., 2012). Therefore, the intention of this exploratory study was to gain a clearer picture of the relationship between a teacher's desires to use a game (i.e., tool) in a particular way and the process of realizing that purpose in his or her classroom.

CHAPTER 4 - METHODS

Educational research had shown that educational games were gaining popularity and traction within several educational contexts. Despite its popularity, little is known about the process teachers engage to use these games in their classrooms. Disappointment has followed several large-scale implementation plans that intentionally factored out the role of teachers, and so we are still unaware of what a teacher's educational MUVE game integration process entails, which is troubling when seeking to design a high fidelity implementation plan.

The goal of this research study was to begin identifying the connection between a teacher's desired use of a game and the process for realizing that purpose within his or her classroom. Four cases were created and analyzed in order to answer the following research questions. First, how did each teacher implement QA? Second, how did each teacher use QA in his or her classroom? Third, what was the relationship between each teacher's stated pedagogical preference and the ways he or she implemented and used QA? Lastly, what were the common integration themes found between cases?

Articulating Methodological Assumptions

This study used methods from case based research (Glaser & Strauss; 1967; Yin, 1981, 2009) to uncover the complex and messy process four individual teachers engaged to use the educational MUVE game called Quest Atlantis. A case study methodology was appropriate because the questions that were posed in this study's target area of inquiry were new, took place in naturalistic settings, involved the interaction and coordination of several actors, and the phenomena under investigation (i.e., educational MUVE integration) was poorly understood (Yin, 1981, Guba & Lincoln, 1983).

The methods I chose for this study were inspired by naturalistic methodological assumptions (Guba & Lincoln, 1983, Lincoln & Guba, 1985, 2000). First, I assumed that in any given classroom there were multiple and distinguishable realities, which occurred simultaneously. These assumptions were in contrast with the idea that there was one objective reality. Capturing the coordination of these multiple realties involved employing a holistic methodological approach. Second, in the context of this naturalistic study, the inquirer (i.e., me) and the object of study (i.e., teacher) mutually influenced each other. My presence in the classroom had an influence on each teacher's integration process while each teacher influenced my research interest.

Consistent with exploratory case study methodology (Glaser & Strauss, 1967; Eisenhardt, 1989), my understanding of a focused phenomenon (i.e., teachers' QA integration process) grew from working with the first set of teachers. I used that understanding to ask more specific interview questions with the second set of teachers. Additionally, the teachers influenced each other; the urban science teacher voluntarily shared her implementation knowledge with the suburban science teacher. Third, due to the contextual and historical nature of an inquiry (i.e., time and place), this study could never be 100% duplicated.

The goal of this study was to develop a series of working hypotheses, and petite generalizations (Stake, 2006) aimed to uncover the relationship between a teacher's desired use of a game and his or her process to realize that function within a classroom. The results from this study were intended to be instrumental when designing future integration game research. Data captured in naturalistic settings cannot always be explained in terms of cause and effect because events were shaped through the coordination of multiple people, through multiple interactions over an extended period of time. In order to capture coordinated patterns of action required me to

seek a holistic picture by conducting the research in a naturalistic context and use multiple sources of data. These naturalistic assumptions significantly shaped my research questions, which, in turn, shaped my decision to construct a series of exploratory case studies.

Research Study Details

Case study research seeks to create a narrative account (Stake, 2006) of the coordinated, complex, situationally-mediated activities and processes amongst agents (Yin, 1981; 2009; Eisenhardt, 1989). Yin (1981) defined a case study as an empirical study (a) that investigated a contemporary phenomenon within its real-life context, (b) when the boundaries between the phenomenon of interest and context were not clearly defined, and (c) that used multiple sources of data (Crosthwaite et al., 1997). In this study, the *phenomena* under investigation were the teachers' QA implementations in the context of their 7th and 8th grade science and language arts classrooms (i.e., real-life context). Within these contexts each teacher's game implementation was subject to various influences and factors (e.g., upcoming standardized tests, limited access to technology, positive previous technology integration experience, a teacher's feeling of responsibility to help his or her students succeed). A naturalistic interpretation of each teacher's implementation was interpreted through a systematic analysis of the various collected forms of qualitative data (e.g., interviews, field notes, video data, and online data) (Eisenhardt, 1989; Corbin & Strauss, 1990; Miles & Huberman, 1994; Crosthwaite, Macleod & Malcolm, 1997).

Context of Study. This study came about through a series of fortuitous events. A chief learning officer of a large, urban, university charter school corporation collaborated with the Quest Atlantis research and design team. The CLO wanted to use QA as a practical means of introducing advanced educational technologies in her school's classrooms. I negotiated with the CLO and QA team to make this study a key aspect of the collaboration. Both parties found that

understanding teachers' processes of integrating QA would be a valuable contribution for the school and for the larger technology integration research community. It was agreed upon that each teacher would attend a one-day training followed by a QA implementation. Due to various technology and support limitations, the QA research team, the teachers, and the CLO negotiated to have the metropolitan teachers implement QA first, followed by the suburban teachers. I was the sole researcher and support staff on site for each implementation.

Schools. The metropolitan school was a free charter school, which opened in fall of 2009 in partnership with a major southwest research university. It was strongly encouraged at this school for students to eventually attend the sponsored university. In 2011 the public education department put this school on academic probation and threatened closure if student achievement scores did not improve within the next year. In an effort to boost student achievement scores, during the summer of 2011, the chief learning officer and governing body hired an entirely new middle school staff. Additionally, a tenure track education professor, from the sponsoring university, was hired to oversee the university and charter school relationship. The professor taught certain classes, oversaw university graduate student teachers, monitored new technology initiatives, supported and consulted with full time teachers about "best practices," and coordinated research improvement initiatives.

In 2008, the suburban school opened as a free charter school. This school shared a similar governing structure as the metropolitan school, yet had a reputation for attracting high achieving students. In 2011, over 95% of the student body had achieved scores above the standard on the state issued standardized tests. This suburban school was situated next to the sponsoring university's satellite campus, and often shared university resources like scientific lab space and collaboration from college professors. In contrast to the metropolitan school, there was no

university professor in residence, but the middle school principal actively served on several boards with the sponsoring university. Additionally, students were strongly encouraged to attend the sponsoring university after high school graduation.

The sites and teachers at each school were similarly encouraged to use problem-based learning and other forms of innovative technologies in their classrooms (e.g., Edmoto, Brain Pop, Read 180). Each teacher had comparable access to technology (i.e. each student had access to a school-issued laptop), and regularly used technology with his or her curriculum. Teachers did not use textbooks, but were been given ample freedom to choose appropriate curriculum that meet standards.

***Unit of Analysis*.** The main unit of analysis was each 7th and 8th grade teacher's game integration process. A critical task in this research was to create concepts that accurately represented how each teacher implemented an educational MUVE game in his or her classroom. The process for developing each case will be explained below.

Selection of Teachers. In the terms of research agreement mentioned above, the CLO selected the teachers who participated in this study. Due to the exploratory nature of this study, partnering with a school administrator who selected and recruited the sample of teachers was an appropriate sampling technique. This study was not meant to test a theory about teachers' game integration processes, which would likely require a more specific set of sampling requirements. Instead, this study sought to generate a set of working hypotheses that could be further investigated in later studies. The only sampling requirement necessary for this study was phenomena representativeness (Strauss & Corbin, 1990) in that the samples (i.e., practicing teachers) were selected based on the criteria that was connected to this study's phenomenon of interest (i.e., teacher's educational MUVE game integration process).

One science and one language arts teacher were recruited from the metropolitan inner city charter school, and one science and one language arts teacher were recruited from the suburban charter school. I had no relationship with the teachers prior to the study, and the teachers had no prior QA or comparable educational game implementation experience (See Figure 4.1; all names are pseudonyms).

Table 4.1

Teacher Subject, School, and Teaching Experience Profile

Teacher	Subject	School	Number of students	Teaching experience
Heather	Science	Metropolitan	24	11 years
John	Learning Lab	Metropolitan	14	< 1 year
Mary	Science	Suburban	31	13 years
Claire	Language Arts	Suburban	32	12 years

Teachers: In this study, Heather, John, Claire, and Mary were the four teachers observed, and a brief description of each individual teacher and their students are given below. Due to a limited number of student laptops, teachers at each site negotiated amongst themselves which of their classes would use QA and which would use the control curriculum (Table 4.1, above, is a breakdown of participant site information).

Heather: At the Metropolitan school, Heather was a science teacher. She had eleven years of experience teaching science in urban high school and middle school settings. She had taken a strong stance toward helping all students learn, including students with special needs. Heather described herself as an innovative teacher. She did not have a filing cabinet in her classroom because she felt that the curriculum needed to be tailored to her individual students' needs. Every year, she developed new curriculum, new activities, and new projects to match the students' needs with the curriculum standards. Heather intentionally connected how the science

concepts she taught in her class were related with the larger science community. She regularly shared the latest science news and research developments, and she hung several science academic conference posters throughout her classroom. Heather tightly managed and controlled her classroom. Every student was assigned a seat and was required to be silent while she talked. During the study, she hand selected which students were allowed to get up from their seats and get their assigned laptops. At the end of each class, students were not dismissed until the computers had been put back in their pre-assigned space.

Heather expressed mixed emotions about participating in the study. On one hand, she was very excited to introduce Quest Atlantis because she said that her students loved playing video games. On the other hand, she expressed a fear that the game would take away instructional time needed to cover all of the topics that her students would be tested on in the upcoming standardized tests.

Heather's QA class consisted of twenty-four mixed 7th and 8th grade students (See Table 4.2). There were twelve girls and twelve boys; 70% were Hispanic, 22% were African American, and 8% were Caucasian. Her classroom was organized by four rows facing the front of the class. Each row consisted of two desks next to each other. Heather's school used block scheduling in which class periods were ninety minutes. She taught a total of five classes, and each class met every other day.

Table 4.2

Individual case student population and demographic profile

Teacher	Total number of students	Gender		Ethnicity percentage per class		
		Girls	Boys	Hispanic	African American	Caucasian
Heather	24	12	12	70%	22%	8%

John	14	8	6	100%	0%	0%
Claire	32	18	15	10%	3%	87%
Mary	31	17	15	10%	10%	80%

John: The other teacher at the metropolitan school was John. Teaching was John's second career, and during the study he was in the middle of his first year teaching a class called learning lab. The administration saw the need for students in this learning lab to develop basic study skills, which included reading comprehension, note taking, composition, and history. John expressed that he was still trying to understand his teaching and classroom management style and that it was difficult to manage a learning lab because students often worked on different projects during the same class period. Unlike Heather, John's classroom management style was more flexible. He would allow students to get up from their seats without expressed permission, converse with each other, and change seats during class. Though John's class was not directly associated with language arts, the school's CLO stated that a persuasive writing game would provide John's students with a positive learning experience. John expressed his enthusiasm about using Quest Atlantis because he recognized that his students enjoyed playing video games.

John's QA class consisted of fourteen mixed 7th and 8th grade students (See figure 4.2). There were eight girls and eight boys,100% of which were Hispanic. John's class was organized into five rows of tables. Two students were assigned at each table. Similar to Heather, John taught five ninety-minute classes that met every other day.

Claire: At the suburban middle school, Claire was a language arts and literacy teacher. Claire was in her twelfth year of teaching and acknowledged that the major challenge in her classroom was motivating and engaging her students. She intentionally created opportunities to connect the curriculum with her students' personal lives. For example, when covering poetry, she had students analyze the lyrics of their favorite songs as a means for recognizing various literary

concepts. Claire intentionally organized her classroom to allow for easy collaboration. Desks were organized into seven pods, which consisted of five desks facing each other. She believed that students learned best when they could discuss and articulate their ideas amongst each other. Claire was an influential leader amongst the middle school teachers at her school, was assigned as the literacy team leader, and hosted two student teachers.

After the QA training, Claire recognized that QA would be very beneficial for her students but questioned whether or not the game could provide a pedagogical benefit. She explained that she had used other non-immersive video games but expressed the difficulty of connecting the game experiences with her pedagogical goals.

Claire's QA class consisted of thirty-two 7th and 8th grade students (See figure 4.2). There were seventeen girls and fifteen boys: 10% were Hispanic, 3% were African American, and 87% were Caucasian. Claire's classes met every day for a 50-minute period. In addition to the QA class, Claire taught five other classes ranging from eighteen to thirty-two students per class.

Mary: The other teacher at the suburban school was Mary who was serving in her thirteenth year as a science teacher and her first year at this particular suburban school. Like Claire, Mary structured her curriculum and classroom to allow for student inquiry, collaboration, and problem-based learning because she had found that students did not learn the content when it was presented in a lecture format. Of the four teachers, Mary was the most hesitant to use QA for two reasons. First, like Heather, she saw her implementation of QA as a potential threat that would take away precious class time needed to cover the other standardized test. Second, she did not know how she would manage students who progressed through the game at different speeds.

Mary's QA class consisted of thirty-one 7th and 8th grade students (See figure 4.2). There were seventeen girls and fifteen boys; 10% were Hispanic, 10% were African American, and

80% were Caucasian. Claire's class met every day for a 50-minute period, and students were arranged into eight individual rows, with four desks per row. In addition to the QA class, Claire taught five other classes ranging from twenty-three to thirty students per class.

Quest Atlantis Curriculum.

The endogenous educational MUVE games used in this research came from the Quest Atlantis (QA) project. QA is an online international educational MUVE gaming project geared to situate students between the ages of 9-15 in educational tasks. QA utilizes strategies used in commercial games and lessons learned from learning research to create student-centric problem solving activities (Barab et al., 2010). Games in this project are meant to situate students into fantastical virtual contexts in which they are given opportunities to learn by doing (Barab et al., 2007). Each student is given an avatar that represents him or herself within the virtual context. Students navigate their avatar with the controls on a computer keypad. Each of the QA games' 3D virtual environments is designed to be interactive and dynamic. For example, a player can navigate their avatar to walk up to a non-player character (NPC) and initiate a dialogue. The student can simply point their cursor onto the NPC, click, and a 2D dialogue page appears on the right side of the screen with that particular NPC's dialogue. The player is then expected to read the dialogue and is given an opportunity to respond by clicking on two or three different response options. The NPC responds differently based on the player's chosen dialogue response (See Figure 3.3). At other times, NPCs ask players to generate hypotheses, calculate data, write research reports, or make recommendations based on their participation within the virtual space. Players are also able to communicate with their classmates and other players playing at the same time throughout the world via a chat dialogue box at the bottom of the screen. It is through this

navigation, NPC dialogue, and student chat features that players engage in academic content and progress through each game.

The academic content in each QA game is different, (e.g., science, language arts), but the objectives and structure of each game are meant to foster what Barab, Gresalfi, and Ingram-Goble (2010) called *Transformational Play*. Transformational play is a MUVE game design strategy meant to coordinate and align three essential contextual elements within a virtual world in order to offer students the opportunity to learn by doing. The three contextual elements are the role of the player's avatar within the game's narrative, the role of academic content in the virtual world to solve the narrative problem, and the role of feedback from the system. In each QA game, players are confronted with a meta-narrative problem.

After reading an introduction letter distributed by their teacher, students are introduced to the game's main narrative and their role in addressing the problem. Once the students log into the game and their avatars are immersed in the 3D space, they interact with NPCs. The NPCs' dialogues is written to support the players' projected role (e.g., NPC Mayor Grimm: "Thank you for using your skills being an investigative reporter to help our town."). Students engage a number of activities designed to scaffold academic understanding, and the game's meta problem is designed to be solved through the explicit use of academic content (e.g., Save national park by collecting data and testing water samples). Students' use the knowledge learned from the scaffolding activities in the game to make recommendations that will solve the main narrative problem and cannot reach a win state without correctly using content. After students submit their final recommendations, the virtual world and the relationship between the players' avatars and the NPCs change to reflect the students' choices.

The four case studies of this research project were divided into the two content areas of science and language arts. The language arts teachers used a persuasive writing unit called "*Plague*." The science teachers used a science based water quality unit called "*Taiga*." Listed below are short descriptions of each unit.

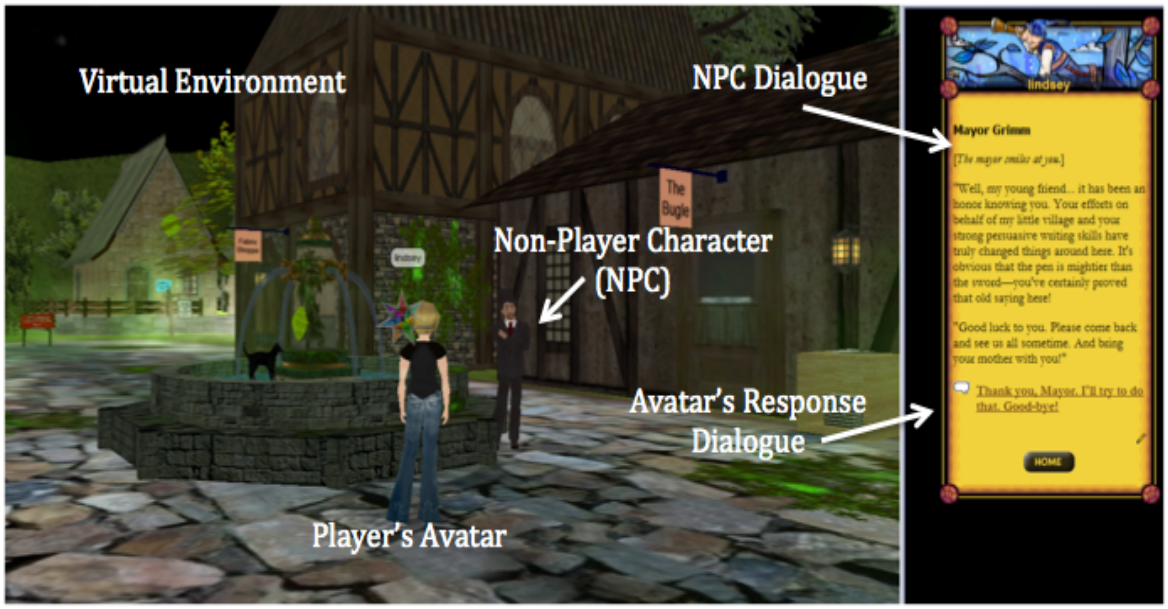

Figure 3.3. QA Screen Shot of the game *Plague*. This picture shows an example of a player's avatar, a NPC, and the dialogue pages used to progress through the game.

Plague: This game was developed with the goal of better understanding the potential of converting a classic piece of literature, like Mary Shelley's *Frankenstein*, into a transformational play space (Barab et al., 2010a). This language arts unit focuses on persuasive writing, as students are asked to convince other NPCs to share their perspective on particular ethical dilemmas. The game's narrative encourages students to grapple with the various ethical dilemmas, as they learn to write persuasively. Before students enter the virtual world, they are encouraged to read an introduction letter, which situates them into the narrative. After reading

the introduction letter, students spend eight to ten class periods in the virtual world. Students use their avatars to navigate through the virtual town Ingolstadt, interview in-game characters, collect supporting evidence, and write a final persuasive article. During class time it is common for teachers to interrupt students' play and highlight a key concept needed for game play.

Central to this work is the theory of transformational play (Barab, et al, 2010a; Barab et al., 2011), which emphasizes the need for this unit, *Plague*: *Modern Prometheus*, to (a) position players as investigative reporters, (b) position the content of persuasive writing as a necessary tool to resolve the main narrative conflict (e.g., Allow the doctor to continue experimenting on his creation made of dead human body parts or stop the doctor's unethical treatment of his creation and look for a cure with other more ethical means.), and (c) position consequentiality by dramatically altering the virtual town of Ingolstadt based directly on student choices.

Taiga. This game was designed to immerse students in an inquiry based water quality problem. In *Taiga* National Park, students are called upon to diagnosis and develop a solution contributing to the decline of the park's fish population and to develop a solution. There are several groups of people who live in or use the river in which the fish are dying. Players eventually discover that each group had equal responsibility for the problems with the river. Players work as field investigators for Park Ranger Bartle to collect evidence about this growing catastrophe and ultimately give a scientifically informed recommendation on how to solve the water quality problem and save the park

The game play in *Taiga* seeks to (a) position players as field investigative scientists, (b) position the content of water quality as a necessary tool to resolve the game's narrative conflict (i.e., saving *Taiga* National park), and (c) position consequentiality by dramatically altering the characters and environment of *Taiga* based on student decisions.

Similar to *Plague*, *Taiga* was designed to take eight to ten fifty-minute class periods, and before students enter the virtual world, they are encouraged to read an introduction letter, which situates them in the narrative. After reading this letter, students navigate the virtual world of *Taiga* National Park, interview in-game characters, collect supporting evidence, and write a final persuasive article. During any particular class period it is common for a teacher to interrupt student play to highlight a key concept or idea he or she wants students to notice.

Teacher Training. For this research, creating a context for student play was complicated and involved teachers considering several technological and pedagogical factors, as it was likely that the teachers' knowledge of how to organize these factors would influence their integration process (Zhao et al., 2002). For this reason it was important to acknowledge the content and activities teachers were exposed to during the QA training. For this particular study, the QA training was a one-day, mid-week event that was hosted on the campus of a large southwestern metropolitan university. The QA project coordinator and I led the teacher training, and all four teachers attended the entire training event.

Based on my previous QA teacher support and research project experiences, (e.g., Barab et al., 2007; Barab et al., 2010) I assumed that teachers would be better equipped to support student play when they could to grasp the connections between (1) overall game narratives and problems, (2) in-game tasks, (3) content scaffolds, (4) locations of various game characters, and (5) and the overall learning objectives. As explained earlier, the QA games had been designed to create activities in which students could learn by doing (Barab et al., 2007; Gresalfi, Barab, Siyahhan, & Christensen, 2009). Furthermore, it has been theorized that students' access to content is closely connected to the students' awareness of game narrative, its characters and

interactions, and the students' intention as change agents (Barab et al., 2010b). The level of the teachers' knowledge of these connections would likely influence their integration process.

It was for this reason that I placed a high emphasis on ensuring that teachers gained the appropriate experience practicing each major type of activity required in supporting meaningful play. Previous technology integration literature (Hew & Brush, 2007), and my previous implementation experience observing QA in classrooms, persuaded me to want to use the teacher training as a tool to eliminate common knowledge barriers to using QA. These barriers included: knowledge about how to play the game, knowledge about how to prepare the game for students, and knowledge about how to support student play. The format of the training was divided into three sections in order to address each potential knowledge barrier.

The first training section sought to eliminate the knowledge barrier of how to play the game by giving teachers the opportunity to play the game themselves (e.g., controlling their avatar through the virtual world). The game play experiences created the basis for explaining the teacher's role in supporting meaningful play. Each science teacher played a portion of *Taiga*, and each language arts teacher played a portion of *Plague*. Playing gave teachers opportunities to practice interacting with the same characters and learning how to use their avatar to navigate the virtual space. As teachers played, the trainers modeled how to support students when they got into similar situations the teachers were experiencing (e.g., how to find an NPC in the virtual space, understand how to use the QA interface to view their game progress, how to talk to the other players in the virtual space). During this section, teachers were encouraged to help students manage their own game play by asking questions that led students to utilize the information in the game to find answers to their game play questions.

The second training section addressed eliminating the knowledge barrier related to preparing the game for students. These experiences included offering practice navigating the online learning management system, the teacher toolkit. This set of actions included registering students, grading students' submitted work, and monitoring students' progress and trajectory. Teachers were also encouraged to teach their students how to play the game at the beginning of each implementation (e.g., find important landmarks in the virtual space, how to interact with NPC's, how to submit reports).

The last aspect of the teacher training involved helping teachers support the game. It was emphasized that teachers needed to understand how each element of transformational play was related to academic content in the games' trajectories. Teachers were given opportunities to practice asking questions related to each element of transformational play. For example, in terms of supporting content with legitimacy, the language arts teachers asked each other, "How do you see persuasive writing helping the town?" and "How can you tell if somebody (a NPC) is supporting your side?" Science teachers asked each other questions similar to, "How can you tell the difference between an opinion and a fact?" and "What do you think would happen to the park if you made a recommendation based on opinions versus facts?" At the end of this section, I facilitated a discussion about relating how the teachers' existing instructional practices and preferences related to the practices suggested in the training.

At the very end of the training the teachers were encouraged to prepare for implementation by playing the entire game in the student trajectory. Gaining experience playing the full versions of *Plague* and *Taiga* would further eliminate game play and implementation knowledge barriers.

Data Collection Strategy.

The data collection strategy sought to collect multiple sources of data for each teacher, which included base-line interviews, teacher-researcher interviews, teacher focused implementation video, and ethnographic field notes.

Baseline Interviews. Integration literature suggests that when teachers can connect their previous experiences using technology to the actions and activities used for a new technology, the integration process is much smoother (Kegan, 1992; Zhao et al., 2002; Ertmer, 2005). In this research study the purpose for the baseline interviews was to obtain data of each teacher's pedagogical preferences. The baseline interview data was used to answer research questions #3, by comparing what teachers said about their preferred ways of teaching and how they used QA. This data was also used to gain a generic sense of the contextual factors present in each teacher's classroom.

Each teacher was interviewed one day before the start of QA in his or her classroom. The interviews ranged from 15 to 25 minutes in length. Interviews were semi-structured but generally covered the following topics: early educational experiences that influenced their desire to become a teacher; the relationship between early educational experiences and their current teaching practices; their educational beliefs; and the relationship between their educational beliefs, current educational practices, and using QA in their classroom. (Please see Appendix 1 for the interview protocol used for the baseline interviews). Due to the long distance between schools and limited resources for recording equipment, the suburban implementation followed the urban implementation, and the start of the implementations were several weeks after the teacher training. The urban teachers were interviewed twelve days after the QA training, whereas

the suburban teachers were interviewed thirty-five days later. Each baseline interview was video recorded and was transcribed for analysis.

Teacher – Researcher interactions. Teacher-**Researcher interactions were** a collection of impromptu and semi-planned interactions during the implementation. In order to gain additional data about the how the teacher was using the game and his or her process through the implementation, these interactions were captured through recorded classroom video and ethnographic notes. During the implementation, when the teachers were available (i.e., when the teachers were not working with students), I sought out opportunities to ask each teacher about his or her implementation progress. The data collected from these interactions served several purposes, (1) in real time, to capture the teachers' thoughts and feelings as they actively sought to integrate QA, (2) to offer each teacher support for any technological, pedagogical, or student focused questions, and (3) to create a member check by having the teacher confirm or deny the validity of my observations.

These teacher-researcher interactions occurred at different times during each class, and the nature of these interactions was often in response to emergent classroom dynamics and varied between teachers. The researcher-generated questions, however, generally covered the following topics: the teacher's thoughts and feelings about various aspects of the implementation, and the teacher's perception of students' engagement. The teacher-generated questions mainly addressed a teacher's need for technical support. Please see Appendix 2a and Appendix 2b for a list of questions and topics that were addressed during these interactions. On average, there were between one and two teacher-researcher interactions collected for each teacher each class period, and the length of each interaction spanned between thirty seconds and ten minutes. Some of the

teacher-researcher interactions were captured on video, and the others were captured in field notes after the interaction occurred.

Implementation Video. During each day of the implementation, each teacher was videotaped with one camera. The purpose of capturing video data was to capture what the teacher did and said with his or her students while using Quest Atlantis. The kinds of classroom activities that were observed included: whole group discussions, just-in-time lectures, grading student essays on computers, monitoring individual students progress, motivating students to stay on task, and problem solving technical issues.

The video camera was positioned in a back corner of each classroom to monitor the teacher's movements, actions, and student conversations for the entire duration of a class period. Due to the limitations of the camera angle, there were moments when the teacher walked outside of the view of the camera and his or her interactions could not be observed; however, because each teacher wore a personal microphone, the teacher's audio was recorded whether or not he or she was in the camera's view. While the microphone recorded the teacher's voice, it could not always detect students' responses or questions directed toward the teacher. The volume of a student's voice, the number of other students talking, and the distance between the inquiring student and the teacher's microphone were factors that affected whether or not the students' voices were successfully recorded.

At the urban schools, I recorded six 90-minute class periods for John and seven 90-minute class periods for Heather. At the suburban school, I recorded ten 50-minute class periods for both Claire and Mary. The total amount of classroom data included 33 class periods and about 40 hours of video data. (See table 4.3)

Table 4.3

Video collected for each teacher

Teacher	Class period length	Number of classroom Videos	Total number of hours video
Heather	90 minutes	7	11 hours
John	90 minutes	6	10 hours
Claire	50 minutes	10	9.5 hours
Mary	50 minutes	10	9.5 hours
Total		**33**	**40 hours**

Field notes. During each day of the implementations I created ethnographic field notes in order to record my observations of the nature of class activity, teacher-student interactions, teacher-researcher interactions, and sequencing of class activity. Additionally, acting as a participant observer, I recorded my thoughts, intentions, and reactions to the events during each day. These data were used to capture teacher enactments during the implementation, which were later used to generate debriefing questions with teachers and to highlight important activities and interactions to be further analyzed. Observations were typed on a laptop every day during the implementation. At various times during the implementations, I revisited the field notes to further articulate interesting ideas, thoughts, and debriefing questions, which had been generated during class time. A total of seventy single spaced pages of field notes were generated from all four cases.

Data Analysis.

The goal of this analysis was to convert the raw collected classroom data into a set of grounded cases or stories that could show the particular manner in which each teacher used QA. I used an emergent approach to coding by leveraging the *constant comparison method* (Glaser & Strauss, 1967, Lincoln & Guba, 1985; Strauss & Corbin, 1990, Crosthwaite et al., 1997) that

involved generating a set of initial categories comprised of similar types of interactions, events or actions, which were the building blocks of each individual case.

I open coded three sources of classroom data: transcripts of the videos from the implementations, teachers' responses to students' online submissions, and field notes (Table 4.4). I used the field notes to identify different types of actions and when they occurred during the implementation. I then analyzed the video data to find more evidence of the same type of actions highlighted in the field notes. Next I analyzed the teacher-researcher interview data to find additional evidence of how each teacher was using QA in their classrooms. Through constant comparison, categories of codes began to solidify. I broke down the types of actions teachers enacted and then compared and contrasted those actions throughout the span of the implementation.

Table 4.4

Open coding process data sources

Type of coding	Sources of data	Phenomena of interest
Open coding	Field notes	Observations of what teachers did and said with their students, and teacher-researcher interactions
	Video of implementation	Actions teachers took with their students during the implementation and teacher-researcher interactions

Answering Research Question #1:

To answer the first research question, "What was involved in each teacher's implementation process?" I created a coding process that would allow me to identify emergent themes in the data that represented how each teacher implemented Quest Atlantis. In answering this question, I was interested in identifying the progression and sequence of the different themes

of actions each teacher engaged to implement QA. For example, Mary's integration process involved a discernable progression in interactions and instructional focus between days one and two. On day one, she showed students how to play QA; however, on day two, she announced that her students would be taking responsibility of their game play in order to reach a certain mission step by the end of class. The discernable change in Mary's interactions, between days one and two, would have been identified as two different themes.

The coding process I used to answer research question one involved three stages. For each stage, I used a constant comparison method to define and refine each code. Once there was a consistency amongst codes, I then collapsed similar codes together in order to find common themes within each case, and amongst cases. A sample of each set of codes was given to a peer reviewer to test for inter-rater reliability. The peer reviewer and myself discussed and adjusted the name and definition of each code until there was 100% agreement. Additionally, I conducted a member check by discussing the initial findings with each teacher. Each teacher agreed to the descriptions given to describe their case. Below, I will describe each coding process stage that I used to answer the first research question.

Stage One - Categorizing interaction type. The first step in the coding process was to code the classroom video data in order to identify the different types of teacher interactions that occurred during class each day of the implementation. Using the teacher as the focus point, I identified all of the teacher's interactions within a particular class period. This process resulted in three codes (and types of interactions): whole group, one-on-one, and teacher-researcher.

Whole group interactions were identified when the teacher sought to address his or her whole class at once. The beginning of a whole group interaction was initiated when the teacher made an announcement or told his or her students to stop playing. For example, when Claire

wanted to initiate a whole group interaction she would stand in the middle of the room and say something similar to this, "All right, 7th and 8th graders, can I have you your laptop screens down for a moment? I have a couple of things to ask you." A whole group interaction would often end by the teacher telling students to get back to work.

One-on-one interactions occurred when the teacher addressed only one student. In the classroom video, the teacher would either walk up to a student, or a student would reach out to the teacher with a particular question. For example, when one of John's students raised her hand, he walked over to the student's desk and asked, "Hi, Meredith. What do you need help with?" The one-on-one interaction would be concluded when either the student or teacher walked away.

Similar to the one-on-one interactions, research-teacher interactions occurred when the teacher asked me a question, or I asked the teacher a question, and interaction ended when one or the other walked away.

Stage Two - Calculating amount of time for each interaction. I wanted to know how much time a teacher spent interacting with all of his/her students, individual students, and me. Knowing this information allowed me to graph the amount of time a teacher spent in each type of interaction (e.g., whole group, one-on-one, and teacher-researcher). Once graphed, I was able to see a skeleton of each teacher's implementation process. The analysis from this stage allowed for the comparison and contrast of the amount of time each teacher spent in a particular interaction within his or her implementation, and I used the time stamps from the video data to detect beginning and end times of each interaction. Similar to the previous coding step, certain themes began to emerge with this stage of analysis.

Stage Three - Coding teacher activity in each interaction. The third stage involved coding exactly what a teacher did during each interaction. For example, in stage one, if a section

of transcript was coded as "Whole Group Interaction," in stage three, this same section of transcript would then be re-analyzed to determine exactly what the teacher was doing during that activity. I coded each category of interactions, whole group, one-on-one, and teacher-researcher, and the end result of this analysis allowed me to understand how each teacher was relating with students. I could identify the major issues or topics of discussion that occurred throughout each implementation, how each teacher introduced and positioned the game to students, how students were positioned in relation to the game, how content was related with students and game play, and whether or not this positioning changed throughout the implementation. Below is a description and example of each of the collapsed codes associated with each interaction type (See Table 4.5).

Table 4.5

Breakdown of teacher interaction categories in relation to interaction type

I	Whole Group	One-on-one	Teacher-Researcher
Tutorial	X	X	
Announcement	X		
Census	X		
Discussion	X		
Narrative and Content		X	
Technical		X	X
Progress / Behavior		X	
Pedagogical			X
Reflection			X

Whole Group Interactions. The data used for these interactions was captured in the classroom videos and field notes. When coding whole group interactions, I asked the following questions to guide my analysis: What was the impetus of the interaction? What was the topic of the interaction? How was the teacher incorporating game play with content? How well did the teacher appear to be prepared? What did the teacher want the students to do? What questions or objections did students have? Each of these questions went into the coding process, which, after collapsing, common codes resulted in four different whole group activities: tutorial, announcement, census, and discussion.

Tutorial. Tutorial interactions were identified when the teacher would connect his or her laptop computer to a projector and give students a step-by-step process for progressing through the game. For example, while Claire was giving one of her tutorials, she said, "Ok, if you follow me to the right and then click on the second arch…."

Announcement. Announcement interactions were short statements given by the teacher to remind students to do or not to do something. For example, Mary wanted her students to remember to write down the data and announced, "Hey, everyone, remember, when you talk to different people, you need to be writing that stuff down. I'm collecting your notebooks for a grade."

Census. Census interactions were identified when the teacher would ask how many people had completed a particular activity or had reached a specific point in the game. For example, Mary asked her class, "Can I have everyone's attention? I need a show of hands, how many are done with Mission 2?"

Discussion. Discussion interactions were identified when a teacher asked students questions in order to help students make connections between the game narrative, understanding

an academic concept, and their choices in the game space. For example, at the start of one of John's discussions, he asked his students, "How many of you think Dr. Frank is evil?"

One-on-one interactions. The data used for these interactions was captured in the classroom videos and field notes. When coding one-on-one interactions, I asked the following questions to guide my analysis: What was the topic of the interaction? Did the teacher ask the student a question, or was a student asking the teacher a question? What did the teacher tell students to do? What was the topic of the student's question? How did the teacher address a student's question? Each of these questions went into the coding process, which, after collapsing common codes, resulted in four different one-on-one activities: narrative and content, technical, progress and behavior, and tutorial.

Narrative and content. Narrative and content interactions could have been initiated either by a student's question or a teacher's initiative. The topic of this interaction was concerned with understanding how an academic concept was related to the narrative.

Technical. Technical interactions occurred when a student asked the teacher for help because of a technical issue related to his or her computer or his or her game operating incorrectly. For example, a student asked Mary, "My avatar is stuck inside a wall. What do I do?"

Progress and Behavior. Progress and behavior interactions were identified when a teacher would ask or tell students about their current progress in the game. The teacher could have asked about the status of being at a particular point in the game (i.e., mission step) or if they had submitted a particular Quest. For example, Claire often asked her students, "Do you have any submissions that need to be revised?"

Tutorial. Tutorial interactions were identified when a student asked for help in finding an NPC or a specific location, and the teacher offering assistance in helping the student get to the right place. For example, a student asked Mary, "How do I find the entrance of the cave?"

Teacher-researcher interactions. The data used for these interactions was captured in the classroom videos, recorded interviews, and field notes. When coding the teacher-researcher interactions, I asked the following questions to guide my analysis: What was the issue or topic of the interaction? Who initiated the interaction? Each of these questions went into the coding process, which, after collapsing common codes, resulted in three different teacher-researcher interactions: technical, pedagogical, reflection.

Technical. Technical interactions were identified when the teacher initiated a question about how to do something in the game. An example of a technical interaction was when John asked, "Where do I find the place where I can grade students' quests?"

Pedagogical. Pedagogical interactions were identified when the researcher and teacher would discuss the intended rationale for various decisions in QA. For example, I explained to Mary, "The reason why they go into the future is so that they can see the consequences of their understanding."

Reflection. Reflection interactions were identified when the researcher would ask the teacher his or her perspective about using QA in his or her class. For example, reflection interaction was coded when I asked Mary, "How does the amount of grading you've done in QA compare to other units?"

Similar to the previous two coding steps, certain themes began to emerge with this stage of analysis. At the same time, the emergent themes uncovered in stage one and two codings were supported after this stage of analysis. When a theme would begin to emerge, or when a theme

was supported, I took note of the theme in order to test its plausibility once I had completed coding all the data. This coding step was completed once the content of every interaction was coded.

Answering Research Question #2.

To answer the second research question, "How did each teacher use QA?" involved a two-step, iterative process. The first step involved seeking to confirm, deny, or collapse themes that emerged in the previous three stages. The second step involved creating an explanation that connected each of the confirmed themes. Below, the process is explained in more detail.

Confirm, deny, or collapse themes. When it was time to answer research question two, each teacher's classroom data had been coded to identify and categorize every teacher interaction that occurred during implementation. Each interaction had been time stamped in order to confirm how much time was spent in each interaction, and to also uncover the flow and progress of interactions through each day. For each teacher, emergent themes had been collected through each of the prior coding stages. Step One of this two step process involved confirming, combining, or denying the plausibility of themes found in the previous stages of coding.

For example, in Claire's case, while coding in stage three, the theme of encouragement emerged. In order to confirm if this was an isolated instance or a theme, I went back through all classroom data, field notes, and teacher-researcher data that was coded "encouragement." If there was sufficient evidence of "encouragement" in multiple interactions, multiple types of interactions, spanning across multiple days, in multiple sources of data, then it would be plausible that "encouragement" was a key aspect of the way Claire used QA, and thus "encouragement" would be confirmed as a theme. On the other hand, if I had reexamined

Claire's data and found there was not a pervasive presence of encouragement, I would have either rejected encouragement as a theme or sought to collapse this theme with another.

Connecting confirmed themes. After analyzing the plausibility of each theme in the previous step, the next step involved creating a code or concept that represented the connection between each of the confirmed themes. For example, in Claire's case, if the following four themes were confirmed: 1, Well prepared, 2. Set explicit expectations, 3. Used multiple ways to remind students of her expectations, and 4. Constantly interacted with students. Then the next step was to seek and find a code or concept that explained the connection between these four themes. This step, and the overall coding process for a particular case would be considered complete when a concept or explanation was created. This overall process of coding was repeated for each individual case.

Answering Research Question #3

The third research question sought to establish how QA was integrated into each teacher's classroom. In this study, technology integration was defined as the process in which a teacher transforms a foreign technology into a useable tool. Research question #3 directly sought to investigate, "What was the relationship between each teacher's stated pedagogical preferences and their implementation?" Previous technology integration research had confirmed that a teacher's pedagogical preference had been a significant influence in the ways that an educational technology was used (Ertmer, 2005; Luft & Roehrig, 2007). However, understanding how teachers integrate immersive 3D videos games is relatively unknown (Young et al., 2012). For this reason, the purpose for answering research question #3 was aimed at investigating the relationship between each teacher's stated pedagogical preferences and how they implemented and used QA in their classroom.

To answer this question, I compared the findings from the first two research questions (i.e., themes and process) to what each teacher said in their teacher-researcher interactions. During the implementations, each teacher shared stories that about his or her pedagogical preferences and beliefs. For example, Heather's integration process closely revealed her pedagogical preferences stated in a teacher-researcher interview. The themes uncovered from these stories, coded in a constant comparisons method were compared and contrasted with the themes found within implementation data addressed in research questions one and two.

Answering Research Question #4.

To answer the second research question, "What are the shared themes and findings found across cases?" I identified the confirmed themes that were present in the cases. In this stage of analysis, there were no additional codes created; instead, existing themes were compared and contrasted. Once a theme met the criteria of existing in multiple cases, I reexamined each teacher's interactions coded within that theme in order to find points of comparison and contrast. For example, the theme coded as "preparation" was evident in each teacher's implementation; however, not every teacher prepared in the same way, which was evident in the way teachers interacted with their students. To demonstrate the comparison and contrast between cases, I gave examples of how each teacher prepared to use QA in their classroom, and I then showed the different ways preparation became evident in each teacher's interactions with their students and me.

In conclusion, the decisions made in choosing Quest Atlantis, the selection of case study methodology the data collection protocol, and the data analysis procedures were aimed at capturing the messy and complex process of four teachers attempting to integrate QA into their existing classrooms.

CHAPTER 5: CASE OF JOHN

The creation of John's case involved addressing the following research questions: "What was involved in John's implementation process for using QA?" "How did John use Quest Atlantis in his classroom?" and "What was the relationship between John's expressed pedagogical preferences and the ways he used QA?"

John's case is one of a remedial, or learning lab, teacher whose implementation process involved using the game in a way that was consistent with someone who was not responsible for teaching academic content. Instead of focusing on academic content as the other teachers did, John focused on using the game to produce nontangible and non-academic outcomes, which were consistent with his teaching practices he employed when he was not teaching with *Plague*.

John's Expressed Pedagogical Practices and Preferences

John came from a family of teachers; both of his parents and only sister were K-12 teachers. John decided in high school, however, that he did not want to become a teacher and branched out into corporate business. After he completed his undergraduate business degree, John worked as recruiter for a major mortgage company. After working for several years as a recruiter, and experiencing the market crash in 2008, John decided to follow in his family's footsteps and pursue a teaching career. He wanted to work in a job where he could make a bigger impact on people, which led him to complete a master's degree in history education.

John's first teaching position involved teaching conversational English at a community college. His students were African refugees who were assimilating into American city life. John's official classroom role was to teach conversational English, and he explained how he felt

that his job was more about building relationships and helping the refugees learn practical skills than it was about teaching English. He stated:

> And it wasn't so much about teaching them English as it was teaching them practical skills like, this is how you get here. Once you are a refugee, you come over here, there's not a lot of guidance, it's like, 'All right, and here you are in America! Totally, new life, go get yourselves an apartment.' So it became less teaching English more like um, here is what you need to do, here is where you need to go, provide them with resources, and, um…They'd show up, and we'd play games and work on developing some basic words, so they could get around town.

John emphasized that these experiences had a profound impact on his view of teaching and learning, in that learning needed to be tied to performance in real life. He reflected:

> John: I think that the education part is not so much the note taking; it's more of what you do outside in your community, who you interact with, who you help.
> Researcher: So it sounds like you have, when you consider what counts as learning, it seems like you have to be able to do something? Not just memorize, would you say that this is accurate?
> John: Um hum. Yeah, you have to do things!

In his current role, John was tasked with running a class that resembled a study hall and was called a "learning lab." In contrast to a traditional study hall, in which students are given extra time to choose which school work they wish to complete, this learning lab was a more intentional attempt to offer students tailored academic support. Other middle school content teachers collaborated with John to communicate which projects students should work on and identify unique academic needs for specific students. During his class, John worked in a one-on-one basis with students to ensure that their work was completed in a timely manner. For example, Mr. Benedict, a math teacher, communicated to John that there was a test coming up in his 6th grade math class. In response, John offered individualized study plans for each of Mr. Benedict's students.

As a new teacher, John found this job challenging because he was asked to simultaneously support several teachers' curricula while still trying to create a classroom context that made learning fun, relevant and engaging. He explained:

> And learning lab has been exactly that second word, a lab because, in fact, it is supposed to be a time for the kids to get their homework done. Which has been really difficult, uh, for me, because I'm an inexperienced teacher. And learning lab is one of those classes where if you, well, 'What are we doing in here? Do they all need to be doing this? Are they all doing that?' Because some of them need science, some of them need math, some of them just want to screw around, and not do anything.

The above quote captured the challenge that John faced in his classroom. He explained how the structure of the class often left him feeling unsure about whether or not he was succeeding as a teacher. In a teacher-researcher interview, John relayed how he empathized with students who did not want to do these programs and said, "And I feel that I am way too understanding, and I totally understand when they say, 'Why do we have to do this?'" He gave the example of an online remedial math curriculum, which presented difficulty in keeping students engaged because students claimed it was boring. He said, "Um, philosophically speaking, you are not going to learn well if you hate doing something."

Since the QA game that John would be using was a persuasive writing game, I wanted to get a better idea of how much John had already taught persuasive writing in his learning lab. He expressed that he was unsure of how the implementation would play out. I asked:

> Researcher: In learning lab, have you been asked to teach persuasive writing?
> John: Ha, no. I've been asked to help the students read more, and we have been going through this book about a girl living in Australia. I play the tape for twenty minutes as the students read along. That's the extent of it.

John's response suggested that he saw his role as a support to students rather than someone who taught academic content. His supportive role involved ensuring students had access to various educational technologies (e.g., set up an audio tape for students to listen to an audio book, help

students access their online curriculum) and supporting and supervising students' progress through each of the various programs.

For John, working in a classroom with consistent changes and vague expectations, while simultaneously supporting a number of different programs in which students did not want to participate, made the idea of using *Plague* appealing. He saw the game as a fun alternative to students' normal drill and skill activities. When asked, "How do you think the students will like playing *Plague*?" John responded, "Yeah, I think they will really like QA. I think that they really like being able to move around and watch their avatar be able to go into the water, and they need that, that, that break. And that little side adventure they take."

John's role as a support teacher seemed to frame both his choice to use *Plague*, because of its potential for engaging students, and his implementation of *Plague*, which emphasized moving through the game. The following sections document the results of the data analysis of John's implementation, which uncovered that John used *Plague* in a manner that was consistent with his stated teaching beliefs and fit within his stated learning lab classroom practices.

John's Implementation of *Plague*

In order to answer research question #1, "How did John implement *Plague*?", I took the themes generated by John's implementation data to build a progression of classroom interactions that he engaged throughout his implementation. The results of this process yielded the answer for research question #2, "How did John use *Plague*?" The analysis revealed that John used *Plague* to promote non-academic outcomes of persuasive writing. John's implementation took place during six 90-minute class periods, which spanned two weeks. The analysis of John's implementation revealed three distinct phases. Phase One involved John's preparation to support students playing *Plague*. The activities in this phase involved the one-day training, playing

through *Plague* as a student, asking me for support, and using the *Plague* teacher resources. Phase Two involved enacting classroom activities that were geared toward giving students opportunities to play *Plague*. These activities included reading the *Plague* intro letter out loud, introducing students to the *Plague* narrative, establishing expectations of the type of tasks students would be completing, and one-on-one interactions assisting students with tutorial and technical questions. (See Figure 5.1)

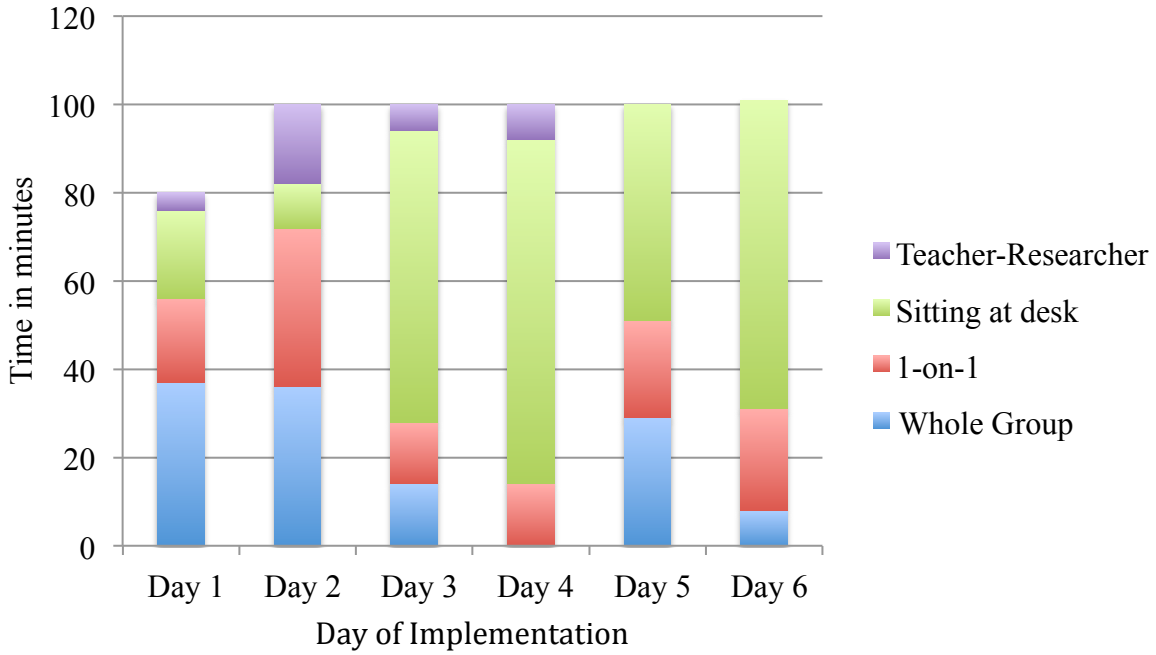

Figure 5.1. Comparison between John's interactions types.

Phase Three was defined by John gearing his classroom activities toward motivating and supervising student progress. During this phase, John's focus was to ensure that students met progress guidelines and to motivate students to consider the real world (i.e., contexts outside of school) value of learning how to write persuasively. Each phase will be fully described below.

Phase One – Preparing To Support Students. Phase One involved John's preparation to implement *Plague*. His preparation started with a one-day teacher training and continued

through the second day of his implementation. His preparation was focused on understanding the game's trajectory, locating key NPCs and other locations within the virtual 3D world, and learning how to trouble-shoot common student usability problems. Though little data was collected that focused on John's preparation, evidence of his preparation became apparent in Phase Two and Phase Three.

Before his implementation started, John began playing through the student trajectory and was able to finish playing through *Plague* by day three of the implementation. Before class on days one and two, I observed him holding and reading through the course materials before initiating whole group discussions that introduced students to the game. John expressed in a teacher-researcher interview that he had never taught persuasive writing before, but studied the *Plague* teacher facilitation guide for directions and insight (e.g., using evidence to support a reason, considering the impact of a moral dilemma).

Phase Two – Introducing Students to *Plague*. Phase Two of John's integration process involved him introducing students to *Plague* and training them on how to operate the game. This phase spanned the first two days of his implementation, and activities during this phase included whole group discussions geared at introducing students to the *Plague* narrative, establishing expectations of the type of tasks students would soon be completing, and assisting individual students with tutorial related questions.

On day one, John introduced students to *Plague* by reading the *Plague* introduction letter out loud, followed by a discussion covering the students' roles in the game. While he was handing out letters to each student, he announced that the content of the letter was an essential tool to finishing the game on time. He said:

> What I handed out to you guys is going to be part of your first mission. It is really important that you stay on task and you finish these missions on time. So what I want you to do before you go in, I'm going to read a couple of things to you, so grab the letter that says, "*Plague*" that I handed out to you guys…and this is a letter form your virtual mother…

John used the letter to help the students understand the types of tasks they would be completing. He read the introduction letter out loud to his class and then facilitated a discussion about *Plague*'s setting, the characters, the game plot, and the students' intended role in the game. In this discussion, John introduced students to the narrative of *Plague* and positioned them as problem solvers. John further sought to support students by setting expectations that there were tasks in *Plague* which required them to read carefully and to be produce detailed reports. To his class, John said:

> You guys really got to pay attention to what you're doing. Make sure you are very detailed in what you're writing. That way you can pass. Otherwise, you guys are going to get stuck, and you're going to retype, and retype, and retype. So really focus on checking your work. Make sure that it is detailed; make sure that you are gathering the details. Write up evidence and really, really, really, really, really, really, really, read what's in that right hand column!

At the beginning of day two, John's second and third discussions focused on informing and reminding students that the nature of their task was to consider various elements of persuasive writing. Toward the middle of class, John held a discussion that urged students to read carefully because their choices to define a particular side of *Plague*'s main argument (e.g., pro side or con side) would affect the entire virtual town. He explained:

> John: Yeah, so what I think they are asking you guys to do in the game is to make a choice, and then you are going to have to defend that choice. You have to come up…you have to come up with evidence. (Toward a student) George, can you help me, what is the choice they are asking you to make?
> George: Who, um that what, who caused the problem? Who caused the disease?
> John: Who caused the disease? Or what is the best choice in the town to cure the disease?
> George: Yeah! Yeah! Yeah! What is the best choice to cure the disease?

John: (Toward the class) Make sure, when they ask you to make a decision, you are very clear, in your writing, what your decision is…When they ask you make a decision, be very, very clear, that you pin point, exactly, what you want to say, you have to pick a side, there is no in between. This side, or this side. So it's with Dr. Frank or Not?

Students: (Several students respond unsolicited) Not!

John: So you're not with him, then make sure you get enough evidence to prove that Dr. Frank is evil or wrong or not going to help the town!

In the quote above John wanted students to make their own choice about the best way to solve the game's main problem and told the class that collecting enough evidence, (i.e., a persuasive writing element) was a critical component to achieving that goal. Through the whole group discussions, John initiated the expectation that students needed to use elements of persuasive to finish the game. Later in that same class, John initiated another discussion in which he reminded students that finishing *Plague* involved collecting enough evidence to prove their chosen side of the argument.

In Phase Two over 90% of John's one-on-one interactions focused on supporting students to get started using *Plague*. These interaction numbers appeared to be consistent with a teacher who was training students on how to use a new technology for the first time; 47% of the one-on-one interactions were coded as tutorial (i.e., focused on understanding how to operate the game), 22% were coded as progress (i.e., focused on ensuring students stayed on task), and 21% were coded as Tech (i.e., focused on offering students technical support). The last 10% of the interactions were coded as addressing topics related to content and narrative (e.g., Helping students understand the concept of motive.). Offering tutorials, (i.e., reminding students to stay on task) and trouble shooting technical problems were consistent interactions related to someone introducing a new educational technology. The frequency of this particular type of one-on-one

interaction dropped significantly starting on day three as students became familiar with using the game and did not need as much assistance from John.

In Phase Two, the data revealed that John was intentional about introducing students to the narrative of *Plague* and actively supported students in how to use the game. He was also intentional about setting the expectation that students were to make choices about their writing assignments that required careful reading and writing. While John gave no indication that the writing assignments would be graded, he did stress that producing quality essays would be required to finish the game.

Phase Three – Managing Student Progress. Phase took place the last four days of the implementation. Starting on day three the focus of John's support significantly shifted away from helping students with technical and tutorial related problems and toward motivating and supervising student progress. These activities included announcements and one-on-one interactions focused on keeping students on task, setting work deadlines, managing disruptive behavior, and supporting students in realizing the value of becoming a strong persuasive writer.

In Phase Three, the nature and frequency of whole group interactions shifted from discussion-focused to announcement-focused. John made ten whole group announcements, all of which were focused on motivating students to stay on track and finish the game in a given time frame. For example, on the sixth day, John announced at the beginning of class that students needed to stay focused on completing the tasks because implementation time was running out. He announced, "Ok, class, you have two days to finish this! I suggest you get to work. Stop screaming. Stop complaining and finish!" On the last day of the implementation, John began class by telling students that he wanted them to log on and finish the game.

> Ok, class, this is what I want: log on, stay in your seat! Ingolstadt, finish it! Mary, listen to me right now! Log on, I'll turn the light off. Contain yourselves. Stay in your seats. No music. This is your last day. You have a lot of work today. Now, let's go! Let's go! Log on!

Represented in the quote above, during Phase Three John's announcements were short, direct and focused on reminding students to continue progressing through the game.

John's Phase Three one-on-one interactions were consistent with someone who was responsible to simply support, motivate, and supervise student progress. The majority of these interactions were focused on offering technical assistance when students were stuck. Toward the end of his implementation, the nature of John's one-on-one interactions shifted to a role in which he consistently reminded students to continue to progress through the game. Figure 5.2 depicted the distribution of different codes of one-on-one interactions between Phase Two (depicted as blue) and Phase Three (depicted as red). Notice the differences in percentage of one-on-one interactions that were focused toward progress and classroom management. Over 53% of the one-on-one interactions involved John telling students to continue working.

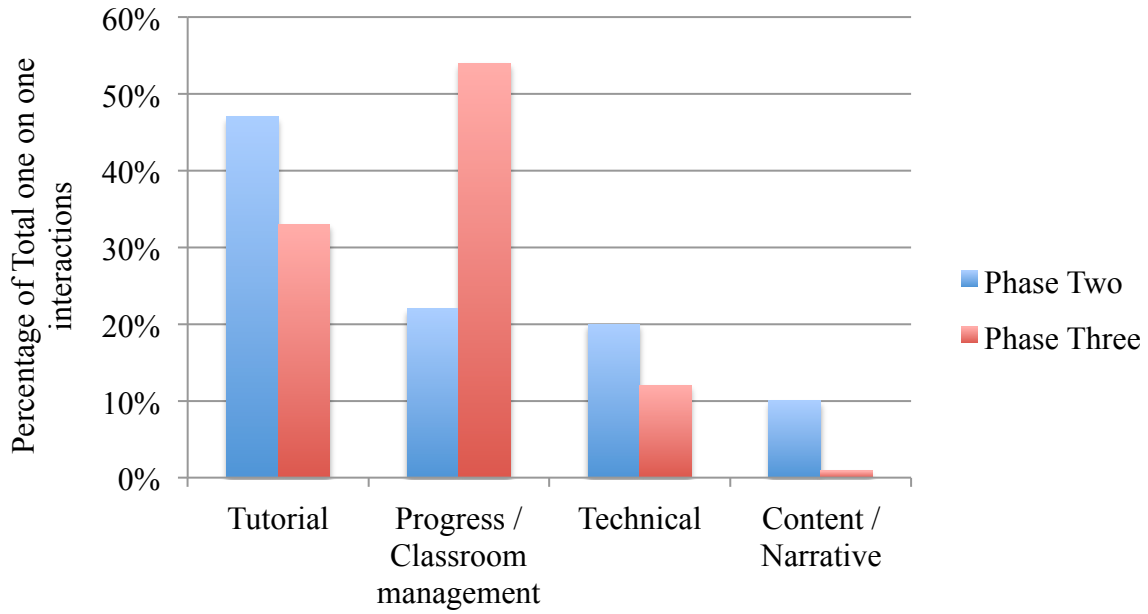

Figure 5.2 Comparison between the content of John's one-on-one interactions.

Since John's focus was not to enhance content retention and engagement, his whole group discussions focused on achieving non-academic outcomes and not aspects of the game that were central to understanding the mechanics of persuasive writing. For example, at the end of day three, John began a discussion by asking students if they had found various items within the 3D world. For example he asked, "How many skeletons are in Ingolstadt harbor?" This scavenger hunt type activity was not directly related to persuasive writing but was important for John to get his students' attention and highlight their freedom to explore the 3D world. He then sought to engage students with the game's narrative by asking them to consider if their choices in *Plague* had moral implications.

> John: Class! What is immoral? Sit down, Edgar. (Students are not paying attention but talking about whatever.) Melissa, what is a moral dilemma? Someone tell me. I'll give you two extra points. Someone raise your hand and tell me what is a moral dilemma?
> Melissa: Mr. S!
> John: I am not a moral dilemma. Louise, what is a moral dilemma?
> Louise: A big, big, big problem!
> John: What kind of problem?
> Student: A moral one.
> John: So, sshhh! You're telling me that a car accident is a moral dilemma?
> Several students: No!
> John: Like how the whole village is in danger?
> Students: Yeah.
> Leo: Like...it's like a couple of people, but a whole bunch of people…(Are we going? Mr. S – in 5 minutes?)
> John: Wait, explain that again, Leo. To the class, it's a big problem yeah.

The last student, Leo, alluded that a moral problem was something bigger than a car accident and could affect a whole town. John built on Leo's example when he asked the class, "Which types of decisions did people, make when they addressed a moral dilemma?" Next, John informed his students how making a moral decision involved a series of checks and balances and weighing of options. He said:

> John: Leo, you're on the right track for a moral dilemma. He said that it is a larger problem that has to deal with the whole town. But what types of decisions do you have to make in a moral dilemma? Do you know?
> Student: Um…wisest decision?
> John: Yeah, the wisest decision. Think about balance. Think about scales for a moral dilemma. Usually there are a couple of options. It has to be more fair? Um, so think about Ingolstadt what is the moral dilemma in Ingolstadt? What is the moral dilemma?

By the end of the discussion there was lot energy in the room. Students were eager to share and spoke over each other. John used the students' energy and attention to articulate the moral dilemma in *Plague*. John concluded the discussion by telling students the moral dilemma was whether or not Ingolstadt should stop Dr. Frank from experimenting on the Creature in order to find a cure. John said, "Ok, there you go. Should you let Dr. Frank continue, or should you stop him? That is the moral dilemma. All right!" Asking students to consider how a moral dilemma could influence one's writing was a prime example of how John used *Plague* to produce the non-academic outcome of problem solving ownership. John did not seek to directly assess students' understanding of how moral dilemmas were related to persuasive writing or the students' job as investigative reporters. Instead, he appeared to be interested in motivating students so they would engage in completing the work needed to solve the problem in *Plague*.

Assessing student work based on participation. Grading submitted student reports and offering feedback is an essential element of a teacher's QA video game implementation. These assessments are important for assigning academic value to the time students play the game; however, in a classroom like John's where the teacher's goals were focused on the non-academic aspects outcomes, assessing student's work took on a different meaning. The lack of an embedded pre-assigned grading rubric was an intentional choice by the game's designers. This decision was made to allow *Plague*, and other QA games, to scale across multiple states and countries with varying rubrics and standards and allowed teachers the freedom to decide how

they would grade students' work. Teachers were given complete freedom in assessing students' work to meet their own unique classroom needs. For John, the manner in which he decided to grade student work was consistent with using the game as a learning lab teacher. At the beginning of the third day, in a teacher-researcher interview, I asked John how he thought his students were progressing. In his response, he explained his plan for grading students' work:

> Researcher: How are they doing?
> John: They are just moving right along. I talked to Heather on Saturday, and she was like, "Oh my gosh, my kids are still on Mission 1 in *Taiga*!" At least in this class, they are going pretty good.
> Researcher: You're reading their stuff? How is their quality?
> John: Better. As long as those text boxes have something in them, I'm letting them pass on. I'm not worried about capitalization.

The quote above indicated that John was not concerned if the students' writing was perfect, only that they participated. This grading strategy was consistent with a learning lab teacher using the game to produce non-academic and non-tangible outcomes.

The way that John decided to formally assess his students' work in *Plague*, however, should not be seen as academic carelessness. On the contrary, there was evidence that John cared deeply about how students viewed the value of persuasive writing. During class on the sixth day, John had a one-on-one interaction in which the student questioned the value and place of learning persuasive writing in his class. Immediately after this interaction, John initiated a whole group discussion, in which he sought to motivate his students to see how persuasion could be used as a tool for positive change. He said:

> Class, eyes up here! I want to have a little talk with you. I was just speaking to Sophie, and she goes, "Persuasive writing has nothing to do with learning lab. Persuasive writing has nothing to do with science! Persuasive writing has nothing to do with anything!" In our social studies class we've been talking about MacDonald's people's persuasive writing, how unhealthy McDonald's is for our community. So what did McDonald's do? They had to make all these changes to help create a healthier menu. So when you are in Ingolstadt, you have to persuade the reader, or to which side Dr. Victor Frank you're on.

> Watch what happens when you write your persuasive essay! Watch what happens to the town of Ingolstadt! You are making decisions that will cost people their jobs in Ingolstadt, and die! So, be very, very careful with the decisions you make, because things will definitely change and persuasive writing ahs everything to do with it.

What we see in John's discussion was a concern for his students to develop a relationship with persuasive writing. Even though he did not formally assess their work, he still wanted students to see that playing *Plague* as important. In this discussion, he elevated the students' play in *Plague* to the same level of importance as other people in the real world who sought to have McDonald's change their menu. This was another example of how John used *Plague* in a manner that was consistent with his role, which was not directly responsible for assessing students' academic work, but interested in developing the non-academic outcome of valuing the process of becoming a strong persuasive writer.

John's Integration Process

To answer research question #3, I compared John's baseline interview statements with his implementation data. The results from this analysis revealed that John used *Plague* in a way that was consistent with someone whose job was to support students' academic success. The actions in his implementation were focused on using *Plague* to produce nontangible and non-academic outcomes, which were consistent with his teaching practices when he was not teaching with *Plague*.

Working in learning lab, John was excited to use *Plague* because he thought it would give students an opportunity to engage in a curriculum that would give them the ability to break from the normal routine of learning lab. John's integration process involved finding ways to motivate students to progress through the game while still creating meaningful experiences for them to see the value of persuasive writing.

The structure and content of John's implementation showed a number of consistencies in the way he managed his class while not playing *Plague*. The connection between the three implementation phases signified that he focused his attention on ensuring students knew why they were playing *Plague*, knew how to use the game controls in order to progress through the game's trajectory, and considered the real world changing power that persuasive writing could offer.

In light of all his efforts, John did not assess his students' academic understanding of persuasive writing. Instead, the data showed how he assessed the non-academic outcome of students' perceived real world value of persuasive writing through his whole group and one-on-one interactions. In the baseline interview we learned that John's first teaching job was teaching English to African refugees. From this experience, he reflected that he highly valued learning when the content was connected to something in real life. John saw his former classroom context, working as an English teacher, as having a significant impact on his students because it offered a means of survival (e.g., finding an apartment, buying groceries getting a job). In contrast, while working as a learning lab teacher, he explained that his students did not show the same level of urgency to learn as the students in the community college. Instead, he often felt resistance from his students to complete their assigned work. This trend continued throughout his *Plague* implementation. The data showed that over 50% of John's one-on-one interactions involved him telling students to keep working.

John's lack of formal language arts training did not hinder him from discussing the value of persuasion and persuasive writing. During the implementation, there was evidence that John used *Plague* to support students in recognizing how persuasive writing could be used in the real world. When a student challenged the value of learning how to write persuasively, John

encouraged his students to see that they could make a big impact. He elevated the decisions students were making in *Plague* to the same level as another group of people who built a case against McDonald's.

In conclusion, John's case is one of a remedial teacher whose implementation process involved using the game in a way that was consistent with someone who was not responsible for teaching academic content. John focused on using the game to produce nontangible and non-academic outcomes, which were consistent with his teaching practices when he was not teaching with *Plague*.

CHAPTER 6: CASE OF HEATHER

The creation of Heather's case involved addressing the following research questions: first, "What was involved in Heather's QA implementation process?" Second, "How did Heather use Quest Atlantis in her classroom?" Third, "What was the relationship between Heather's expressed pedagogical preferences and practices and the way she used QA?"

This was a case of a discipline-specific teacher who used an immersive video game to practice a different discipline. Heather was a science teacher who used a science based immersive video game to practice writing composition. Analyzing Heather's implementation data uncovered that she used three distinct elements to employ her existing classroom management strategy in her implementation of the *Taiga* game. First, she offered numerous demonstrations that modeled how she wanted students to operate QA. Second, she repeatedly communicated explicit expectations of how her students were to play the game. Lastly, she created and executed a number of accountability measures to ensure that students met her expectations.

In this chapter, I will explain the key pedagogical themes that emerged in Heather's baseline interview: Heather's stated passion for teaching science, her conviction that every student could learn, and her strategy for creating a positive learning environment. Next, I will discuss Heather's implementation process, which involved game preparation, offering tutorials, setting expectations, and managing student progress. I will then discuss how her implementation strategy led to using *Taiga*, a science based immersive video game, as a writing tool. This chapter concludes with an analysis that illustrates how Heather's stated pedagogical shaped her implementation.

Heather's Expressed Pedagogical Practices and Preferences

Heather was passionate about conducting scientific research and teaching science. During this study, she was completing her second masters in Clinical Research Management and worked within a biomedical research lab where she conducted and organized various research initiatives. She had also taught science in various urban middle and high school settings for eight years and loved working within the intersection of lab research and science education. In our initial teacher-researcher interview, she articulated that she wanted to teach science in a way that reflected the practices of a full-time lab scientist. She explained:

> I want to do more than just give them the facts. I want to show them how to practice science, how to think like scientists. I subscribe to different scientific journals, and try to share new articles and findings that match what we are doing here in class. See here, (she points to the wall behind her desk), that's a poster I made and presented at a conference. I shared with them my research topic, how I approached the problem, the methods I used, and discussed my results.

To Heather, teaching was more closely related to following a cause than working a job, and she believed that learning was not a luxury reserved for those with privileged backgrounds but a

right that all children should have. Motivated by this cause, Heather structured her class in such a way so that learning was not optional. In her baseline interview she passionately expressed:

> For me, it's about the reality making learning absolutely mandatory! Like, it is not optional! We are going to do this regardless! Whether you want to, or whether you don't! Whether you can or not! You are going to do it! It's going to happen!

Heather summed up her teaching philosophy in one statement, "To succeed, they [students] have to have structure and personal accountability." Heather's desire to make learning mandatory was realized by creating and maintaining a structure that gave her a large amount of control over student outcomes. Her intention was to create a classroom environment with as little ambiguity as possible. Heather's strategy involved the following three elements: 1. give students opportunities to see how and why certain learning activities are necessary, 2. give students specific roles with clear expectations of what was expected of them, and 3. hold students accountable to her expectations.

Heather's classroom structure was heavily influenced by her experience with the Kegan Structures group (http://www.kaganonline.com/about_us.php). According to Heather, the goal of the Kegan Structure was to remove ambiguity in the classroom. Students were to be given explicit roles, explicit tasks, and held to explicit accountability objectives. She explained:

> See, I've learned a lot through Kegan. With Kegan, everything is very structured, where there is personal accountability. So, yeah, a lot of what I do is from the Kegan training that I received. Where every person has a specific role, everyone has a specific task, it is very clear cut and defined as to what the expectations are, and it is not optional to me that they learn.

Heather became a believer in the Kegan structures at her previous school, where, in one year, the school's status changed from a failing to a high achieving status. In a teacher-researcher interaction she recounted:

> Heather: We defied the odds, we went from a failing label school to a plus label in one year, and it had never been done in this state. I don't know if I shared that with you before, but that was from…
> Researcher: Would you say that was a Kegan school?
> Heather: It was a lot of implementation of Kegan, and um, but it was because of Kegan!

The walls in Heather's classroom were covered with science posters, diagrams of various systems (e.g., periodic table), posters demonstrating students' work, and even an academic poster Heather had presented at an educational science conference. The middle school science department did not use textbooks, but relied on a number of online content providers (e.g., Scholastic, Discovery, Pearson, Brain Pop), and students used laptops every day. Heather explained that she would normally instruct students by connecting her computer to a projector and share slides, demonstrate and practice various problems, explore science-based websites, and watch educational videos.

Heather expressed that a challenge working at her current school was that many of the students' parents valued education but did not have the experience or knowledge to support their children's learning. She stated how many of her students were first generation Americans, and English was their second language. Heather shared a story about a parent-teacher conference with a student who had missed 40 days of class. Shortly after the conference started, Heather realized that the girl's parents were illiterate and were limited in how they could support their child's education. The parents told their child that she would have to face the problem of catching up at any school. Heather recounted,

> I realized that they were illiterate. They were telling her, "You're going to encounter this problem anywhere, and you have to figure out how to deal with this here. And this school is just as easy as everywhere else."

Upon hearing these parents' comment, Heather, defended that her school is not like other schools, but was significantly more academically rigorous. She stated:

> This is a college prep school! We are much more difficult than a regular middle school. And if we are, this is not, if they are not able to bridge the very large gap that we have right now. You don't want to do her a disservice by keeping her here because the expectations are going to continue to grow. I'm not going to lower them.

Heather used that example to highlight some of the challenges she regularly faced. She later said that the parents often did not realize what was necessary to support their children. She said:

> The responsibility falls on the parents, and they want to help, but they don't know how. They don't realize that they need to bring their daughter to school. And that takes knowledge and experience to realize what to do.

Despite her expressed challenges, Heather portrayed an optimistic view that students could and *would* learn in this advanced and challenging setting. According to Heather, her students' achievement levels ranged from some who were tested as gifted to others who were in the special education program. She recounted that many of her students came into her class performing far below grade level, but when they left, were performing at or above grade level:

> Researcher: Do you notice any difference working in a school that has a high free and reduced lunch numbers?
> Heather: No! I mean, I see a difference when I start with them, but not when I'm done with them. I have even had several students who came into my class labeled as special ed., but then after being in my class for a year, they tested out.

Heather wanted to implement *Taiga* by using her existing Kegan-like structure. In our baseline interview I explained that part of this research was to gain a clearer picture of how educational videos games were used in classrooms. I compared how the current educational video game research was similar to the illiterate parents' story she shared earlier, in that educators saw the importance video games could play in education but were unaware of how to support large scale implementations. Heather's response to my analogy suggested that she foresaw the success of her integration process being closely linked to using her Kegan-like structure. I asked:

> Researcher: I see that teachers and educational video games have the same type of relationship as this girl's parents toward her education. In one sense, teachers love the

> idea of educational games because they are fun and engaging. On the other hand, they don't know how to support learning with games and then just let them go and let them play the game. Does that make sense?
> Heather: Yeah! Because they haven't *implemented the structure*. I know what you are saying. They have to have structure, and create personal accountability.

There was an abundance of data to show that Heather used her existing classroom structure to implement *Taiga*. First, she offered numerous demonstrations in which she modeled how to operate QA. Secondly, she repeatedly communicated her expectations of how she wanted her students to play. Lastly, she created and executed a number of accountability measures aimed at ensuring students were closely followed her expectations.

Implementing *Taiga*

To answer research question #1, (i.e., What was involved in Heather's implementation process for using QA?), I took the themes generated from Heather's implementation data to build a progression of classroom interactions. Heather's implementation took place during seven 90-minute class periods, spanning two weeks. The results from this analysis revealed that Heather's implementation progressed through three phases. Phase One of the implementation involved Heather's pre-implementation training. Phase Two spanned the first four days of Heather's implementation and largely consisted of Heather showing students how to play (See Figure 6.1). Phase Three spanned from the middle of day four through the end of the implementation. At the transition between Phase Two and Three there was a sharp drop in whole group interaction geared at showing students how to play, to a spike in whole group and one-on-one interactions focused on setting expectations and keeping students accountable to those expectations. The following sections will show how Heather used her Kegan-like structure to implement *Taiga*.

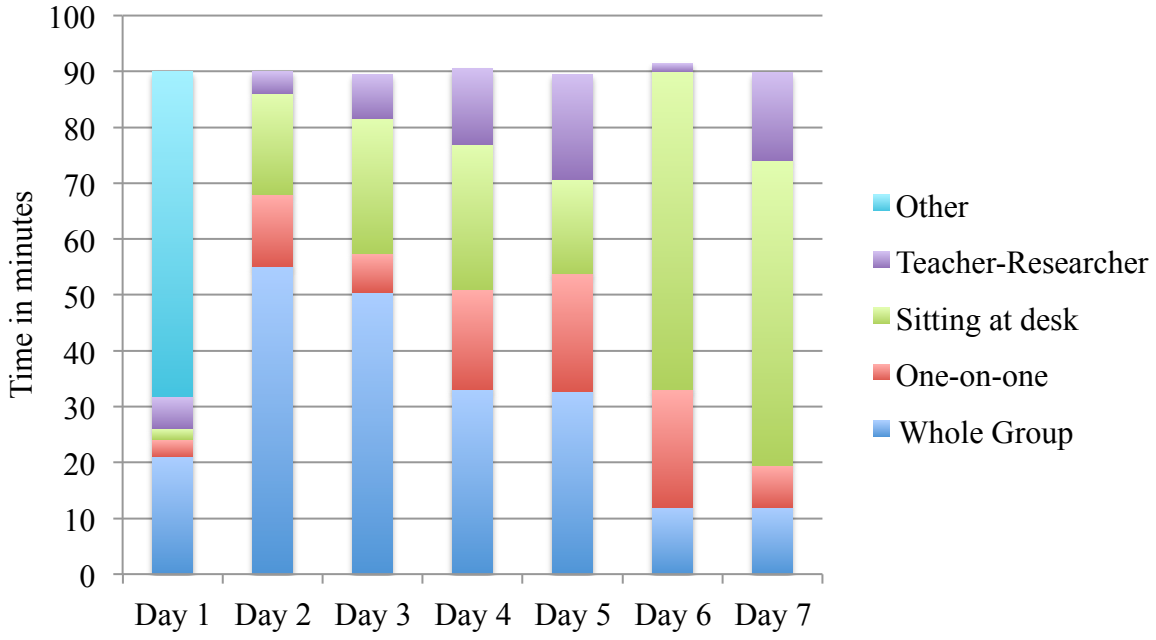

Figure 6.1. Comparison between Heather's interaction types during her implementation.

Phase One Preparation. Heather's preparation for *Taiga* involved a one day teacher training, playing through a portion of the game as a student, reading the *Taiga* teacher resource guide, and asking me for technical support. Due to the fact that most of her preparation occurred outside of class, little data was collected of her preparing to use *Taiga*; however, in the last teacher-researcher interview, Heather explained that she wished she had more time to prepare.

> Researcher: How well did you think the one-day training prepared you for this implementation?
> Heather: Definitely one day training is not enough. There is so much.
> Researcher: Can you explain a little more of what you mean by "so much"?
> Heather: Well, I think going in and doing the game and becoming acclimated with the game that would be one thing. Then, and then using a day and going in and using the field notebook and going through how they should be filling it out, when it's useful, and then another day maybe even going over the Missions and this is what they should be working toward. I mean, I know that we did, look at each other's, like we submitted something really fast. And then we were supposed to review something. But it was basically dog paddling, without a lot of comprehension. Oh, we are going through this fast and we have to keep up with everybody else, but the comprehension wasn't there. I was trying to get through it, but the comprehension wasn't really there. Because there is so much! Yeah, so I don't think that one-day of training would probably do it justice. Maybe two days. I think that three days would be the best because then you could put so

> many objectives for the day to where it's not everything in one day and now you're gone. If you don't have that, then you lose. I feel that I could do so much better the second time around, so much better.

In the quote above, Heather referred to her process of learning how to implement *Taiga* as, "dog paddling," and that she wished she had more time to prepare. She felt that she had not had enough time to play and understand how to integrate each element of *Taiga* into her discipline structure before her students started playing.

Phase Two - Showing Students How to Play. In her implementation, Heather conducted multiple tutorials in which she modeled for students how to progress through *Taiga*. With the introduction of new and unfamiliar curriculum, Heather wanted her students to know how to use the technology, which led her to spend a total of 109 minutes (i.e., the equivalent of more than two 50-minutes class periods) showing students how she wanted them to play *Taiga*. The content of Heather's tutorials revealed that showing students what to do involved instruction for navigating in the 3D space, interacting with NPCs, checking one's mission status, and submitting writing assignments (i.e., Quests).

Consistent with her description of a Kegan structure, Heather sought to take away all the guesswork and ambiguity of what students were to do to operate the game. I coded these interactions as "tutorial," in that she was acting as a game trainer, showing students how to operate the game mechanics. All of Heather's tutorials followed a similar pattern, she first logged into QA with her teacher laptop, which was connected to a projector, and then explained her choices as she maneuvered her avatar through the 3D space. The excerpt below was taken from a forty-five minute tutorial on the second day. Notice the level of detail Heather used to explain how to interact with an NPC:

> Ok, if we look over here on the right hand side, this is where you have most of your information. You see, welcome to QA. Here is Keenan. He says, (She reads the dialogue page) "Hi Quester, you're new here. Come over here and talk to me." (Toward the class) You can interact with characters (and) objects by clicking on them in the world. Your own responses are shown on the clickable quote bubbles on the bottom of each page. There is an example of one below. (Reads the dialogue page) "Cross the bridge in front of you and follow the path left and then, just click on me so we can talk." (Toward the class) So I'm going to hit my arrow key.

After her initial tutorial, Heather offered additional tutorials because students continued to struggle navigating within the 3D world. For example, at the beginning of the third day, I brought to Heather's attention that students had been struggling with the topic previously covered. I suggested that she conduct another tutorial as a means of better managing the course. Heather immediately announced to the course that all students were to stop what they were doing and listen to her.

> Researcher: It might be good to have them go through and help them find their quest because they seem to be having all the same problems.
> Heather: (To Researcher) Ok. (Toward the class) Ok, guys, I would like to have your attention please! I see that we are struggling, and so what I would like to do for those who are struggling, I'm going to go through this with you. So…if you're one of the ones who is struggling, please watch, because I will be going through the exact same things that you're going through.

That day, Heather spent more time redoing the same tutorials she had given the previous class period (i.e., 48 minutes of class time for the second tutorial compared to only 45 minutes for the first tutorial). During each tutorial, students were asked to stop playing QA, close their laptop lids and only watch Heather play QA. Heather spent over 50% of the first three class periods conducting these tutorials.

Phase Three – Setting Explicit Expectations and Keeping Students Accountable.

Starting in the middle of day four and spanning until the end of her implementation, Heather's interactions with her students transitioned from showing students how to play, to setting and

managing specific game play expectations. The focus of her whole group interactions shifted to manage play expectations. There was a spike in one-on-one interactions that involved Heather reminding and telling students to meet her expectations (e.g., finish their work, stay on task). (See Figure 6.2). In the following sections I will show how in Phase Three, Heather continued implementing *Taiga* through her Kegan-like class structure by setting specific game play expectations and creating accountability measures aimed to help students meet those expectations.

Setting clear expectations for behavior. Throughout the implementation, Heather strongly emphasized her stance on maintaining classroom order and conveying student roles. In this section, I will illustrate how Heather established her expectations that informed students of how she wanted them to play *Taiga*.

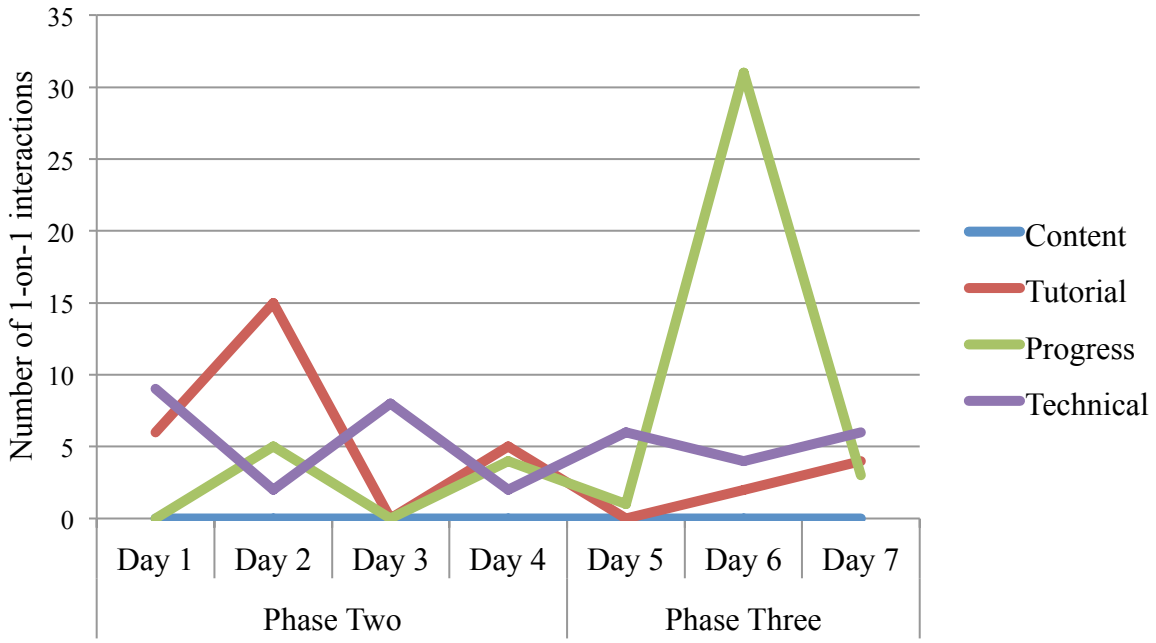

Figure 6.2. Comparison of Heather's one-on-one interactions between phase two and phase three.

Heather continued to use a firm system of class order. She gave students explicit expectations for how they were to behave in class, regardless of the curriculum. During the implementation, it was apparent that Heather wanted to infuse her structure into every aspect of her classroom: from students' posture in their chairs, to handing out computers, to the way that they were to observe Heather demonstrate playing QA. The excerpt below shows how Heather instituted detailed instructions and expectations for distributing student laptops. She directed:

> Heather: (Toward the whole class) All right, when I call your laptop, please get up and get the laptop number that I call out. So, Salina, 61, Savanna 62, John 63, Jose 64, Mia 65…no Mia, you don't have your permission slip. Nope, go to the back…66, 67, 69, Joey, 70, 71, 72, 73, 75, 76, 77, 78, 80, 81, 82, 83, 84, 85, 86.
> George: (Walks up to Heather) Number 80 is not in the laptop cart.
> Heather: (Toward the class) 80 is supposed to be there, who is supposed to have 80?
> Aubrey: I have 80.
> Heather: (To Aubrey) Did I give you 81?
> Aubrey: No, 80.
> Heather: No, I would have said 82.

This process occurred at the beginning and end of every class period. This same category of expectation extended to directing students on how they were to sit in their seats. For example, on the day that *Taiga* was launched, Heather gave out an explicit set of instructions that told students exactly how much time they had to get into their seats and how to sit in their chairs. In the example below, notice the attention to detail she gave for a relatively simple classroom management procedure:

> Ok, you have exactly ten seconds to make it back to your seat. If you haven't, I will mark you down for not following directions. 10, 9, 8, 7, 6, 5, 4, 3, 2, 1. The room is looking a mess. Where should your belongings be? Ok, where should your feet be? Where should your shoulders be? Ok, very good! You guys are looking better.

Similar types of instructions were given anytime there was a transition in classroom behavior such as walking into the classroom, handing out computers, transitioning from whole group to individualized work, transitioning from reading the *Taiga* introduction letter to students playing *Taiga*, and from individualized work to tutorial. Each time there was a change in classroom activity; Heather would give similar types of explicit instructions.

Keeping students accountable. The last element of Heather's structure was to ensure that her students were held accountable to her expected classroom behavior and game play expectations. Heather revealed she believed student engagement and learning were ultimately tied to her ability to follow through and hold students accountable. During the implementation, Heather often reminded students that their jobs were to solve *Taiga*'s narrative problem (i.e., figure out who was to blame) by completing each mission in *Taiga*. Thirty-nine percent (i.e., 31 of 113) of one-on-one interactions involved Heather asking students about their progress for completing mission tasks and submitting and revising their quests. Similarly, the analysis of whole group announcements revealed that 60% (19 of 32) were intended to remind students that they were responsible for staying on task through their task list.

The structure of Heather's accountability practices took on a three-part process. First, accountability was directly related to a directive she had announced to the class. Second, she would walk around the classroom and intentionally monitor students' progress to confirm that students were following her directions. Third, she would enact a specific punishment or reward based on the students' level of compliance within a given time frame. The data analysis revealed that Heather had combined accountability measures for classroom behavior and different accountability measures related with student play.

For example, the classroom behavior accountability measures related to how students related to each other while they were playing *Taiga*. On the fourth day of the implementation, Heather was frustrated that students were talking back and forth in class, asking each other how to find certain items within *Taiga*. She was not directly opposed to students collaborating, but in this scenario, three students were yelling back and forth across the classroom. Heather perceived this particular behavior as disruptive and off task because students were chasing each other within the 3D world. Heather announced to the whole class a set of instructions that explicitly outlined her expectations and the consequences if this similar behavior continued. In a strong tone, she announced:

> You don't ask each other where you are at! You are supposed to find this on your own. Find out through the coordinates. Do you know what I'm going to do? I'm going to change every single one of you, I'm going to change your rights, when I see that you are continuing to socialize with one another, I'm going to change your rights, to where you aren't going to see anyone. You're going to be in *Taiga* all by yourself. I want the goofing off to stop now! And I'm not playing. And you know that I don't play.

After this declaration, Heather began the second stage of her accountability, monitoring students' progress. She wanted to make sure that students were not chasing each other but making progress on their missions. In a teacher-researcher interview, Heather explained that she monitored students to make sure they were doing as they were told. The examples she gave indicated that she was searching to find out whether or not students had followed her directions:

> Researcher: When you are walking around the classroom, what you are looking for?
> Heather: I'm looking to see if they understand what they are doing. So I'm making sure that they are not just running around. I see them navigating through, but I'm asking them, "So what are you doing now? What are you doing on your list? What are you trying to accomplish right now?" You know, those are the types of things.

After monitoring students, she found that some students were still not doing what she had asked, which resulted in her taking away multiplayer rights from her students. After class that day, Heather reflected on her decision to follow through with her expectations.

> I also see it as, um, I've given them warnings, but I follow up with what I say, and if you keep screwing around, you're going to lose your rights to see people. It happened and then it happened. They don't need to call my bluff. You know, and they know it. I don't know why they continue to push but they get what they asked for.

While implementing *Taiga*, Heather explained she felt that she needed to keep students accountable otherwise they would not have likely done the work she told them to do. On day four, Heather discovered that most of her students were not filling out their notebooks as she had earlier requested. Once she found this out, she explained that they had a specific time period to fill in the pages of their *Taiga* field notebooks otherwise they would get an infraction, a form of class demerit. Heather commanded to her class:

> Your field notebook is worth 50 points, and I'm going by and checking your field notebooks and you're not filling them out.…I'm coming by to see if you have completed your field notebook. If you have not, I will be documenting that you were not following directions. If you've had a warning already, then you will now have an infraction. I'm giving you exactly three minutes, and then I'm coming by to see where you are. You're going to pull up your tasks list, to show me where you're at. And then you're going to show me that you're documenting your field notebook, has been filled in. I've asked nicely many times, for some reason you're taking this as a suggestion not a direction. It is a direction. And if you're not following directions, you will be marked down accordingly (starts timer).

Ensuring that students were filing out their notebooks (i.e., following directions) dominated the class period that day. Two students received infractions for not following directions. In a teacher-researcher interaction after class, Heather reflected on that day's events and articulated the importance she saw for keeping students accountable. In the excerpt below, notice how Heather stresses the importance of accountability with her expectations:

> Researcher: So, you don't assume anything, and give very specific expectations of what needs to be done, and give students the ability to succeed by not guessing what to do?
> Heather: And they will always know that there is going to be an accountability piece. That is what is so important in that accountability piece that they know that they are going to be held to that. They won't just do it, unless I'm going to follow through with it. And I hate that it comes down to threating them, but it had to be done, or I told them, "You got to the end of class period to get this notebook filled out, if not, you'll have an infractions for not following directions! I'm specifically telling you now!" You could just see the pencils flying. There were flames shooting off their pencils. They knew that that I wouldn't say it, if it wasn't going to happen. And they were working their tails off.

The quote above captured how Heather created accountability structures while using *Taiga*. According to Heather, she needed to be able to follow through after she set an expectation (e.g., filling out notebooks), otherwise her structure would collapse. After class, Heather further elaborated how she perceived that her students knew to take her seriously.

> They know that I was going to come by and check, and I did, and I went by and checked and made sure. I think that two or three kids that I have to check up on. They are right here and right here. (Points to student's seats) But other than that, I've got everybody. And they knew that I would be there. And I carry the clipboard and I've got documentation. And when I grab the clipboard, they are like, ahhh, great!

Heather integrated *Taiga* into her existing Kegan-like classroom structure. First, she offered numerous demonstrations modeling how to operate QA. Secondly, she communicated explicit classroom behavior and game play expectations. Lastly, she held students accountable to her expectations by actively monitoring student progress. To Heather's surprise, her structure did not lead to the student outcomes she originally expected. In the next section, I will explain how

Heather's implementation process led her to use *Taiga* to promote a relevant but indirect academic science outcome.

Using *Taiga* to Teach Writing Composition.

To answer the research questions #2, "How was Heather using the game?" The data revealed that Heather attempted to implement *Taiga*, using her Kegan-like structure, to promote scientific reasoning. However, the designed affordance of free play allowed students multiple opportunities to circumvent Heather's authority by using the game as a virtual playground. As a result to maintain classroom control, Heather used *Taiga* to promote an indirect academic outcome of writing composition.

As Heather's implementation progressed, grading students' work was the means of keeping students accountable to the expectation to solve the main problem (i.e., find who was to blame) and move through the game. Beginning on day five, students began submitting reports (i.e., Quests). When Heather started graded students' reports, she noticed that the majority of her students had not followed the mission directions, (e.g., using evidence to support their hypothesis), nor were they writing in complete sentences, using correct grammar, or editing their spelling. In *Taiga*, teachers have the ability to send back a student's submitted report (i.e., Quests) for revisions. This game feature is meant to offer students the ability to learn from their mistakes. Once a teacher sends back a quest, it is the student's responsibility to respond to the teacher's feedback and make the proper revisions. Through this iterative process, Heather discovered that several students had either not completed their quest revisions, or they had resubmitted their quests without making any revisions. Becoming aware of this, at the end of the fifth day, I asked:

Researcher: Did they (students) make changes before they resubmitted their quests?

> Heather: No! So I said to them, "Isn't this the exact same thing you just submitted last time? Same thing?" Some are just resubmitting. I'm going through, and looking, what comments did I make to this student, and I specifically remember told them fix your punctuation. So, I'm scanning for grammar and punctuation. Was it resolved? NO. I specifically told them, "Spell check is your best friend! Wink, wink!" And I'm going back and looking at spelling, and things are spelled wrong, and I'm like, "How hard would it have been to hit the spell check button?" Like I shouldn't have to go back there and just keep…I mean Bronson submitted something nine times. Jacob, who is one of the smartest kids in 7th grade, did the same quest six times.

It is important to note, in the quote above, that Heather made the distinction that the problem was not with the game, nor was it because her students were incapable. Instead, she attributed the students' failure to revise their quests as a form direct disobedience in meeting her expectations. Previously she had announced to the class:

> Heather: For those of you who have, um, accepted submissions that would be, Bronson for *Taiga* 1, "Revising the hypotheses." That is the only person in the class who has anything accepted. No one else has anything accepted.
> Student: What do you mean?
> Heather: Bronson is the only one who has a submission accepted. The rest of you are just click, click, clicking through the game just how I asked you not to.

"Click, click, click" was a phrase Heather used to describe when students were using *Taiga* as a playground, by simply clicking buttons to progress through the game. When Heather observed that students were progressing to the next missions, without having their quests (i.e. writing assignments) accepted, she immediately saw the need to add an extra layer of accountability so that students would prioritize her directions above their own agendas. In this case, Heather had to reestablish her expectations in order for her students to do what she wanted. She announced:

> So those of you who think you are on level, or mission or on the third mission, you're not! You're just clicking through! There is one person who has had their submission accepted and that is Bronson. No one else has had their submissions accepted because of the quality of work that we talked about last time.

After creating this extra layer of accountability, Heather witnessed that her students were not taking the writing portion of *Taiga* seriously (i.e., following her expressed expectations). In the

last three days of the implementation, 20 of 23 whole group announcements were focused on keeping students accountable to her rule of not racing ahead and properly revising their quests. In those last three days, 35 of 68 one-on-one interactions were geared toward ensuring that students were submitting quality essays and not racing ahead. Here is an example of a whole group announcement Heather made:

> Ok, we're having a big problem, but I'm not going to name names, but there are some of you who feel that this is a race and click, click, click, and I thought we addressed this last time. Did we not have this discussion last time?

In an interview, she explained how she felt responsible, as a science teacher, to create the expectation that students could and would communicate their scientific ideas correctly. In a teacher-researcher interview she expressed:

> I feel that I am the math teacher, the social studies teacher, and the science teacher because science relies so much on both content areas. You know, it merges both math and language arts, and so I just don't want them to go on until they are producing good reports.

The challenge to get students to not race ahead made Heather wonder if she had set her expectations too high. In a teacher-researcher interview at the end of her implementation, as Heather was seeking to make sense of her challenging experience to integrate *Taiga*, she explicitly referenced her displeasure of how John had assessed his students' work in *Plague*. She was concerned that if she did not enforce such high expectations, then students would not learn. She reflected:

> I just feel that the bar has been down here for so long, and I know that they are much higher, but I just won't settle. I'm a perfectionist, and I'm not going to settle for them (students) half-assing it. I don't know if I'm supposed to say this or not, but I looked at what Dominic said in John's class, and he has said something where he wasn't giving a full sentence or anything. I forgot what he said, John's response was "Nice try, Dominic." Well, that is not very helpful because it is not specifically telling him use capitalization. Why aren't you using correct grammar? Punctuation? Why aren't you using evidence? Like I feel, like, I don't know, am I going too deep? Am I setting the bar too high?

The quote above was a key indicator of Heather's conviction to keep her expectations high. Despite her students' engagement, and her best efforts to create and maintain a robust class structure, Heather felt frustrated. She felt that the extra effort needed to maintain her structure was not enough because students were refusing to submit work that met her expectations. After class on the last day of the implementation, Heather expressed her frustration for not being able to get students to do what she wanted, but was convicted to preserve and uphold her high standards. In the quote below, notice the reason why Heather did not back down:

> I'm so irritated with myself, and I was up till like one o'clock in the morning working on this (grading quests) because I know that they are patiently waiting for feedback. I feel so bad, but and I feel, "Ok, maybe I am creating a hell of a lot more work for myself?" But at the same time, this is a learning experience! And they need to know to write correctly, and they need to be held accountable to have complete sentences and punctuation and spelling, and I'm just not going to let it go. Especially when they have the feature of spell check right there and they are just choosing not to use it.

In the quote above, Heather communicated her conviction that students needed to be able to write. The last element of Heather's structure was to ensure that her students were held accountable to her expectations of classroom behavior and game play, and the actual data from her implementation revealed that Heather had given her students specific expectations for how they were to use *Taiga*. Paired with each set of expectations, Heather implemented a set of supplementary accountability measures. Furthermore, through her iterative process, Heather became frustrated that students were refusing to meet her expectation for quality writing, which lead to Heather using *Taiga* as a writing composition tool instead of her intended science curriculum.

Heather believed that all students could learn if they were placed in the right type of structure and given opportunities to be shown what to do, given clear expectations, and held

accountable to those expectations. In this case, though not her first choice, using *Taiga* to promote writing comprehension was the means for ensuring students were given the best opportunity to learn a skill that was directly relevant to science.

Heather's Integration Process

In order to answer research question #3, I compared Heather's baseline interview statements with her implementation data. The results from this analysis revealed that Heather used her established structure to implement *Taiga*. The elements in her structure included extensive tutorials for showing students how to play *Taiga*, followed by specific expectations and accountability measures for how students were to use *Taiga*.

For reasons that were consistent with her stated academic and pedagogical preferences, Heather used *Taiga* to promote an indirect science outcome of writing composition. It was through this process of setting expectations and keeping students accountable that Heather decided to use an immersive science video game curriculum to promote writing comprehension.

During the implementation, students did not follow her writing guidelines, which challenged Heather's belief that all students could learn as long as they were situated in the correct structure. In this case, as Heather added layer upon layer of additional expectations and accountably, her students still failed to comply. Though it was not her first choice to use *Taiga* as a writing curriculum; she still found value in keeping students accountable to her expressed writing expectations. First, she stated her fear that students would not learn if she did not keep them accountable. On the other hand, it was plausible that Heather was disturbed by students' writing quality because of the value she saw writing have in the science community. Working in an active science research lab, Heather had had first-hand experience realizing how important it was for scientists to apply basic writing composition rules and guidelines. Lastly, there is reason

to believe that if Heather would have implemented *Taiga* again, she would have prepared differently, which would have likely altered how she how she used and implemented *Taiga*. She did not initially realize the amount of work involved in implementing *Taiga* and aligning it with her Kegan-like discipline structure.

Heather's Conclusion

This is a case of a middle school science teacher who used an educational immersive video game to promote the indirect academic outcome of writing composition. Using the game in this way was consistent with her stated pedagogical believes and practices.

CHAPTER 7 - THE CASE OF CLAIRE

The creation of Claire's case involved addressing the following research questions; first, "What was involved in Claire's Quest Atlantis implementation process?" Second, "How did Claire use Quest Atlantis in her classroom?" Third, "What was the relationship between Claire's expressed pedagogical preferences and practices and the ways she used QA?"

Claire's case is one of a veteran literacy teacher who shaped a persuasive writing immersive 3D video game to fit within the existing practices of her literacy class. She intentionally framed her implementation to use the game to fulfill the requirements of a major class writing assignment, while simultaneously fostering student reflection on the impact of using persuasive writing.

Claire's Expressed Pedagogical Practices and Preferences

Claire was a veteran teacher who was teaching 7th and 8th grade literacy at a suburban charter school. She had been teaching literacy for eleven years and wanted the literacy content she taught to be presented in such a way that was meaningful for her students. Claire's desire to organize her class in this way was driven by the desire to duplicate a profound learning experience she had had in 6th grade. This experience in grade school drove Claire to become a teacher. For Claire, sixth grade was the highlight of her schooling and was unmatched in the rest of her K-12 experience. In following grades, Claire was driven to understand why her 6th grade experience had been so much better than her middle and high school years. She said:

> It was around 7th and 8th grade, this age when I started to say that I really wanted to be a teacher, and it was my 6th grade teacher I kept on comparing my 7th grade teacher, my 8th grade teachers and my thought process was always like, "Why was this 6th grade teacher so much better, in general, for me?" She was easier for me to relate to, easier for me to do work, and I kept on looking for that, for the next couple of years, and I didn't find it, so I was going into high school I said, "I'd really like to find that teacher." And by

> the time I got out of high school, I didn't find another one like it as my 6th grade teacher, and it really motivated me to be like that teacher.

As she progressed in school, Claire saw that what made her sixth grade teacher different was how she was intentional about connecting the curriculum to each student's personal interests. For example, Claire remembered in sixth grade how she was rarely told she was "wrong," but was always required to back up her answers with evidence. In that context, Claire felt encouraged to learn, and explained:

> So (Claire's sixth grade teacher) was just very creative and open. Your answers were rarely wrong, it was always, "Ok, now can you back up, why you gave me that answer?" It was always, making you critically think and making you go outside the box…and I always wanted to be that, like that great teacher.

Through their shared desire to teach, Claire maintained a friendship with her 6th grade teacher who wound up acting as a support for Claire's teaching. Claire wanted to offer her students a similar experience to what she had experienced in sixth grade, and so incorporated teaching practices that modeled the practices of her 6th grade teacher. These teaching practices became evident in the initial teacher-researcher interview as three pedagogical themes emerged: critical thinking and problem solving, providing rationale for why a particular activity was important, and connecting class activities with what students found meaningful.

First, Claire explained that critical thinking and problem solving were a more important skill than memorizing answers because the Internet made it easy for students to access information. She, therefore, saw a greater need to help students develop skills that would allow them to discern the value of information when solving a problem:

> I don't need to memorize things, I don't need to have things memorized because now, we're in a generation where the knowledge is out there. Information is out there; we just have to know how to get to it. So that's kind of like she (Claire's model teacher) was encouraging us to do is work together and find ways to figure this out. And I think that is more important than giving the students the answers.

Second, Claire wanted students consider the impact academic content could have outside of her class. From her previous teaching experience, she discovered that it was easier for her students to engage in a learning activity if students understood *why* something was worth learning. Claire learned early on in her teaching career that working with 7th and 8th grade students required providing contextually significant meaning (i.e., potential real life impact) for them to find a learning activity meaningful. In the following quote, notice how Claire indicated the importance of providing a learning activity:

> Um, I learned early in my teaching that with this age group, if you don't give them that "why" how this is related to something I want to actually be doing, um, you lose their interest pretty quickly, and you…The biggest question in 7th and 8th grade is, "Why?" "Why?" And most of the time they are only asking why because they think it's a lame activity, or they don't want to do it, they want to stall. But when you can actually give them an answer, and say, "Well, in life this is what you're going to need this for and how it can help. And by you learning it now, you can go back into the community and help in some way. Um, I think it gives them that direction we lose too often when we say, "You have to memorize it because that is what we want you to do." Um, I think it is good to give them that direction.

Claire intentionally sought to provide students with rationale for why their investment of time and energy in completing their assignments was worth it (e.g., "Now you can go back into the community and help in some way.").

Finally, Claire wanted to know her students and what was personally meaningful them. For this reason, at the beginning of each school year, Claire would spend the first two weeks of school learning about her students. By having this knowledge, Claire could build connections between their interests and her curriculum and learning activities. In our interview, she explained how she altered her curriculum each year based on the unique interests of her students. She recounted:

> So, you know, I think it just changes every year. Because of the group of kids you have. So my lessons from last year might not be the same as this year because I have a group of students who might be into a different type of music or a different type of writing. I might have one class period that is really creative and poetry is easy for them, but when I talk about, um, writing a song…um, I'm more into reading books, and I'm not really into the music…Once you already understand that with the kids, the secondary part of making sure you're bringing things that they will relate to is a little bit easier…So, we try to, whenever we plan a lesson in general, we already have the expectation in mind. We have to link it back to something that is going to be used by them that is going to show them that you're going to be using this, for this way, and, it will change the outcome of whatever you're trying to do. Whatever critical thinking you're doing, whatever problems you're solving,

Claire's stated pedagogical preferences appeared to frame how she implemented *Plague*, by establishing clear game play expectations that focused students toward seeing the impact their choices had on the virtual town of Ingolstadt. Likewise, Claire's experience as a literacy teacher seemed to frame how she used *Plague*, which emphasized completing the writing activities to fulfill a major class writing assignment. The following sections document the results of the data analysis of Claire's implementation, which uncovered how Claire implemented and used *Plague* in a manner that was consistent with her role as a literacy teacher and stated teaching beliefs.

Claire's Implementation of *Plague*

In order to answer research question #1, I took the themes generated in Claire's implementation data to build a progression of classroom interactions that she engaged throughout her implementation. Claire's implementation took place during ten 50-minute class periods, spanning two weeks; however, she was only present for eight of those days and was absent on days three and four due to a family emergency.

Claire's implementation of *Plague* took on three distinct phases (See Figure 7.1). Phase One involved game preparation. Though no data was collected from this phase, it was apparent that Claire had a specific intention for how she wanted to use the game. After revealing the

sophisticated manner in which Claire introduced *Plague* to students, it was highly probable that she had already integrated the game before the start of her implementation. From the implementation data, Claire had finished preparing before the first day of the implementation. Phase Two, spanned the first two days of the implementation, and the data revealed evidence that Claire introduced *Plague* as a writing game, integrating her pedagogical preferences and pervious classroom practices. During this second phase, Claire's interactions involved introducing students to *Plague*, offering a step-by-step tutorial, establishing the rationale for why students would be playing an immersive game, and emphasizing that students would be required to produce a high quality 5-paragraph persuasive essay. Phase Three spanned from day three through day ten. The focus and nature of Claire's interactions during this phase were aimed at supporting students meeting her game play and writing expectations.

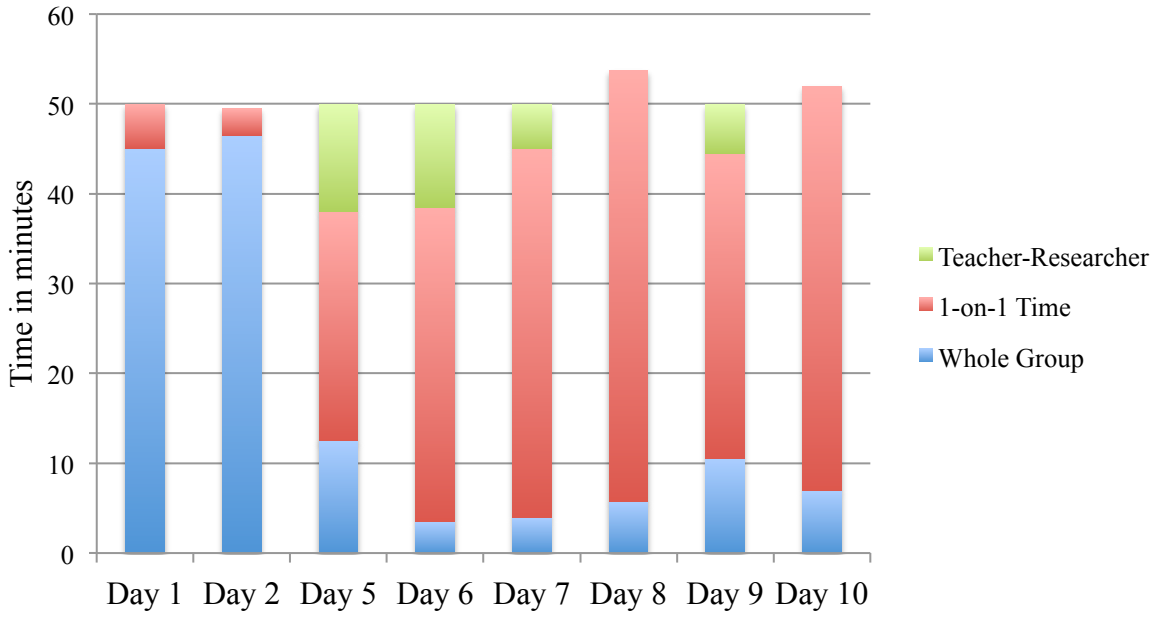

*Figure 7.*1 **Time comparisons between interaction types during Claire's implementation.**

Phase One – Preparing To Use *Plague*. Phase One involved Claire's preparation for using *Plague* as a major writing assignment by learning how to frame her implementation with her stated pedagogical preferences. Claire's implementation preparation involved playing through the entire student game trajectory and reflecting on how the narrative and persuasive writing scaffolding were connected. This process took several days, and when I had arrived the day before students were going to start playing *Plague*, I observed Claire and her teaching assistant playing through mission five and discussing strategies for supporting their students.

Little data was collected in observing Claire's implementation preparation; however, the detail and coordination Claire used to set student expectations, infuse her authority into the game, and offer sustained student support in meeting her expectations could not have occurred without a rich personal understanding of *Plague* and its features.

In her initial teacher-researcher interview, I asked Claire how she foresaw *Plague* being integrated into her classroom. Her response indicated that she had thoroughly prepared to implement the game using her existing pedagogical preferences, and she reflected on how *Plague* could be a struggle for some teachers who did not share her same pedagogical preferences. She commented:

> Have you found, have you run into teachers, where because of either philosophy or their teaching style, implementing this game is very difficult? Because I could see it being a challenge or that you would run into either…It is, when I was going over it. I've come to the realization that the whole point of it is to be able to ask those guiding questions, that make them reflect on it and if you have someone that is not comfortable with it to ask those questions or know what questions to ask, a lot of it is lost. A lot of the impact is lost.

Her statement above indicated that she saw that teachers, who did not find value in helping students reflect on the impact of their decisions or connect how an activity was meaningful, would implement *Plague* differently than how she intended to implement the game. Furthermore,

Claire communicated an excitement about the opportunity of using a tool that could help her students reflect on the real life impact of using persuasive writing.

Phase Two: Establishing *Plague* As Major Writing Assignment. Phase Two of Claire's integration process involved Claire introducing students to *Plague* and training them on how to operate the game. This phase spanned the first two days of her implementation, and classroom activities during this phase included whole group discussions geared at establishing the rationale for why students would be playing a persuasive writing video game, introducing students to the *Plague* narrative, offering students a step-by-step interactive tutorial, and establishing expectations that *Plague* was a literacy game.

By examining the order of activities from the first two days, it becomes apparent that Claire was intentional in framing the use of *Plague* to fulfill a major writing assignment. Before students were told that they would be playing an educational MUVE game, Claire began establishing clear expectations as to how and why she wanted her students to engage with the game. She introduced *Plague* by conducting a two-day step-by-step tutorial, and used this tutorial to teach students how to operate *Plague* (e.g., customize their avatar, navigate their avatar in the 3D world, learn how to submit quests). The structure of her tutorial involved an interactive step-by-step process in which she had students observe her progress through a portion of *Plague* with her computer connected to a projector, and then she asked the students to repeat the step on their laptops.

There was more to Claire's tutorial than just showing students what and where to click. She drew on their previous class experience to make sense of the type of activities they would be doing in *Plague*. This process involved Claire transforming the game's narrative into a set of operational expectations and activities. These activities included reading dialogue pages

critically, taking detailed notes, and portraying their perspective in writing. These tutorials laid a foundation for the rest of Claire's implementation. In the following section, I show how Claire introduced and set expectations for how and why *Plague* was to be used as a major writing assignment. I will then show how Claire drew upon these expectations to ensure students met her expectations for using the game in during Phase Three.

Establishing the why. Claire used the *Plague* introduction letter to first introduce students to the concept of an academic video game and to establish a rationale for them to playing this type of game. This activity was consistent with her stated pedagogical preference of providing students with a "why" for an activity. Claire used the game's introduction letter to initially position students as investigative reporters and connect how and why their role was linked to solving the main narrative problem. She passed out letters to each student and had them read the letters to themselves to learn about the *Plague* narrative. Next, she announced that the letters had important information pertaining to what students would be doing in *Plague* and used her personal knowledge of the storyline to initially shape the students' expectations of how and why they were going to play this game. After students finished reading the letters, Claire elaborated on her expectations when she explained the role students would be playing in *Plague*. She said:

> Claire: Ok. In these letters, ok, your mother has a written a letter to you, and your mother has gone on to remind you of all these wonderful accomplishments you have done, and what is your job? What are you really good at right now?
> Brandon: An investigative reporter.
> Claire: An investigative reporter. Right. It says, "I'm so proud of you. You're such a good investigative reporter." So in this actual video game, your character is an investigative reporter, and as an investigative reporter, you have been asked to go to Ingolstadt, K! And decide on what's going in Ingolstadt.

Claire drew key points from the letters to project her expectation that students would be engaging in activities consistent with being an investigative reporter.

Next, Claire introduced students to their reporter notebooks and informed them that they were a graded activity related to being an investigative reporter in *Plague*. In the excerpt below, Claire explained her expectations of how and why she wanted students to use the notebooks:

> All right, this notebook. There are places in here where you can keep notes. It says, "Mission 1: What's wrong in Ingolstadt?" You will want to write down notes from the people you've talked to, or else you will not be able to do your final mission, your final portion of it. You have to have some information, or evidence, to support what you are writing about, ok. At the end of this whole unit, I will be collecting this book [for] a grade. Make sure that we have this filled out with important information from each mission go through. So if you turn to mission one, it says, "Use this space to record, to make sketches to the buildings people and atmosphere in Ingolstadt you have witnessed so far." So throughout, not just play the game. Play the game and get through, get through. You need to be thinking about what information is probably going to be important to me. You are an investigative reporter. That is your job right now. Scoop has hired you to do this.

It is important to note that Claire did not use the notebooks as busy work, but to create a consistent connection point between the *Plague* storyline and students' roles. She not only told her students that they were to act as investigative reporters, but she also created an ongoing and graded activity that required all students to take copious notes as they progressed through the game. Consistent with her stated pedagogical preference, Claire provided a rationale for why note taking was connected with their role as investigative reporters. She drew on various current investigative TV shows to set the expectation that note taking was a normal task any investigative reporter would do. Working from this rationale, Claire justified note taking as a logical task for fulfilling their role in *Plague*. Claire explained:

> The skills you have as being an investigative reporter have been asked to put to use in this mission. Ok! Your investigative reporter notebook is right here. As an investigative reporter, like on TV, CSI, all those fun things, when there is a reporter, they always have a notebook. Always taking notes. Whatever people say to them they are always taking

> notes. Don't forget it later. That's what this notebook will be for. When you get into your mission and we start moving forward around tomorrow, people you talk to, you will need to write down information, and you will need to write down what they said to you, so you can remember the places that you've gone and don't want to forget about. That's everything will be put in here, ok. Everything will be.

Before students had even opened their computers, Claire had begun to steer her class in the direction that she wanted. She introduced students to the *Plague* storyline and communicated why taking on their role of investigative reporters was key in solving the main narrative problem. Claire sought to influence the meaning students would give to the various activities in *Plague*. In other words, she drew upon stated pedagogical beliefs for providing why students were going to be playing *Plague*. She wanted students to view a click in the game as something more than a click. She wanted them to see it as part of playing a role, and making an impact. The next section will look at the ways Claire steered her class through her step-by-step tutorial, using the tutorial to train students on how to operate the game while setting specific expectations of how she wanted them to play *Plague*.

Teaching students how to operate *Plague*. Before the implementation started, I informed Claire that the first couple of days of playing would likely require her to act as a technology trainer and tech support staff. In other words, in the first couple of days, the students' pace and progress would be slow, but, if she took the time to train her students on how to play the game, she would likely not have to manage many technology problems toward the middle and end of the implementation. Claire applied these suggestions by setting up a two-day QA tutorial. Once the students' roles and expectations had been established through the introduction letter, Claire told her students:

> When we go into Ingolstadt, today I'm going to walk you through what it will look like to do your first mission and how you get to different places in this town. Ok?...These first couple of days are going to be for working out the bugs, making sure your passwords

> work, setting up your avatar. We're going to kind of walk around a little bit, show you the controls, and then we're going to talk about expectations. The expectations we're going to have of you…and also what you can expect from Quest Atlantis.

Working like a technology trainer, Claire walked students through each step the first mission in *Plague*. These steps involved in-game actions such as learning how to navigate within the 3D space, showing students how to interact with NPCs, how to use the mission steps to progress through the game, and how to submit their first writing piece. Claire modeled how to play the game by first showing students where to go in the virtual world, and then asking them to follow along on their laptops. The excerpt below represents how Claire walked students through the tutorial.

> All right! If you've clicked on the crystal you should look over to the right. Let's look over to the right here. Ok, Emissary Island is where you are right now, and Ingolstadt is the world that you want to go to. Click on your Ingolstadt, yours might be different. If you're in my class, it will only say Ingolstadt. (Waits 20 seconds.) Everybody here? Press on Ingolstadt. We are going to the doomed town!

This excerpt represents the interactive structure of Claire's tutorials. She would first show students where to go and then ask students to follow. Ensuring that students knew how to operate the game's mechanics was foundational to setting up her writing expectations. In the next section, I will show how she used the tutorial to further communicate her expectations for how students were to play and write within *Plague*.

Establishing game play & writing expectations. In my field notes during the first implementations with John and Heather, I noted that there was a need for teachers to communicate to their students how QA was different than other commercial games. I suspected that when students heard their teacher say, "We are going to be playing a game," they would likely perceive QA to be similar to popular commercial games. Without clarifying how QA was different from commercial games, teachers could find themselves frustrated because students

would not take the learning activities in these games seriously but instead engage in activities that contradicted a teacher's agenda. Before Claire's implementation started, I shared with her my impressions about intentionally setting her students' expectations for what they would be doing in *Plague*. She adapted my recommendations by intentionally setting students' expectations in order to use the game as she wanted.

Earlier, I explained how Claire used the introduction letters for establishing the notebooks as a means of understanding why students were playing the game. When she transitioned to explain how *Plague* would be used as a class assignment, she created an intentional connection between what students were going to do in the game and what they had previously done in her class. During the tutorial, Claire communicated her expectation that student success using the game depended on their attention to read critically and remember how to write persuasively. In the following sections, I will show how Claire set up *Plague* so students would understand that their play was directly related to completing a major class assignment. This process involved highlighting the importance of reading dialogue pages critically, producing quality essays that were a major part of their game play, and being held accountable to the quality of essays they submitted.

Reading critically. During the data analysis, it became apparent that Claire developed an implementation goal to communicate the importance of reading critically. She wanted students to value the information in the "yellow text boxes." The yellow text boxes contained NPC dialogue, critical information for navigation in the 3D world, and information about how the students' individual actions affected the progression of the narrative. By not paying attention to the information being shared, students would have been stranded virtually. From her preparation playing the game, Claire realized that her students would be hindered in their ability to use the

game as she wanted if they did not read critically. She conveyed this point by jokingly telling the class how the teaching assistant got lost because he had not read a particular dialogue page critically. She recounted:

> It was really important that we read all of this information, because, um, you will find that you have left a person and realize, oh…they told me I needed to go somewhere, and I don't remember where I need to go, and I have to go back and find them. So read everything! Read it slowly and carefully. You have to go back. Um, Mr. S. and I were joking. When Mr. S and I were going though this together, Mr. S kept getting places and saying, "I'm not sure where I'm supposed to be going!" And my joke to him was, "Did you read critically? I don't think you did, so you have to go back and read." Make sure you are reading it so you don't end up like that! Ok?

As stated in the quote above, Claire saw critical reading important because of her experience playing. During the tutorial, Claire situated her stated expectations with game activities students would be engaging in later on. In this case, she was teaching students how to interact with an NPC. On her screen, she navigated her avatar to an NPC and reminded students why reading critically was important. She told her class:

> Ok, Ok, when you get to a character or reflection often in this quest or any of the missions you're going to be doing, you're going to need to be continuously reading this big yellow box that you will have over here (points to the screen on the 2D screen on the right). Ok, this has really important information, for you. It gives you instructions on what you are supposed to be doing. It tells you where to go. It tells you people that you are going to meet up with.

Multiple times throughout the tutorial, Claire communicated that she wanted students to read thoroughly and critically. Stating these expectations gave students an accurate expectation of the types of activities she wanted them engage in as they played. In the next section, I will describe how Claire set the expectation to equate the value of the *Plague* writing activities with a major class writing assignment.

Setting persuasive writing assignment expectations. In Phase Two, Claire set the expectation that the culminating activity in *Plague*, a five-paragraph persuasive essay, would be

used to fulfill the students' major writing assignment for that grading period. To use the game in this way, she first established the expectation for students to realize that *Plague* was a unique kind of game in which writing was a major activity. Next, she set an expectation, which elevated the writing activities in *Plague* to the same level of value and importance as pervious literacy class writing assignments.

During the tutorial when students were first asked to write and submit their first quest, she explained how *Plague* was a unique type of game:

> We're going to be actually submitting our quests, um, because this is a literacy program. Most of your assignments that you will be doing will be some form of writing. Ok, so when you submit, it will be different than science because you have to be reflective. You have to be thinking about these issues that are going on in this town. So, everybody with me?

In the quote above, Claire set an initial writing expectation by reminding students that *Plague* was a game that was connected to their literacy class, and that they should use the game in a way that was consistent with the classes existing expectations.

Next, Claire articulated the specific ways *Plague* was connected with her literacy class. First, Claire reminded students that their five-paragraph essay would be graded. Second, Claire explained that she would grade students' works with the same rubric used to grade their previous class writing assignments. In the quote below, notice how Claire set the expectation that student's essays will be graded with a familiar rubric.

> Claire: Remember, ok, the article that you are writing for Scoop is going to be the your 5 paragraph essay that I'm going to grade using what? Using what?
> Students: (Respond together) 6 point grading rubric
> Claire: Yep, the six trades rubric… When you are writing your 5 paragraphs for scoop, make sure that you keep in mind how you are going to be graded in literacy class as well because everything that we teach you here to be good writers will probably transfer into being a good writer for Scoop as well. Ok, so make sure you are keeping that in your mind, before you go on.

Third, Claire connected how some of the persuasive argument tools in *Plague* were the same tools used in literacy class. During the game tutorial, students were asked to finish a persuasive argument for an NPC who was suffering from the *Plague*. During the activity, students were given a persuasive writing concept map. When the map appeared on Claire's screen, she reminded students that the concept map did not represent a new type of concept or idea, but was a tool they had already used during previous grading terms. She explained:

> Claire: We've all done this. What other type of writing also uses a thesis, reasons and evidence? What type of writing did we do last quarter? What did we do? I can wait a second. I know that we are really, really excited about this, but what type of writing did we do last quarter that also uses a thesis, a reason, and evidence?
> Stephanie: Our research paper?
> Claire: Your research. So you're very familiar with this actual format so, you don't have to open this up to make it a lot larger, ok. This is, um, similar to the maps that we used when we were writing the research.

Lastly, Claire wanted students to use the same energy and focus they used to persuade her to allow special class privileges (e.g., eating outside for lunch, casual dress days) when they were writing their persuasive essays. To communicate this point, Claire drew upon previous class experiences when students sought to persuade her. She instructed:

> We all know that 7th and 8th graders have done that (persuade others). If you have never had to persuaded somebody of something before, which I don't believe. Right, you tried to persuade me for causal dress days. You try to persuade me to go outside and eat lunch outside. You persuade me all the time. So, I know you've persuaded someone. Write it in here. When you are done with your writing, you're going to scroll down and hit submit.

In the examples mentioned above, Claire explicitly communicated her expectations for wanting students to take the writing activities in *Plague* seriously. Claire sought to shape her students' concept of *Plague* by setting the expectation that the game was to be used in a way that was consistent with established practices of her literacy class. She did not leave these expectations to

chance but used them as part of a larger initiative to set up *Plague* to fulfill a major writing assignment.

Infusing her authority into the game. In the tutorial, Claire not only wanted her students to expect that they would need to read critically and submit various writing assignments, but she also wanted students to realize that the quality of their submitted essays mattered. This expectation was initially established by explaining how submitted reports were going to be graded using a familiar rubric, but Claire went a step further by creating an immersed accountability measure by infusing herself (i.e., her authority) into the 3D world of Ingolstadt.

During the tutorial, Claire came to the point in the mission where students met Scoop Perry, Ingolstadt's virtual newspaper editor, an important NPC. Claire positioned this NPC as the gatekeeper of writing quality, as students learned how to use the character's Persuasive Argument Tool (P.A.T.). In the teacher toolkit, teachers access the submitted writing assignments and give feedback via Scoop Perry's character and dialogue. The PAT tool used a particular reason-evidence paring to measure the strength of students' arguments and assign a score. Claire told students how Scoop did her work for her, and how he would be giving students feedback about the quality of their submitted writing assignments. She explained:

> Claire: Scoop is going to be going over your paper and making sure that everything is good. I love him because this is great, huh. Scoop does all the work for me. So, who do you have to impress? When you write your papers?
> Students: Scoop.
> Claire: You have to impress Scoop. Right! So when you submit to him, he is going to tell you, "You didn't follow what I asked you to do." Or, "Yeah this is great!" So think of him as your boss. Right. He is asking you to write a newspaper article. Um, and you have to prove to him right now. Are you good enough to be a writer for his newspaper? So this is kinda your first mission. Are you good enough?

In the excerpt above, Claire set the expectation that essay quality mattered, by explaining to students that Scoop would give them feedback about the quality of their submitted work. For

example, if students submitted a high quality essay, they would need to expect a message from Scoop saying, "This is great!"

Claire did not stop at only giving students an expectation of feedback but equipping them with knowledge of how to use the game's writing tools to produce high quality essays. In the tutorial, Claire proceeded to show students how they could use the tools in the game to ensure they were writing quality work. She explained that knowing how to use the Persuasive Argument Tool would be important to fulfilling their jobs as investigative reporters.

The PAT tool measured the strength of connection between students' chosen evidence with selected reasons and thesis. For example, a high score would mean that there was a tight connection between evidence, reasons, and thesis. Claire used this part of the tutorial to explain how the tool worked and further set the expectation that Scoop would be monitoring the quality of their submitted writing assignments, and ultimately her expectations for successful writing submissions.

> …Ok. Tells you how he's going to score your persuasive pieces. Ok? Making sure that the evidence you have is very, very solid. How many times have you heard that when we did our research paper? Is your evidence solid? Does it go on to really support your thesis? That is exactly what we are going to be doing here. Ok, and then you respond to him, "Who has that really handy tool." That is what every one of you will tell him.

This was another instance where Claire drew on students' previous class experience to make sense of what they would be doing in the game. In this case, she used students' class experience of selecting and discerning supporting evidence in a prior research paper to communicate her expectation of building their quality arguments in *Plague*.

In Phase Two, the data revealed that Claire wanted to use the 5-paragraph essay in *Plague* as a major class writing assignment. To accomplish her goal, Claire was first intentional about training students on how to view and operate the game. She used the tutorial as a platform

to establish her game play expectations so that students would use *Plague* in a way that was consistent with her normal literacy practices. These expectations involved establishing a rationale for why students were playing a persuasive writing video game, highlighting particular game practices students needed to use in order to fulfill their role (e.g., take notes, read critically), connecting how students' submitted work in *Plague* would be evaluated with the same standard used in previous writing assignments, and lastly, establishing accountability focused on promoting quality writing. In the next section, I will show how Claire transitioned her efforts from giving student tutorials and setting expectations to supporting students to meet those expectations.

Phase Three - Supporting Students to Meet Teacher's Expectations. After the first two implementation days, Claire shifted her efforts from setting expectations to supporting students to meet those expectations. The implementation data revealed a consistent effort to ensure that students continued to use *Plague* to fulfill a major literacy writing assignment.

Due to a family emergency Claire was absent on days three and four and asked me to address any technical issues that students may have. A substitute teacher was assigned to supervise students on those days but only supervised classroom behavior and did not engage students with the game.

Claire returned to her class on day five, and the nature of her classroom interactions shifted from setting expectations to supporting students to meet those expectations. This change was evident from the analysis of the structure of classroom activity. On day five, the majority of her classroom activity transitioned from whole group instruction, to one-on-one individualized support. The nature of this support was directed toward helping students fulfill the expectations established during the first two days (See Figure 7.2).

In this section I will show how the data indicated a transition in classroom activity, and I will end by giving classroom examples that represent how Claire supported her students to meet her expectations. The classroom data from day five through day ten indicated that Claire used the majority of class time monitoring students' progress, offering consistent submission feedback and extended periods of individualized support as needed.

In my field notes, I wrote that Claire appeared to always be moving and on her feet walking through her classroom, and this impression was confirmed through the data analysis. In a teacher-researcher interview after day seven, Claire explained how she preferred to be up and walking around during class and not behind a computer. She said, "I don't like to be the teacher who sits in front of her computer all day, you know? I like to be up and moving," and the classroom data revealed that she did, in fact, spend the majority of time walking around monitoring students' progress through *Plague*. In the last five days, Claire spent an average of 38 minutes of the 50-minute class periods, (i.e. 76%) walking around her class working with and monitoring students. Each interaction ranged from two seconds to five minutes. (See Figure 7.2 below.)

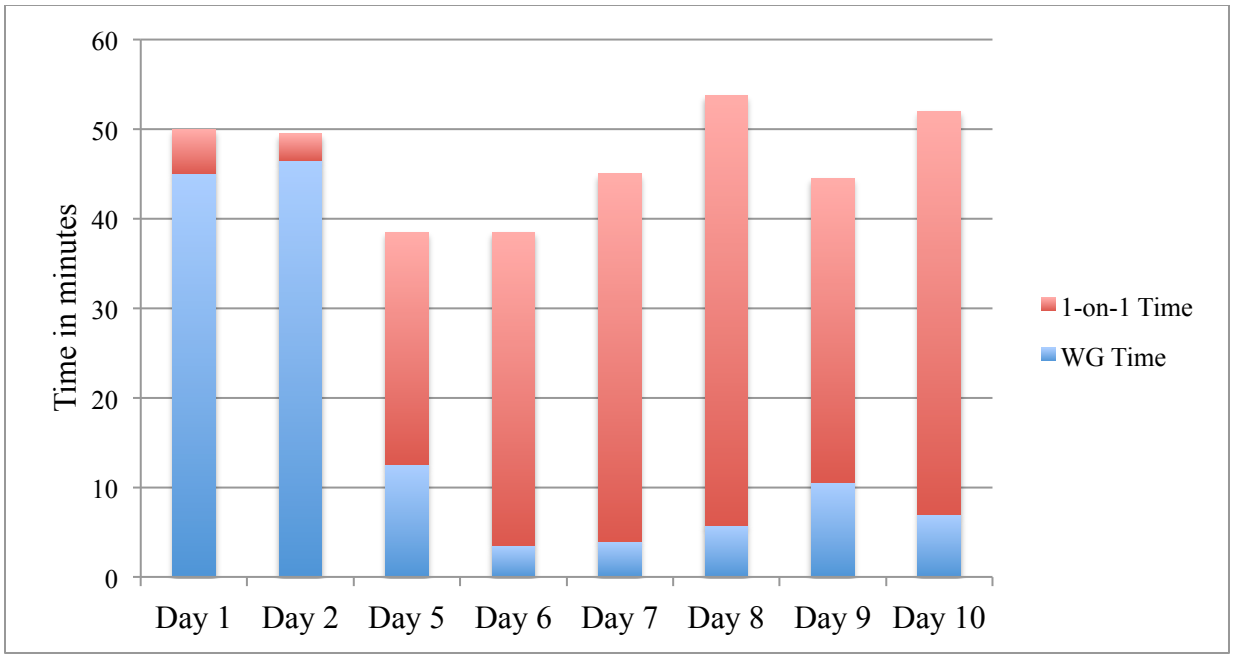

Figure 7.2 A comparison and distribution of Claire's classroom whole group and one-on-one activity divided in minutes across each day of her implementation.

The nature of Claire's classroom activity indicated that her efforts were aimed at supporting her students to meet the expectations she had set at the beginning of the implementation. During the latter half of the implementation, I coded the sum of Claire's classroom interactions as monitoring. Monitoring was defined as a type of classroom activity in which the teacher (i.e., Claire's) initiated engagement with students to identify individual student progress, and/or address any technical, narrative, or academic concerns. In contrast to monitoring interactions is supervising interactions, the activity when a teacher may be passive and mainly responding to student-generated questions (e.g., characterized by the substitute teacher on days three and four). Both of these student-teacher interactions, and the nature of classroom activities in the latter half of the implementation indicated that Claire was, indeed, being proactive in reminding students of the expectations of what she wanted them to do.

Classroom structure during each day. The class structure for days five through ten was very consistent and held the same routine. Claire would begin class with a short announcement that reminded students of the expectations they were to fulfill that day. Immediately following that announcement, students would log onto *Plague*, and Claire would commence the rest of her classroom interactions by walking around to each student's desk and asking them questions about what was just announced. The one-on-one interaction would last between two seconds and five minutes, depending on where a particular student was in relation to Claire's expectations.

Opening announcements. The topics of the opening announcements were focused on reminding students to check the status of their submitted reports (i.e., Quests) and to continue progressing through the game in a timely manner. Claire daily reminded students of her game play expectations, which were established during Phase Two. Below is an example of the type of announcement Claire gave at the beginning of class. In this announcement she reminded students to check the quality of their work:

> Claire: Ok, 7th and 8th graders…5, 4, 3, 2, 1. For not even two minutes, put your covers down so your attention is on me and not this amazing game. All right, just a reminder from yesterday, what is the first thing you do now that you signed in to your mission? Yes, honey. (Calls on student.)
> Student A: Check your mission list?
> Claire: Good. Well before the mission list? What do we do? Yes, [student].
> Student B: See if your quests need to be revised?
> Claire: Good. See if your quest needs any revisions to it. Ok. So make sure you go in and double check, read your feedback, from Scoop, that is the first thing you do. Because remember if it is not revised, I do not see it, and then what happens?
> Students: Get a zero!
> Claire: You get a zero for your portion in here. Right. So make sure you have done that.

During opening class announcements, like the one above, Claire reminded students that they would earn a zero if they did not review and revise their quests. This was a representative

example of the way Claire reemphasized her expectations that the quality of student's writing mattered.

One-on-one support. Each day, as soon as Claire was done giving her opening announcements, she would immediately begin monitoring students by walking around the class to follow up with each student based on the criteria she set in her opening announcement. The consistency and volume of one-on-one interactions made it clear that Claire was interested in supporting each student to meet her expressed game play expectations. The example below represents the shorter monitoring engagements with students. As she passed by a group of students playing she asked:

> Claire: How you doing? Where are we? Did we check to see anything that needs to be edited?
> Student A: Yeah, but it's still pending.
> Claire: Ok! (Toward Student B.) [Student], how about you?
> Student B: I'm just rewriting.
> Claire: That will be fine as long as you resubmit. (Toward Student C.) [Student], how about you? Yours are still pending?
> Student C: Yeah.
> Claire: Ok.

Monitoring students put Claire in a position to know how each student was progressing, and she was able to quickly respond to students doing something that was not aligned with her expectations. This avoided certain students spending large amounts of class time off task. For example, on day seven, while Claire was routinely monitoring students, she discovered that a student was not taking notes. She said:

> Claire: [Student] how we doing?
> Student A: Good.
> Claire: Good. Have we been taking notes in our book?
> Student A: No.
> Claire: Make sure you are because remember I'm going to collect those for a grade.
> Student A: Ok.

On day six, as she had done on day seven in example above, Claire reminded another student of the expectation to read critically by telling her to remember to pay attention to the directions of a particular quest. She said:

> Claire: Good. Now, before you submit this, make sure you go up and re-read again what it says to do and make sure that you are following that. Ok? Or before you submit it, you can call me over and I can read it for you. Ok?
> Student A: Ok.

Extended one-on-one support. The majority of monitoring interactions during days five through ten closely resembled the examples above. They were quick instances for Claire to check in and gauge each student's progress. During the last half of the implementation, Claire had 237 unique one-on-one monitoring interactions. From that number, only 14 interactions lasted longer than 20 seconds, and those interactions involved a few students who needed extra support in order to meet Claire's expectations. The efficiency of Claire's system allowed her the time and space to offer this small subset of students extra support without singling them out or taking away support from other students. After Claire initiated an interaction with students, the students' responses to her questions would indicate whether or not Claire needed to offer them more help. In the example below, Claire saw the need to offer extra assistance to one particular student, "Rachel". On day five, Rachel had resubmitted the same quest several times and was finding it difficult to follow all the quest's directions. Claire used her positioning as Scoop, the initial gatekeeper of quality, to motivate Rachel to follow directions. She explained:

> Claire: If you are missing aspects of the actual assignment, maybe you didn't follow all the directions correctly, then you might have a different message in here to tell you what you need to do to then go and fix it, revise and submit it again. This is a huge portion of this. Like I said, you will get a grade for the things that you submit. Eventually when Scoop has accepted everything, I will then get the accepted stuff. He'll say, "Yeah, they're doing great." And then I can go though and look at the accepted stuff. Right, to give you a grade within this classroom, if Scoop never accepts it, do I ever get to see it?
> Rachel: No.

Claire: So what happens? What does your grade turn into?
Rachel: A zero.
Claire: A zero because it hasn't been accepted. If you have to revise something, its really important that you take the time to read what Scoop is doing, and doing what you now need to do because you have to get that accepted in order for me to see it.

After this initial dialogue, together Claire and Rachel examined her latest submission in relation to the quest directions. The above example showed how Claire was intentionally supporting the student to meet her expectations by walking her through a process of assessing the student's current work with the directions on the quest. Later on during the implementation, Claire decided to sit down with another student, "Kim," for five minutes and walk her through the process of revising her quest. Claire said:

Claire: Ok, Kim, how we doing, honey? Did you check in? Did you check your missions? Are they accepted? (She looks at student's computer.) It looks like we have a couple that we need to revise. Ok, scroll all the way down to see what they told you needs to be done.…(after reading the quest response) Ok, lets go up. Let's look at it. It says that you are missing the three reasons. Right so, ok, so if you are writing a letter to your mom, right, when not going to be referring it to your old friend, you're saying (reads the quest out loud) "Hey mom, your friend Victor Frank, how the townspeople are divided," opening sentence, ok. "I know you heard some people want to stop the doctor and run him out of town. Others think he is Ingolstadt's best cure for the *Plague*." So Stan thinks it's a good to have it used. Why? This is where you're missing the reasons because why Gene says that this is a bad idea. In your notebook (referring to notebook) did you take notes in here when you talked to Gene and Stan? Yeah, all they talked about was the beast. Ok, they definitely talked about the beast a lot, but they talked about why they felt the way they did. Ok, do you have notes on why they thought that? (looking at notes…) Hum…all right, what I would do is probably go back and maybe see if talk to them, Ok, and find out what Gene thinks. So yeah he thinks that, he doesn't like the best and he doesn't want, it tested on, ok. And Gene thinks it is a good idea. Now we need to go back and find out why, why he feels this way.
Kim: Oh…
Claire: Why do they both feel that way? Does that make sense?
Kim: Yeah.
Claire: What I want you to do is go back and see if you can talk to them. Okay? Um, and I would really like you to get to that point when get all of your notes taken to review that. Go back and start typing that and then call me over. We can make sure that. How many times have you had to redo this? A couple of times, now, right?"
Kim: Yeah.

> Claire: Yeah, so, um, when you get to that point just call me over and make sure that we kind of set it up correctly and then it will be sent in and accepted. Then we'll go onto the next one because it looked like you need to redo that one also. Ok, honey?
> Kim: Ok.

In the exchange above, Claire could have simply told Kim to go back and check her mission list. Instead, she sat down next to the student and offered detailed support that connected the *Plague* narrative, academic content of persuasive writing, and her expectations for submitting quality work. Claire's prior experience playing through the trajectory of *Plague* gave her the knowledge to know exactly what this student was working on, and how best to support her. After this initial interaction with Kim, Claire landed at this student's desk two other times during that same day and spent a combined total of fourteen minutes supporting this one student.

The significance of the interactions between Claire and these students was important for several reasons. First, it showed that Claire was interested in helping students understand the connection between the narrative, main problem, and using the game in a way that was consistent with her previously stated expectations. Secondly, it showed the depth and breadth of Claire's capacity to support her students during class. She was able to monitor a lot of students with minimal effort after she set clear expectations during the first two days; however, when a student needed extra help, the system Claire had set up at the beginning of the implementation afforded her the time and space to do so. Third, the system Claire set up allowed her to support students at different achievement levels. In a teacher-researcher interview during day six, Claire explained that some of her 7th and 8th grade students had been tested as gifted. She described them as, "wicked smart." She also had students at the other end of the achievement spectrum who could only read at a 3rd or 4th grade level. In a class of 32, she would have only been able to reach five students if she had given each student the same amount of time as she did with Kim;

however, despite the differences in students, Claire was able to successfully support all of her students, and ultimately have 94% of her students submit the final essay.

Research Question #1 sought to answer how Claire implemented *Plague*. The results of the implementation data indicated her process involved three interrelated phases. Phase One involved her preparation for using the game. Phase Two occurred during the first two days of the implementation and involved setting her expectations for how and why students were using a 3D video game as a writing assignment. Lastly, in Phase Three, Claire aimed to support students in meeting her game play and writing expectations.

Using *Plague* As a Major Class Writing Assignment.

To answer research question #2, "How was Claire using the game?" I analyzed the themes and phases found in Claire's implementation data. The analysis revealed that Claire framed *Plague* to fulfill a major literacy class writing assignment by creating a set of expectations that situated *Plague* within the normal practices of her literacy class.

Starting in Phase One, Claire was able to learn how *Plague* could be used to fulfill a major writing assignment, and the results of her preparation were evident in Phase Two of the implementation. During the complex two-day tutorial, Claire framed how she wanted her students to use *Plague*. The expectations she established did not appear to be random or arbitrary, but were deliberate and intentional. Before students touched a computer, Claire explained *why* they were playing *Plague*. Second, through her step-by-step tutorial, Claire modeled how to operate the game controls while emphasizing specific game practices critical to producing a quality essay (e.g., taking notes, critical reading). Third, she communicated her expectations of how *Plague* was a game connected to her literacy class. These expectations involved framing *Plague* as a unique kind of game in which reading critically, taking good notes,

and writing quality essays were a major part of fulfilling the players' role. Lastly, she infused her authority into the game by telling students that the NPC Scoop Perry, was going to grade their work.

In Phase Three, Claire urged students to work towards completing their 5-paragraph persuasive essay. She shifted her efforts from setting expectations to supporting students to meet those expectations, and this involved transitioning her classroom activity from whole group instruction, to one-on-one individualized support to ensure that students were working toward finishing their 5-paragraph essay. All in all, the sum of Claire's implementation data pointed to her desire to use *Plague* in a way that was consistent with her existing literacy class, in that students would be offered a meaningful learning experience to produce a class assignment of a quality five-paragraph persuasive essay.

Claire's Implementation Process

In order to answer research question #3, I compared Claire's baseline interview statements with the themes generated from her implementation data. The results from this analysis revealed three integration themes. First, the intentionality Claire displayed to shape her implementation indicated that her integration process likely occurred before the implementation started. Second, Claire was intentional to frame *Plague* as a game that was intimately linked to her literacy class. Third, there were numerous indications that Claire employed her pedagogical preferences to shape her implementation, and that she was pleased with the result of her efforts.

Integration before implementation. Claire's integration process likely occurred during her preparation (i.e., Phase One) and, surprisingly, not during her implementation. In this study, technology integration was defined as the process of transforming a foreign technology into a useful tool; however, it was implicit in the implementation research that this process would occur

simultaneously with the implementation (e.g., Zhao et al, 2003). Starting on day one, Claire showed no indication that she was unaware of how the game was going to be used. In contrast, Claire exhibited a sophisticated level of intentionality for her students to use *Plague* in a precise way. She set specific expectations for how she wanted *Plague* to be used while also providing a rationale for why students were playing. At the start of her implementation, Claire appeared to have begun her implementation using *Plague* as a familiar tool (i.e., used for a specific purpose), and not as a foreign technology.

Claire's implementation preparation, (e.g., playing through the game as a student), likely created an opportunity for her to reflect on how her existing classroom practices could connect with various play and academic features in *Plague* (e.g., the *Plague* narrative, 3D immersive world, embedded persuasive writing scaffoldings). From this experience, she was able to create a plan that involved modeling how to play the game, while establishing clear expectations that would help ensure that students would produce the quality of work she expected for her class. For example, in her tutorial she elevated the meaning of specific practices that she thought produced quality academic outcomes (e.g., reading critically, using evidence to support their argument) and applied an existing grading rubric to the essays students would produce in *Plague*. Once students where trained on how to use *Plague*, Claire spent the remainder of the implementation supporting students to meet her expectations.

Claire's system allowed her to reliably keep track of the progress of 32 students and offer consistently high levels of feedback and academic support with a complex subject (i.e., persuasive writing). Even with her two-day absence, Claire's system resulted in 94% of her students finishing the final essay. Toward the end of the implementation she confirmed that

students were producing quality work. On the last day, she announced, “This is some of the best writing I’ve ever seen you produce. Great job, everyone! Keep up the good work!”

Claire liked how she could use the game’s embedded tools and NPCs to offload large portions of the essay organization and procedural feedback. This reduced Claire’s workload because she only had to support students writing on one topic, compared to previous persuasive writing units when she needed to support thirty-two different topics. During the implementation, Claire liked how easy it was to direct students to redo a particular step if they did not understand something. In the same light, when students were absent, Claire could quickly find out where they were in the game trajectory and then know exactly what type of support they needed. On Day 8, Claire commented on how her large class of 32 felt small because she had already visited each student multiple times within the first fifteen minutes of class.

Claire’s case adds an interesting angle to the larger portion of the technology integration literature that criticizes teachers for using technology in procedural and remedial ways (e.g., Cuban, 1998; Cuban, 2001). For Claire, a tool that could help her organize a complex subject, like persuasive writing, with a large and diverse group of students, was warmly welcomed into her classroom. In a teacher-researcher interview toward the end of the implementation, she explained how teaching subjects like persuasive writing, in paper form, was difficult and a lot of work because would students often get lost in the procedural details of creating a persuasive essay and miss the big picture of how to persuade an audience. When teaching persuasive writing in the traditional way, there was no automated system to help her keep track of students’ work. She explained that it was difficult to organize, monitor, and keep track of a large and diverse class all while continuing to have them meet her criteria of quality. In other words, without the

affordances of *Plague*, Claire could not have offered each student the level of support that she had offered Kim.

When doing the math, in a 50-minute class period, and after taking attendance and giving initial direction, Claire could only have offered 32 students one minute and twenty-four seconds of support. However, with *Plague*, after two full days of communicating her expectations and training students on how to play the game, Claire had enabled the majority of her class to successfully self-pace through the game with minimal corrective effort on her part. Furthermore, Claire's system left her with ample time and space to sit down with a select group of students and offer a very high level of support without neglecting the other students.

From the very start of her implementation to the end, Claire exhibited a sophisticated level of support to frame *Plague* as a major class writing assignment. It is highly likely that Claire's integration process occurred before the implementation as evidenced by her efforts to set specific writing expectations, properly train her students in using the game, connect the game narrative to their play, and offer a consistently high level of student support aimed at meeting those initial expectations. In other words, Claire appeared to have begun her implementation of *Plague* as a familiar tool (i.e., used for a specific purpose), and not as a foreign technology.

Framing *Plague* as a writing game. During her implementation, Claire was intentional to frame *Plague* within her literacy class, and this framing involved integrating two defining characteristics of her class. First, Claire established *Plague* as a writing game. During Phase Two of her implementation she told students that because they were in literacy class, they would be expected to write. She further supported her expectation by integrating additional literacy class practices of reading critically, taking notes, and supporting reasons with evidence. In Phase Three, Claire was constantly aware of her students' progress toward producing their essays as

seen in her high number of student support interactions and inquiries about student writing assignments.

Secondly, Claire established *Plague* as a writing game by requiring that the quality of students' writing produced in *Plague* needed to be at the same level as other class writing assignments. Claire accomplished this integration by using a familiar grading rubric, which was used with former writing assignments. In Phase Three, Claire cleverly embedded herself into the game, by taking on the role of Scoop Perry, in order to create an ongoing measure of quality. She used Scoop as means to ensure that students paid attention to the mission directions and submitted completed quests.

Integrating pedagogical preference into the implementation. In the implementation data, there were numerous references that Claire's employed her pedagogical preferences to shape her implementation. During Phase One, Claire provided a rationale for why students were going to play an immersive writing game. In her initial teacher-researcher interview, Claire recounted how it was easier teaching middle school students when they were given an explanation of the impact for why an activity was worth learning. Impact, according to Claire, referred to the increased level of real world influence a student could obtain by learning literacy content. When the themes in Claire's initial teacher-researcher interview were compared with implementation data, a connection appeared. In Phase One, Claire wanted students to reflect on how their decisions affected the virtual town of Ingolstadt. At another point in Phase One, Claire connected how real reporters and detectives take notes; therefore, students should see note taking as an authentic activity of real investigative reporters. In both settings, Claire displayed her interest for providing reasons for why a learning activity (e.g., producing quality essays in *Plague*) was worth investing the energy to finish.

Claire did not only want to ensure that students understood the mechanics of writing persuasively, but she wanted them to write with purpose. In a teacher-researcher interview on the last day of her implementation, Claire explained how her favorite part of the implementation was witnessing the passion students demonstrated to defend their positions (i.e., Defend Pro or Con side of the argument). She explained:

> My favorite part about that (implementation) was when I would walk around and being able to interact with them (students) and seeing their answers because I think it (*Plague*) had a little more, um, impact on them individually as students. Right, when I would ask them, "Um, how is your article going?" They had passion for it. They really felt one way or the other, and when I read their papers, they had so much passion in them. It's nice to see because sometimes when I assign an assignment and there is no reason because, "Oh it's a research paper." It's like, "You have to write the research paper because the teacher said so." It's different with this paper. They had to convince the town of how they felt and they convinced them (NPCs in Ingolstadt) to change the outlook of the game. Right, so, whichever side they picked, then they saw six months later that, their choice actually did change the town, and, um, I think it brings a little bit more reflection, a little more impact on the actual learning. I think it's going to be easier for them to remember. "Oh, my persuasive essay for third quarter in 7th or 8th grade was this." And, um, I just feel that it is a little bit more impactful.

The *Plague* implementation affirmed for Claire why she provided students with a rationale for the potential impact learning literacy content could create. In her *Plague* implementation, Claire happily attributed students' passion and quality of writing with their perception that their essay would make an impact. This example, along with the expectations communicated during Phase Two, indicated that Claire employed her stated teaching preferences to implement *Plague*.

In conclusion, Claire's case is one of a veteran literacy teacher who shaped an immersive persuasive writing 3D video game to fit within the existing practices of her literacy class. She intentionally framed her implementation to use the game to fulfill the requirements of a major class writing assignment, while simultaneously fostering student reflection on the impact of using persuasive writing.

CHAPTER 8 – CASE OF MARY

The creation of Mary's case involved addressing the following research questions: First, "What was involved in Mary's Quest Atlantis implementation process?" Second, "How did Mary use Quest Atlantis in her classroom?" Third, "What was the relationship between Mary's expressed pedagogical preferences and the way she used QA?"

This was a case of a veteran science teacher who used a science based 3D MUVE game as a virtual internship. She integrated her pedagogical preferences to promote a meaningful learning experience in which students practiced, applied, tested, and reflected upon the impact of practicing scientific inquiry.

Mary's Expressed Pedagogical Practices and Preferences

Mary was a veteran teacher who had taught science for twelve years. During this study, she was teaching her first year of 7th and 8th grade science at the suburban middle school, and her main goal as a teacher was to create a learning environment that presented scientific content as meaningful and impactful. In her baseline interview Mary passionately stated, "I think that everything we do in science has to have some meaning. Understand why are we doing this. What can I do to make this more meaningful for them?" Translated into everyday practice, Mary's pedagogical preferences of meaning and impact were realized in three different teaching practices: learning science from practicing science, promoting the process of problem solving, and reflecting on the impact of using science content.

Learning science from practicing science – Mary wanted to foster a classroom context in which students learned how to practice science. In her initial interview, she explained how she intentionally promoted class activities that allowed students to choose how to test, experiment

with, play with, and apply various scientific concepts. For example, earlier that term, she had students create model cars from various materials (e.g., popsicle sticks, balloons, rubber bands, paper clips, cardboard) in an effort to give students experiences applying Newton's three laws of motion. Students were asked to experiment with a number of different designs in order to create the fastest car. As I was prepping students' laptops for the Quest Atlantis implementation, I overheard Mary telling students to be intentional about using Newton's laws to refine their car designs. In our interview, Mary stated that her rationale for using the cars was intended to create an applied and meaningful learning experience. She explained:

> Well, I think we need to step back, and I think the first thing you need to do is make something that is meaningful for them, so that's why we did something like the cars so they got to construct it and develop it themselves. So they had the freedom to come up with their own idea, yet still had, um, specific questions they had to answer. Like, you know, "We talked about Newton's first, second, and third law, tell me how, what you just created, um, relates to those concepts."

When it was time for students to test their model cars, Mary recounted how a university physics professor, from the nearby university satellite campus, spent the day with her class in their shared lab space. Mary was surprised, but pleased, to find out how much the professor enjoyed interacting with the students and asking about their designs. She recounted, "He really liked talking with them. Asking them how they came up with their ideas, asking them why they used something like Popsicle sticks for their axels." Mary explained how her interaction with the university professor was an example that affirmed her pedagogical preference to offer meaningful learning activities. She explained:

> I think that, um, just giving them notes and telling them what those concepts are, they are not going to learn it. In fact, when I talked to Dr. Phillips, he said most of these concepts are really hard for college age students to learn. That they struggle with them, and he'll ask the same questions five times, and they'll won't get it the first four times, and maybe the fifth time. Because, um, I know there is a lot of things we talked about in my class that we go over there, they still have a hard time with. But I think that if you make the

> lesson meaningful, where there, they get to guide their own discovery of their own learning.

In contrast to her stated pedagogical preference, Mary recounted that in her previous twelve years of teaching she had found that science activities that focused on rote memorization did not help her achieve her goals as a teacher. She said:

> I've been teaching for twelve years now and just by giving notes and asking them to memorize facts, they're never going to remember it. And why should they? I mean with all the technology we have these days, if you want time to know something all they need to do is Google it.

As indicated in the quote above, Mary believed that students best learn science when they are given an opportunity to practice science.

Promoting the process of problem solving. In her class, Mary wanted her students to know that engaging the problem solving process was just as important as getting the correct answer. She wanted to create a classroom culture in which students took responsibility for persevering when problem solving, and her pedagogical preference was realized when she asked questions instead of offering answers. She explained:

> When I've taught from year to year, I have kids who get very discouraged by that, and if they ask me a question, I won't give them the answer…and they will go home and tell their parents that I refuse to answer their questions until they're used to being in my classroom because they are used to, because a child is normally used to asking questions and getting an answer, and that doesn't happen here!

In the quote above, Mary explained how it took students some time to adjust to her commitment to problem solving because she wanted students to realize that science was an iterative process. For example, it was not uncommon for Mary to present problems that required students to offer and test multiple explanations.

Reflecting on impact when applying scientific concepts. Mary's last pedagogical preference involved encouraging students to reflect on the impact of using science outside the

classroom. At the end of our interview, she emphasized her desire to help students understand impact. She explained:

> Oh, yeah, I had one more point I was going to make, um, is impact! A lot of the kids don't understand what empathy is, and I think that would be really good to talk about, what and how their decisions are going to affect.

Mary saw impact as an important contribution to her teaching because it helped connect students' actions with making science education meaningful. For this reason, she expressed her excitement about students playing *Taiga* because of the integration of science with environmental and social impacts. She concluded our interview by explaining her excitement about *Taiga*. She said:

> Yeah, that would be interesting to see what happened, when asking, "How would you feel if you were the fisherman, and everybody is blaming you because it's your fault? How would you feel if you were that fisherman? What would you do? What would you say that is when you can start talking about the ethics of good science?" I can make people believe certain things if I kind of tweak a couple of graphs and say that is what happened.

Looking back at how Mary sought to organize her classroom, there were three distinct strategies she related to make science learning meaningful. First, Mary wanted to use activities that allowed students to learn how to practice science. This involved creating activities that allowed students to test, experiment, play with, and apply various scientific concepts. Second, she wanted to encourage students to engage in a problem solving process. This involved supporting students by asking questions without providing answers. Third, Mary saw learning becoming more meaningful when students could reflect on the larger impact that applying scientific concepts and principles could have in the world.

The data analysis revealed that Mary integrated these same principles into her implementation of *Taiga*. In the following sections, I will show how Mary set students'

expectations for using *Taiga* as a science game that focused on the application of scientific reasoning, perseverance when problem solving, and the reflection on the consequential impact of one's decisions.

Mary's Implementation of *Taiga*

In order to answer research question, #1 "What was involved in Mary's Quest Atlantis implementation process?", I took the themes generated from the data to build a progression of classroom interactions that she engaged throughout her implementation. Her *Taiga* implementation took on three distinct phases (See Table 8.1). Phase One involved Mary's game preparation. Similar to Claire's preparation process, the implementation data indicated that Mary had finished preparing, and completed a major part of her implementation process, before the first day of the implementation. Phase Two, occurred on day one and involved establishing a rationale for why students were playing *Taiga*, a short game tutorial, and an introduction to the main narrative problem that aimed to situate where students would be applying the practice of scientific inquiry. In this phase, Mary's desire to frame *Taiga* as a meaningful learning activity became apparent in the way that she established the process of hypothesis generation as a game prerequisite. Phase Three spanned from day two through day ten and involved Mary applying a consistent effort to frame *Taiga* as a virtual context for applying and practicing various scientific concepts. During this Phase Mary applied her pedagogical preference to encourage students to reflect upon the impact that their decisions had on the virtual park.

Phase One – Preparing To Use *Taiga*. Mary prepared to use *Taiga* as a tool for her students to practice and apply the process of scientific inquiry. Before students were introduced

to *Taiga*, Mary spent several hours playing *Taiga* through the student trajectory, which was essential for her ability to use *Taiga* as a virtual internship.

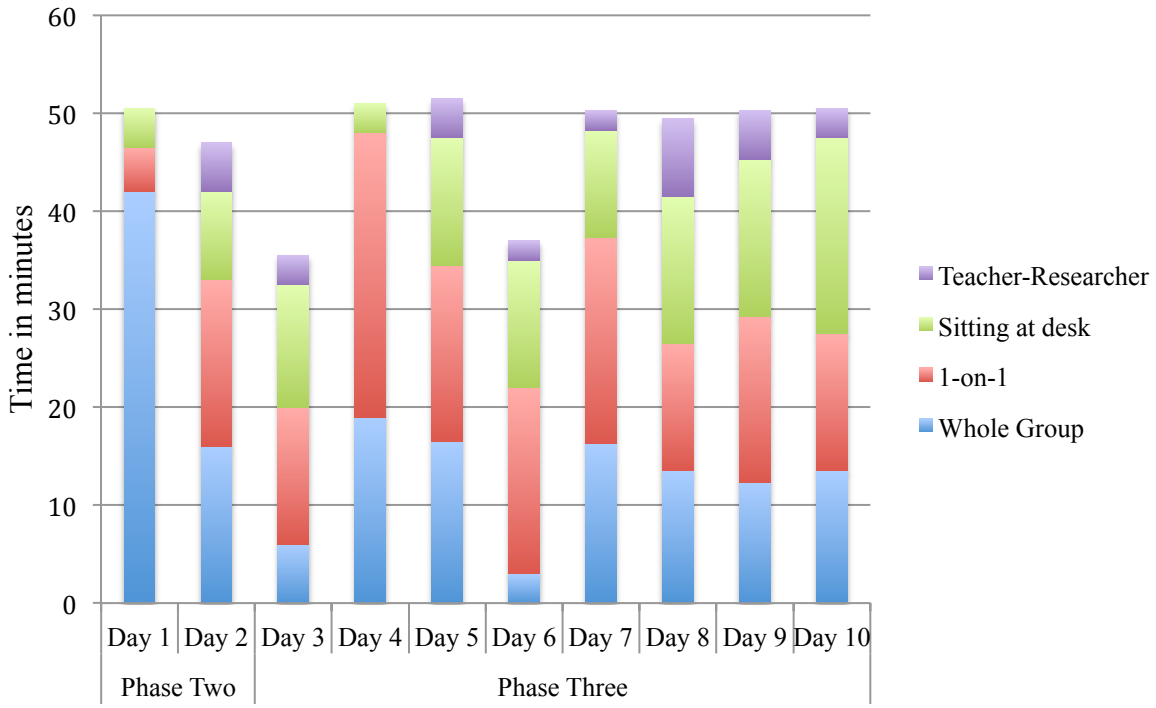

Figure 8.1 Comparison and progress of interaction types throughout Mary's implementation of *Taiga*

There was no data collected as Mary prepared and played through *Taiga*, but her preparation was evident in how she introduced *Taiga* and supported students through her implementation. While supporting students, Mary often referenced her own experience playing through the game as a rationale for setting a specific expectation. For example, at the beginning of the second day, Mary urged students to ask questions if they were lost. She drew on her own experience of learning how to play to encourage students to be proactive in asking questions. She explained:

> Is there anyone that has any questions about what you're doing or where you're at? Or if you're lost? I'm assuming you're all doing great 'cause no one's raising their hand, which is fabulous! But, no question is a dumb question, so make sure you ask. Believe me, I had some real dumb questions when I was playing. You're doing a lot better than I was doing. I'm impressed!

A few days later in the implementation, Mary made another reference to her process of playing the game, when a student corrected her for not being able to successfully navigate through a virtual cave. In a teacher researcher interview she explained how she thought it was funny that her students gave her the same advice she told them about navigating the 3D space. She recounted:

> I'll never forget the comment he (student) made about the cave, though, because I kept saying to the kids, "I cannot get in and out of caves." They're like "If you read the directions! It tells you to turn to the right." "Okay, you're all right." I'll never forget that. That's hilarious! I'm like, "Yeah, I read that about five times, turn to the right and which right is that? The first one! It says the first right you take in the cave." I said, "Okay, I get lost every time, you're right."

These examples illustrated that Mary took an active role in preparing to implement *Taiga*, and this preparation allowed her to know what students would experience as they progressed through the game. Additionally, her preparation gave her an opportunity to connect how the learning activities in *Taiga* matched her pedagogical preferences and academic goals. This finding was evident throughout her implementation.

Phase Two: Framing *Taiga* As A Science Game. Phase Two spanned the first day of the implementation. On that day Mary's classroom interaction data indicated that she intended to frame *Taiga* as a meaningful activity that was directly related to her science class and accomplished this by connecting the process of scientific inquiry with *Taiga*'s narrative and 3D world. She started class by positioning the content of scientific inquiry as a prerequisite for playing the game, and then, later on during the implementation, she explained to students how

Taiga was meant to offer an opportunity to practice and apply the process of scientific inquiry. In my analysis, I broke down how Mary initially positioned *Taiga* to offer students a meaningful learning opportunity to practice and apply scientific inquiry.

On the first day, there were four distinct activities that Mary used to shape students' expectations for how she wanted them to play *Taiga*. First, she gave a review of the process of scientific inquiry. Second, she offered a short step-by-step game tutorial geared at fostering students to self-pace progress through the *Taiga* missions. Third, she introduced students to the main problem in *Taiga*, and fourth she gave an explanation for how students' success in the game would be directly related to their ability to apply principles of scientific inquiry.

Establishing and reviewing pre-requisite knowledge needed to play *Taiga*. Before students learned that they would be playing an immersive video game, there was evidence that Mary had integrated her pedagogical preference to frame *Taiga* as a meaningful activity. In the implementation, she placed knowing of how to generate a hypothesis as a prerequisite to playing this game.

At the beginning of class on day one, Mary posted two questions on the board that she wanted students to answer. She referred to these beginning activities as "warm-ups." It was her way to focus students' attention toward the scientific content that they would be applying that day, and allow herself time to take care of daily administrative tasks (e.g., taking attendance). On the first day of her implementation, Mary wrote the following two questions on the board:

1. What is a hypothesis?
2. Tell me the difference between a fact and opinion.

This warm-up activity lasted about five minutes and was followed by Mary leading a whole group discussion. She initiated the discussion by briefly mentioning that students would be

playing a game, and then stated her expectation that students would first need to know how to generate and test a hypothesis before playing the game. She said:

> For the next two weeks, we're going to have to write hypotheses. The actual program that we are going to be working on, I want to make sure that you understand what a hypothesis is. It is not what? What is the one thing that I told you that it's not? ….

Mary reviewed and emphasized the criteria for generating and testing a hypothesis, and its scientific function. She told her class:

> You need to be able to test it. A hypothesis is not only an answer to a question. That's what it is, an answer to a question. In order to answer that question, you need specific background information. So we need to know about that problem. So you might need a bit of research to know what the cause or the setting right now is. Um, then we need to get specific facts about how to answer that question. So now I need to know the difference between a fact and opinion?

In the quote above Mary emphasized four interrelated points related to the definition, function, and process for generating a hypothesis. The points were, 1. A hypothesis answers a question, 2. To answer a hypothesis requires understanding the problem, 3. Research is required to gain access to the main problem, and 4. Observable facts need to be collected. Mary used these scientific principles as the prerequisites for students playing *Taiga*. In other words, Mary did not start her implementation by telling students that they were going to be playing an educational game, but instead intentionally framed the game as subordinate to the task of accurately creating and testing a hypothesis.

After the initial discussion, Mary immediately transitioned to communicate the game play expectation of taking accurate notes. It was at this point that Mary first mentioned that students would be playing a video game; however, she did not elaborate about how much fun the game would be, but instead, she directed students' attention toward the importance of using and recording observable data as they progressed through the game. She explained:

> The first thing we're going to go over is your notebook. This is extremely important (pauses) to not lose this. When you are going through each mission. You'll go through five missions. That's five different, a mission is like, it's about a day's worth of work. In each mission there are a number of different tasks, and to do those tasks, if you forget to what they are, you've actually writing some notes, in your booklet so. So it is very important that you are writing things down in your booklet.

Before students had opened their computers, or been told that they would be playing a game, Mary had initiated her *Taiga* implementation by establishing the knowledge of hypothesis generation and note taking as prerequisites for acceptable game play.

Teaching students game controls. It was not until after Mary's warm-up discussion in which she reviewed the essential elements of hypothesis generating and her initial game play expectations, that she allowed her students to first explore the 3D world. At this point, Mary offered a short step-by-step tutorial to train students on how to independently progress through the game. The activities in this tutorial involved showing students how to navigate in the 3D space and how to progress through mission steps. She showed students how to use the keys to navigate their avatar through the 3D space, how to teleport into *Taiga*, how to change their avatar, and how to use their mission steps to progress through the game. Below is an excerpt from the transcripts taken from Mary's tutorial:

> There are only a few things I'm going to show you until you can start making your avatar, just to show you examples of what you are going to be doing. So you're going to talk to different people. And if you ever forget what your mission is. Where it says home, you're going to click on home. Because it's going to show you specific directions. Ok, I'm going to show you some things, look at mine. You see this thing that clicks around and around for your mission. If you open it, it's going to show you the things you need to complete. Like if you forget what the ranger tells you, the people you're going to speak to, you can go back here, and it will show you what you need to complete.

The quote above showed how Mary's tutorial only covered the basic functions students would need in order to take responsibility for their own progress in *Taiga*. Mary was impressed with how quickly her students learned the basic game navigation and proceeded to introduce students

to *Taiga*'s main problem. In comparison to the amount of time Mary spent in the warm-up discussion that day, this game tutorial was short, and only lasted eight minutes. The amount of time spent on this tutorial in comparison to the other framing activities that day was additional evidence that Mary had integrated her pedagogical preference to frame *Taiga* as a meaningful learning activity.

Introducing *Taiga*'s main problem: After the tutorial, Mary had her students close their laptops to read and discuss the *Taiga* introduction letters. She used this letter to help students connect how each of the earlier activities (e.g., establishing *Taiga* prerequisites, game tutorial) were intended to help students see the game as an opportunity to practice and apply the process of scientific inquiry.

After students read the introduction letters to themselves, Mary explained her intention to use *Taiga* as a scientific inquiry practice tool in relation to students' role in the game. In the excerpt below, Mary restated the main narrative problem in connection to applying the scientific practice of discerning opinion versus fact. She explained:

> So basically what you are trying to do is figure out what is hurting Taiga National Park. There are three groups. You are going to talk to them, and they are going to give you information about what they think is causing the problem. The river is being polluted and the fish are dying! You're going to try and figure out what is causing that. So what you first need to realize is: Are the people you are talking to, are they giving you facts or opinions? That is why we talked about the difference between fact and opinion. You click on those different people to talk to, and they that is what you need to keep in mind. Is it a fact that they are giving you or an opinion? So you need to come up with a hypothesis during mission one. You'll actually revise that hypothesis in the second mission. Is what is causing the damage, what is causing the damage by these groups? All right!

As indicated in the quote above, Mary introduced the game features in *Taiga* as secondary behind students focusing on the process of generating and testing a hypothesis (i.e., scientific inquiry). Framing *Taiga* in this way was consistent with her stated pedagogical preference to

offer her students meaningful learning activities in which they could learn science from practicing science. Mary accomplished this framing by connecting how game play was related to successfully generating and testing a hypothesis. She first reviewed how students should generate a hypothesis, discussed how to discern the differences between opinion and facts, and emphasized collecting data and taking notes. It was not until after these first three activities that Mary told her students that they would be practicing and applying these concepts in a 3D game. After a short step-by-step tutorial focused on equipping students to self-direct their progress through the game, Mary introduced students to the main problem in *Taiga*. Phase Two concluded at the end of the first class period when she connected practicing scientific inquiry with game play. Her actions revealed a stronger intention toward wanting students to focus their game play toward properly applying the concepts of scientific inquiry than getting them excited about playing a video game in school.

After setting the expectation that *Taiga* would be used as a tool for practicing and applying scientific inquiry, the implementation data for day two through day ten, (i.e., the remainder of the implementation) further supported the claim that Mary had integrated *Taiga* before her implementation. She showed no significant signs that she was implementing a new technology. Instead, the implementation data revealed a consist intention to frame *Taiga* as a tool for fulfilling her stated pedagogical preferences. She placed a higher value on students properly understanding and applying scientific inquiry over enjoying the game. In the next section, I will highlight how Mary continued to fulfill her pedagogical preference to teach science by practicing science. She framed *Taiga* as a tool that students would use to practice and apply scientific inquiry.

Phase Three: Supporting Students to Meet Initial Expectations. Phase Three spanned day two through the end of the implementation on day ten. The analysis of Mary's classroom data revealed her intentionality to structure class time so that students would continue to focus on using the game for practicing and applying the principles of scientific inquiry. In other words, there was sufficient evidence, throughout the rest of the implementation, that Mary had integrated her pedagogical preference to use *Taiga* as a meaningful learning activity by exerting a consistent effort to support students integrating scientific content with game play.

The structure of each class took a similar shape and structure. Mary would begin her class with a warm-up activity spanning between eleven and eighteen minutes and consisting of a set of questions students answered by themselves followed by a teacher-led discussion. After the warm-up, the rest of the class period was allotted for self-directed play (See Figure 8.2 below for a day-by-day activity breakdown).

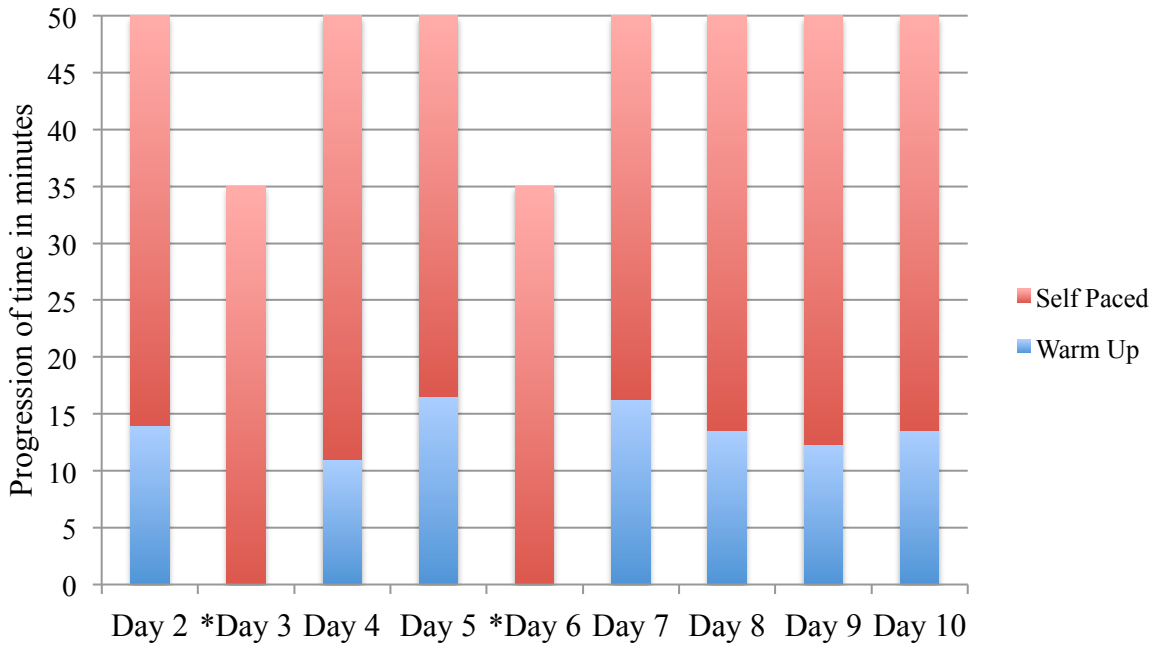

Figure 8.2 Displays the comparisons of class time spent between warm-up activities and self-directed play. *Indicates scheduled days with shorter class times.

Daily Activity Breakdown. Mary maintained a consistent focus toward reminding students to use key inquiry concepts in relation to their game play. From days two through ten the structure of classroom activities were the same. She began each class period with an eleven to seventeen minute warm-up and then allowed students to progress through the game trajectory for the rest of the class period. (See Figure 8.2 above)

Figure 8.2 shows the breakdown of classroom activity each day during the implementation. With the exception of days three and six, Mary started each class period with a warm-up activity followed by a teacher-supported self-directed play. Day three and day six were scheduled shortened class periods due to school-wide class functions, so no warm-up activities were given on those days.

Warm-up Activities. Mary used the warm-up activities to continue framing *Taiga* as a tool for practicing and applying science. Through use of these warm-up activities, Mary showed evidence that she employed her pedagogical preference to connect science and impact. The structure of each warm-up activity resembled the warm-up activity from day one. As students walked into class, they were presented with two or three questions posted on the board. She would give them five to seven minutes to answer the questions alone, followed by a seven to nine minute whole group discussion. In each of these discussions Mary intentionally connected how the same scientific concepts they were discussing were related to concepts they would be practicing and applying in *Taiga*. In Table 8.3 is a breakdown of each warm-up activity topic Mary conducted. The table shows how she sought to leverage the game play features in *Taiga* to accomplish her goal of using *Taiga* as a tool for learning science by practicing science.

Table 8.3

Mary's daily warm-up topics and her connection to game play in *Taiga*

Day	Topics and Concepts	Applying concepts to the game play
2	Review how to write a hypothesis Review the main problem - Fish are dying	When students talk to NPCs, they need to focus if NPCs are giving facts or opinions. Record facts in notebooks
3	No warm-up	No warm-up
4	Turbidity and sediment Dissolved Oxygen Water PH	How does extra sediment in the water effect the health of fish?
5	Relationship between the location of each group in the park and the type of river pollutant they created Previous days' vocabulary use in warm-answers	Asking students to recount the types of evidence they had collected from each site that they planned on using for their hypothesis. Remind students not to just take pictures of each site, but use pictures as evidence to assess each site
6	No warm-up	No warm-up
7	Systematic perspective of declining fish population problem in game	Asking students to consider a solution for the fish problem that benefited each party involved. Reminding students that game mechanics are related to giving correct evidence and not randomly clicking buttons.
8	Effects of high and low PH and fish health Effects of fertilizer on fish health	Helping students connect the balance of certain concepts related to fish health, such as PH, fertilizer turbidity, were related to each group's

		relationship to the park and the main problem.
9	Analyzing the implications of one's hypothesis.	Discerning the consequences of their decisions. Students discerning who was most affected by their recommendation.
10	Reanalyzing data based on previous results Continue to refine one's hypothesis in light of new evidence.	Understanding each party's contribution to the fish problem Helping students realize the water became cleaner when each party modified how they worked and lived in the park.

On day five Mary's warm-up questions were intended to help students connect how taking pictures at various places in the park was related to gathering observable data needed to test one's hypothesis. Embedded in this example was a process Mary used to position the game to allow her students to practice and apply scientific inquiry. First, she used an academic concept as a mechanism to focus students' play. Second, she followed up with questions aimed at getting students to reflect on how they would apply the concept in the game. Third, she offered feedback to help students refine and or refocus their use of a concept in the game. This process was evident on day five when Mary asked:

> What evidence have you collected to help support your hypothesis that you've written? Direct evidence that you've seen, you've observed? Not that you've heard opinions on. I'm calling a direct observation. You've actually seen it.

In the quote above, Mary's questions were focused toward getting students to connect game play with collecting empirical data, (i.e., the main academic concept that she wanted them to practice and apply that day). After asking the question, Mary was not pleased that students were reluctant to volunteer answers. In turn, she reminded her class that many of them were about to progress

through a section of the game where they were expected to collect evidence. She primed the discussion by saying:

> You have evidence that you've collected on it. Because some of you I've seen take pictures, what did you see with those pictures? Did you look at them, or did you just take them and then go? Because I think they actually wanted you to look at them and like take little notes about them what you saw. Ryan? What're some things that you saw?

Mary positioned the game as subordinate to students properly practicing and applying concepts of scientific inquiry. In this instance, Mary wanted students to use the picture taking activity in *Taiga*, as a means for collecting observable data on each site. She further communicated the value of collecting observable data by asking students to tell her what data they had collected. She reminded them of the academic concept as a means to focus their game play:

> That helps you, because remember when we write a hypothesis we need direct evidence. Stuff that you actually observed not that you just heard people talk about because remember those types of things when people talk are called what? Opinions! We need direct observations, things that you actually saw from the evidence that you collected.

This example represents one of many attempts Mary enacted to use students' game play experiences in *Taiga* to create a meaningful learning experience. Evidence of this process was captured when Mary addressed her class at the end of the warm-up on day five when she said:

> When you're writing your hypothesis, you need to think about what you've written in your notebook, what evidence that you've written down. Because I know when you were taking pictures, some of you didn't actually write down what you saw. When you go back to look at those pictures to write your hypothesis, you might actually want to examine them.

This pattern occurred for each warm-up activity. As Table 7.3 displays, this process was repeated eight of the ten implementation days and uncovers the process Mary enacted to use the game as a tool to promote scientific inquiry practice and application.

Self-Directed Play. After the warm-up activities, remaining class time was given for self-directed student play. This type of activity was characterized as students working by

themselves on laptops, progressing through the game missions. Mary proactively monitored each student's progress and offered individualized technology, navigation, and academic support as needed. In this case, one-on-one monitoring interactions were similar to how Claire monitored her students, in that Mary initiated engagement with students in order to identify individual student's progress and address any technical, narrative, or academic concerns.

While students were in self-paced play, Mary consistently paced through the room monitoring students' progress while also addressing students' questions. There were three types of problems Mary addressed when she monitored students: technical, progress, and tutorial. Technical problems arose when a student's computer froze or lost Internet connection. Progress problems arose when Mary was not pleased with a student's pace in comparison to the expectation set during the warm-up activities. Addressing both of these types of problems did not directly indicate Mary's intention to use the game as a tool for practicing or applying scientific inquiry, but they instead highlighted the pragmatic need to address such problems when working with an immersive technology. The last problem type, coded as tutorial, arose when a student did not know how to complete a particular mission step.

When faced with a tutorial related question, Mary displayed her desire to foster her pedagogical preference of promoting the problem solving process and her desire to use *Taiga* as a scientific inquiry practice tool. As a means of justifying why students were asked to complete a game step, Mary supported her students by interjecting a question or statement related to scientific inquiry. For example, on the fourth day, a student asked for help in order to understand what was required in a submission for a particular quest. At this point in the game, this student had interviewed multiple NPCs and had collected observable data needed to test his hypothesis, but was unsure what to do next. Mary supported the student by walking him through the steps

needed to complete this submission and stressed the importance of using evidence, a scientific practice emphasized in previous warm-up discussions and throughout the implementation, to complete this assignment. In the excerpt below, notice how Mary supported the student and emphasized the need to use evidence, a concept she had earlier discussed in a warm-up activity. She said:

> Mary: It says revising your hypothesis.
> Student: It just says include details from the people.
> Mary: So, here. Go back up here. (Points to quest description on student's computer) So it says, (reads quest description on the computer screen) "You need to write a testable hypothesis about the cause. Include details of what you learned from talking to the people or any evidence you collected." (Toward the student) Like the pictures or the meters, (Continues reading) "Describe how your hypothesis may be weak or flawed and what other alternative hypothesis are possible." (Toward the student) It's asking you to come up with more than one hypothesis if you can.
> Student: Ok.
> Teacher: Make sure you are using evidence to support it, so you can test it.

There was no evidence to suggest that this student was not using the game as Mary desired, only that Mary felt inclined to remind the student to use evidence. This was an indication that using *Taiga* in a particular way was in the forefront of her mind. In other instances, Mary encountered students who needed tutorial help because they failed to use the game as she intended. Through these interactions, Mary's desire to use *Taiga* as an application tool was further confirmed. For example, on day four, a student did not know how to proceed and called Mary over for help. After asking a series of questions, Mary soon found out that the student had just sped through the mission steps and failed to record any data from the NPC interviews or observations. She then told the student:

> I don't know what you've done here. Did you write down what the fish tank looked like? (Student remains silent) Are you writing in this? (Points to student's field notebook.) Here is the problem: you're supposed to be taking notes here. I'm collecting this. Because it asks you what were the Meter 1 Readings. You're supposed to tell me what is the temperature, the turbidity and what you learned.

Mary eventually walked the student through the task and reminded the student to record data for the rest of the implementation. The examples listed above represent the types of problems Mary encountered throughout her implementation. The manner in which Mary solved these problems supported the idea that Mary drew on her pedagogical preferences to frame the game and guide how she supported students. In her implementation, Mary displayed a continued effort to use the game as a tool for practicing and applying scientific inquiry to support students engaging in the problem solving process.

Furthermore, the results of research question #1 indicated that Mary's implementation took three distinct but interconnected stages. Phase One involved Mary's game preparation which took place before the start of her implementation. Phase Two occurred on the first day of the implementation and involved establishing a rationale for why students were playing *Taiga*, conducting a short game tutorial, and then situating students' use of scientific content within the *Taiga* narrative and 3D world. Lastly, Phase Three spanned from day two through day ten and involved using a similar class structure for framing various scientific terms and concepts to be practiced and applied within the *Taiga* missions that students were expected to play that day.

Using *Taiga* to Practice, Apply, Test and Reflect Scientific Inquiry

To answer research question #2, "How was Mary using the game?", I analyzed the themes and phases discovered in Mary's implementation data. From this analysis, it was apparent that *Taiga* was used in a way that was consistent with a science teacher who wanted her students to practice, apply, test, and reflect upon the process of scientific inquiry. Implemented in this way, Mary's use of *Taiga* was characterized as a virtual internship.

When I considered how to characterize the way Mary used *Taiga*, the choice of a virtual internship seemed to be the most accurate representation. An internship characterized the process

of someone (i.e., an intern) working *in situ* with the specific intention to gain experience. Upon examining the data, two significant themes emerged, which indicated that Mary used *Taiga* as a virtual internship.

First, Mary intentionally set to create a classroom context in which students could use the game to gain experience applying the process of scientific inquiry. During Phase Two (i.e., day one) we saw Mary starting her implementation by announcing that students needed to understand how to generate and test a hypothesis as a prerequisite for playing *Taiga*. After a short game tutorial, Mary established the problem in which students were to apply the concept of scientific inquiry. Next, Mary situated the application of prerequisite knowledge directly into the *Taiga* narrative. Mary communicated that if students did not know how to generate a hypothesis, then they would not be able solve the main narrative problem. In Phase Three, Mary continued to use warm-up activities to frame students' play.

For the second theme in Mary's implementation, Mary emphasized students' use of the game as a tool to reflect on their impact from their science application. In this case, impact involved connecting the use of science content as the main means for progressing through the *Taiga* narrative. For these reasons, characterizing Mary's use of *Taiga* as a virtual internship seemed the most accurate representation because of the emphasis she placed on students reflecting on their play.

If Mary had focused solely on hypothesis generation, without explicitly mentioning how students were to take responsibility for solving the problem, then I would have characterized Mary's use of *Taiga* as a virtual lab. At the same time, the alternative characterization for Mary's use of the game as a virtual field trip would not explain why students actively participated in and took responsibility for solving the narrative problem. This is because the educational value of a

field trip is to expose students to a new context in which science is applied, and not to position students to take responsibility for solving a problem.

In Phase three, Mary continued to encourage students to take responsibility to use science to change the *Taiga* story. On day five, Mary wanted students to reflect on the potential impact their hypothesis would have on each group using the Park. She drew a diagram of Taiga National Park on the board. The diagram included each major site (e.g., Loggers, Mulu People, and Sport Fisherman) in relation to the direction the river flowed through the park. She used the diagram to help students predict and reflect on the potential impact their hypotheses would have on the park. Toward the end of her implementation, on day nine, Mary wanted students to consider the impact of their choices, and so asked students to reflect on the consequences of their initial recommendation. On that day she asked the class:

> What do you think? Not, what do I think. What do you think most likely caused the changes in the park? Everybody might have a different answer, there's no right or wrong answer…What do you think you could have done instead?

The results of research question #2 indicated that the implementation themes revealed that Mary used *Taiga* as a virtual internship. She framed *Taiga* as a game in which students could practice, test, and then reflect upon the consequences of applying scientific content within the virtual world of Taiga National Park.

Mary's Integration Process

In order to answer research question #3, "What was the relationship between Mary's expressed pedagogical preferences and the way she used QA?", I compared Mary's baseline interview statements with the themes generated from her implementation data. The results from this analysis revealed that a major part of Mary's integration process likely occurred before her implementation started, which incorporated each of the previously stated pedagogical

preferences: the development of meaningful learning opportunities and encouraging students to take responsibility for their learning and to develop an awareness of their impact when using science. There was no data collected when Mary was preparing to use *Taiga*, but her implementation data indicated that the game was not a foreign technology. Instead, the data revealed a notable level of certainty and intentionality in the way Mary had systematically incorporated each of her stated pedagogical preferences into her implementation.

Learning science from practicing science. In her initial interview, Mary stated her belief that students learn science best when they are given an opportunity to practice science through meaningful learning activities. According to Mary, the criteria for a meaningful activity involved creating a problem that required the direct application of a science concept, and giving students the freedom to choose how they would test, practice, and apply a solution.

The implementation data revealed that Mary used the same criteria she employed for creating a meaningful activity that she did for implementing *Taiga*. In Phase Two and Three Mary positioned *Taiga* as the virtual testing ground for scientific inquiry, and, as explained in previous sections, it is important to note here that Mary continuously stressed practicing and applying content as the main activity and use of *Taiga*.

Mary also emphasized students' choice. In Phase Two, Mary explained to students that they would choose which group of park stakeholders they thought had caused the fish decline by applying the process of hypothesis generation. In Phase Three, Mary asked students to reflect upon the choices they had made in the game, and by doing this, along with positioning the content to be applied and emphasizing student choice, we can see that Mary did, in fact, integrate her first stated pedagogical preference.

Promoting the process of problem solving. Mary saw the iterative process of problem solving as the gatekeeper for learning science content. She said it was through the iterative process of applying a concept, that science could become meaningful. It was for this reason, that Mary was explicit about not telling students the answers because she found it hindered the problem solving process.

The data revealed that Mary integrated this preference during her implementation. In Phase Two, Mary presented the main narrative problem in *Taiga* as something that would require students to actively engage in a problem solving process. In Phase Three, Mary inquired about students' progress, and asked them to defend their choices. Throughout the entire implementation, there was no evidence that Mary told students the right answer to any content related question. Instead, she responded to questions by reminding students to apply the process of scientific inquiry to find an answer.

Developing empathy when applying scientific concepts. The last theme of Mary's pedagogical preferences was that she wanted students to think about the larger worldly impact of using various scientific concepts and principles. Mary saw impact as an important contribution to her teaching because she wanted to help connect students' actions with meaningful science application.

The data also revealed that Mary integrated this preference during her implementation. During the warm-up activity on day nine, Mary could have examined and analyzed the reasons for why students chose the wrong hypothesis. Instead, she used the whole group discussion to have students reflect on the changes their recommendations created in Taiga National Park. In this way, Mary integrated her desire to foster students' empathy in the virtual context in which students applied their scientific knowledge.

Therefore, the results of research question #3 indicated that a significant amount of Mary's integration process occurred before her implementation started, and yet, there was ample implementation evidence that she integrated each of her stated pedagogical preferences to use the game as a virtual internship.

In conclusion, this is a case of a veteran science teacher who used a science based 3D MUVE game as a virtual internship. Mary integrated her pedagogical preferences to promote a meaningful learning experience in which students would practice, apply, test, and reflect upon the impact of their process of using scientific inquiry.

CHAPTER 9 – CROSS CASE ANALYSIS

To answer research questions #4, "What were the integration themes across cases?" I compared and contrasted the themes generated from research questions one through three. From these analysis three major themes emerged; first, teachers sought to implement Plague or Taiga in relation to their stated pedagogical preference. Second, in relation to the first cross case finding, each teacher implemented the game in a way that would buttress his or her existing classroom authority. This finding became apparent though the various ways each teacher addressed a common set of implementation risks. The strategies each teacher used to address these risks was consistent with their used of QA, but differed between cases. Thirdly, the complex, sophisticated, and organized manner in which two of the four teachers preemptively addressed these new implementation risks indicated that the process of sense making (Weick et al., 2005) is likely another element of a teacher's game integration process.

Teachers' Attempt to Leverage Game Affordances to Maintain Student Control.

It was clearly stated in the game literature that the advantage of educational immersive games was that students could be given the opportunity to freely explore and make choices within an information rich virtual world (e.g., Squire, 2006; Barab et al., 2010a). In this study, the game affordance of "free play," (i.e., giving students the ability to freely roam within a 3D virtual world), presented major challenges each teacher needed to confront in order to successfully use the game as they wanted. As each teacher sought to implement QA, they were faced with the challenge of managing or controlling their students' free play so that students would use the game in the manner in which they directed, and produce quality work within a limited amount of time. For example, John, Claire, and Mary were able to implement the game in

a way that supported their classroom authority; however, for Heather, the game affordance of free play allowed students to continue to circumvent her classroom authority (i.e., her explicit expectations) which resulted in her ending the implementation frustrated with her students.

These finding resonate with what Savery and Duffy (1996) found in other problem-based contexts, in which teachers were challenged to create a learning environment in which students were encouraged to take on goals that were complementary to achieving the goals of a curriculum (Savery & Duffy, 1996). Similarly, Barab et al., (2012) noted that if students did not find the problem worth engaging or were distracted by other game affordances, their performance would not likely yield the desired learning outcome. In this study, each teacher was challenged to manage students' free play, while remaining in control to get students to complete each mission, and ultimately produce quality work within a limited amount of time. Their solution to this problem was to explicitly define specific game play expectations, that they found were necessary toward using the game to meet their teacher's goals. Expectations were the explicit rules that students were to apply when playing Plague or Taiga. In each case, teachers set explicit expectations for how they wanted students to use Plague or Taiga. The expectations pertained to how students were to use content in their play, highlight specific game play practices, and set explicit play rules aimed to help students meet the teacher's content and quality expectations. An expectation functioned as a bridge between what each teacher experienced playing and how he or she wanted to use the game. It also functioned, as a way to avoid potential implementation pit falls that they experienced through their own play.

The cross case analysis revealed that each teacher was intentional to set and manage expectations that outlined how students were to engage with academic content. By reflecting upon the relationship between an implementation and integration, Rodger (1995) and Hall and

Hord (2006) offer an important insight into the significance of identifying the various expectations given by teachers. As stated in Chapter Three, an initial implementation is a teacher's first opportunity to test whether or not a particular technology can be used in a way that will buttress his or her existing classroom authority. A teacher's decision whether or not to continue to use a particular technology is largely influenced on how well the new technology was first implemented. When we apply this process to integrating immersive games, this study revealed that implementing immersive games was a tremendously complex and brittle process. The number of expectations each teacher gave indicated the number of factors that influenced whether a teacher could use the game as they desired (e.g., technology infrastructure, training students how to play, setting explicit game play expectations). The implementation was brittle because each teacher had to offer intentional effort to ensure that the various game elements worked together in harmony. In the section below, I will break down the various factors that challenged each teacher's authority and then compare and contrast each teacher's attempt to address these factors. The implementation threats were (1) technology breakdowns, (2) student game operation, (3) teacher academic expectations, and (4) student game progression

Technology Breakdowns. Immersive games like QA are complicated technical systems that require a robust network of technology in order to run smoothly. For example, to operate QA required data servers, personal computers, networks, adequate Internet bandwidth, routers, data ports and ample Wi-Fi access points. During the study, each teacher experienced several technical breakdowns. A technical breakdown occurred when one or more components of the complex system failed to work or could not communicate with the other parts of the system. As a result, students were cut off or hindered from playing. These technology breakdowns threatened

each teacher's classroom authority because the root causes of many of the technical breakdowns were beyond the control of the teacher to fix.

Zhao et al., (2003) found that when the support needed to run a particular technology spanned a short distance and when the dependence on obtaining resources needed to support students using the technology was minimal then the technology was likely to be integrated. For example, if a teacher could implement an educational technology without the expressed consent of an administrator or could troubleshoot technical problems without the help of a technical specialist then that technology would have a low dependence. Additionally, if the resources needed to support students could be easily accessed by the teacher, (e.g., obtaining a cart of laptops) without needing the approval of others, then that technology would also be considered to have a low distance. Zhao et al., (2003) explained when the distance and dependence were low a technology would most likely be integrated. When we take Zhao et al's concepts of distance and dependence and apply it to Quest Atlantis we find that the distance and dependence of using this game were both very high.

In the four cases, there were a total of 140 differently coded instances in which teachers were confronted with technology breakdowns. Technology breakdowns were coded any time student progress was hindered because of some aspect of technology failing to work. Examples of technology breakdowns included computers freezing, slow Internet connectivity, QA servers failing to communicate with student accounts, Quests not submitting when students clicked the "submit" button, slow response time for clicking buttons, students getting stuck in virtual walls, and virtual worlds not fully downloading. Each of these 140 instances of technology breakdowns challenged the teachers' authority to use the game as they desired because the distance and dependence on these were beyond the reach of the their control to fix by themselves.

Of the four teachers, Heather's class was the most affected by technology breakdowns. Even before students began play in the 3D world, a problem occurred in which the QA server was not communicating with teachers' efforts to register students. In QA, student data is used for research, and this requires that every QA teacher indicate that his or her students have turned in a parent-signed Human Subjects release form. Teachers make this indication online through the teacher portal. On the first day of playing QA, Heather took the proper steps to ensure that her students were registered. In normal circumstances, there would be about a minute lag time between the teachers registering their students and students being able to log onto QA; however, when it was time for Heather's students to log on, the system did not recognize their accounts. After having all of her students log off of QA and restart their computers, the QA system still did not register her students' accounts. Heather was then forced to find an alternative curriculum solution for the rest of class that day. When she realized that QA was not going to be used on the first day, she told her students the following:

> Please listen. I want you to shut down your computers and restart them, please. Shut them down. Restart your computer please….(After five minutes had passed, students had restarted their computers and could see that QA was still not working). Please switch your papers with um, your partner. Make sure your names are on your paper. Remember if I don't have your brain pop by the end of today, uh, all eight modules, it will be a zero!

Debriefing with Heather after this class period, she explained that she felt like a failure because she felt personally responsible for technology breakdowns and felt like she was letting her students down. In the quote below, notice how Heather alluded that the technology breakdowns undermined her classroom authority:

> I feel like I'm failing this because I feel like they should have already been starting their game by now, and they're not. I've been wanting to know what I need to do to help this because I feel like I'm doing the kids a disservice. I don't know what I'm doing wrong.

Heather was frustrated when the technology broke down because she felt powerless to help her students continue in the game. In addition to Heather's feelings of inadequacy, this technology breakdown took students away from the game for an entire class period.

In John's class, he had to deal with computers that did not allow all of the objects to load in the 3D world. Students couldn't see their avatar, textures on the ground, or buildings, and were able to walk through walls. These technology breakdowns inhibited John's students from progressing because they would get stuck in 3D objects like walls or buildings, or the computer would freeze. John's strategy for overcoming this was to have students choose another computer from within the class's computer cart. This strategy only worked if there were extra computers, and the students would make known that they needed another computer. In one particular case, John noticed a student was not playing. When confronted, the student explained that his computer was not working. John explained that he needed to go get another computer:

> John: "Hey, [student name]! Shouldn't you be writing?"
> Student: "I have to do some writing in Ingolstadt."
> John: "You have to finish Ingolstadt, [student name]!"
> Student: "My computer doesn't work. It keeps freezing."
> John: "Do you need a new one? Exchange it!"

For Claire and Mary, technology breakdowns were addressed in a more proactive manner so that students could find ways to keep progressing in spite of known technical glitches. For example, school issued laptops would often freeze, thus preventing students from progressing. Claire and Mary told their students that their computers would likely freeze during play and offered the strategy of restarting QA to fix the problem. For example, Claire explained to her class:

> Okay, 7th and 8th graders, we have already had a few students with computers who have frozen up on them. It happens relatively often. It has happened. All you're going to do is close out of QA, and then just re-log in, and it should be fine. Okay, so if your quest freeze, don't log out of your computer, just refresh your Quest Atlantis, and then log back in.

In this study, each teacher could do little to plan against technology breakdowns. By examining the technology breakdowns in relation to teachers' authority to use the game in a certain way, highlights the point that implementing these technologies are complicated and require significant technology infrastructure support. If that support is not in place prior to the start of an implementation, then the distance and dependence needed to support games like QA could be too far or too much and thwart the teacher's intended use of the game.

Students' Game Operation. Despite the high amount of technology breakdowns that occurred during the implementation, not all technology related issues were outside of the control of the teacher. Teachers had the ability to train students on how to operate QA. From these results, we can see that another implementation threat revolved around giving students enough time to learn how to operate the game. It would be shortsighted to assume that students would automatically know how to operate a new game (e.g., Plague or Taiga) without any prior explanation or game tutorial. Instead, when implementing a new game into one's classroom, a teacher should expect to take responsibility for ensuring that his or her students know how to operate the game being implemented.

On the other hand, when students did not know how to navigate the immersive 3D world, interact with NPCs, submit writing assignments (i.e., Quests) then they could not use the game as the teacher wanted. Therefore, tutorials, teacher-generated activities, were used and functioned to eliminate this implementation threat by training students to use Plague or Taiga in a particular way. Tutorial topics included 3D navigation, avatar customization, learning the game interface, reading dialogue pages carefully, and learning how to determine the next step in their trajectory.

The implementation data showed each teacher spent time training students on how to operate the QA technology. The structure of these tutorials differed in ways that were consistent with each teacher's stated pedagogical preferences and role. Three of the four teachers conducted tutorials through whole group interactions. Claire and Mary structured their tutorial by first clicking something in the 3D world and then having the students follow by clicking that same thing on their computers. They also used the tutorial to set up specific game play expectations while preemptively addressing known technology problems. This will be discussed further below.

In contrast to Claire and Mary, John's method of offering tutorials fit with his role as a student supporter. He did not conduct a whole group tutorial, but in the first two days, the majority of his support was geared toward helping students navigate the 3D world and submit their first quest.

Heather used the tutorial as the means to fulfill her need to show students how to play the game. Unlike Claire or Mary, she did not ask students to play along with her, but simply observe her as she progressed through various mission steps. On day three, the class period after offering her first tutorial, Heather soon realized the majority of her students were still experiencing problems navigating through Taiga. This was followed by her spending the majority of the next two class periods showing students how to play. Heather used the tutorial to ensure that students knew what to do, but the amount of time she spent showing students how to play threatened her established classroom authority to get students to finish on time. Her tutorial resembled what Zhao et al, (2003) said about the teacher taking over the technology and playing for the students.

Despite the different approaches for offering tutorials, we see a common theme tht each teacher directly sought to address the students' need to learn how to operate the game. By taking

time to equip students to use the game in a particular way, aided in buttressing each teacher's authority by eliminating the threat that students would not know how to play.

Setting expectations for engaging with academic content. The next implementation threat was connected with students' engagement with the game's embedded writing activities. As mentioned in Chapter Four, one of the major ways students engaged with academic content was through the completion of various Quests (i.e., writing activities). The manner in which each teacher presented their expectations for engaging with the Quests indicated that they did not assume students would automatically engage in the ways they wanted. On the contrary, each teacher set a similar set of expectations, which were connected to the ways they wanted students to engage with the game's writing activities. Across cases, each teacher set explicit expectations communicating that playing this game required students to, 1. Read carefully, 2. Take notes, 3. Produce written recommendations and analyses, and, 4. The quality of their written work should match the standard of normal classroom work.

Reading carefully. Each teacher stressed that reading carefully was essential for playing Taiga and Plague. Acknowledging this aspect of each teacher's implementation may appear to be minor, but the design of each QA game required students to read a lot of text. Furthermore, reading the text was a major way in which students saw the narrative progress, perceived consequences of their actions, detected character motive, and discerned opinion verses fact. If students had simply clicked through dialogue pages without comprehending the message, they would have overlooked critical information necessary for completing their Quests. For these reasons, each teacher set explicit expectations to read carefully.

Reading carefully also helped ensure that students paid attention to the content and used the game as the teacher wanted. From playing the game as a student, each teacher would have

had first hand experience using the information presented in the 2D dialogue pages and mission pages for navigating through mission steps, witnessing the progression of the narrative, and experiencing how students would engage with the academic content. If students did not read this information carefully, then they would have gotten virtually lost and could not have engaged with content in a way that each teacher wanted. Therefore, the expectation to read carefully likely represented each teacher's effort to ensure that his or her students placed value on paying attention to all of the information in the game.

Claire had a lot at risk if her students did not read carefully. Therefore, she preemptively set the expectation that playing Plague correctly required students to read carefully. She infused this expectation in her tutorial and justified reading carefully as a strategy for not getting lost. Reading carefully was significant for Claire's students to not get lost in the game trajectory, but more importantly, ensured that students were using persuasive writing to solve the main problem.

For John, if students were reading carefully, then that meant they were doing their work. It was only when students stopped playing the game that John's authority to maintain class order was called into question. Therefore, in John's class, students were given the expectation that they were to read carefully. Reading carefully was John's way of ensuring that students paid attention to the tasks in the game and guaranteeing that they could finish the five missions.

For Mary, reading carefully was an essential step in her using Taiga as a meaningful learning experience. Reading carefully would ensure that students understood the main problem and could apply the lessons discussed in the warm up activities (e.g., discern which NPC were offering opinion or facts). In her tutorial, Mary emphasized to her students to read carefully so that they would not get lost in the same way she did in her preparation.

Student's reading carefully had a different purpose for Heather compared to the other teachers. In her tutorial she acknowledged the importance of reading the dialogue pages in order to finish the game. After these initial references, the rest of her interactions coded as reading carefully were in reference to students disobeying her rules. In other words, what appeared to be at risk for Heather was the potential loss of respect compared to a risk of students not using the game for a particular purpose. Used in this way, the game became a major threat to Heather's authority because the free play offered students a way to continue playing without doing what she said. Furthermore, Heather communicated to students that not reading carefully was a direct form of disobedience. Nevertheless, students continued to not engage, as she desired.

Taking notes. As reading carefully was stressed for proper game play, each teacher also placed a high value on note taking during student game play. In each game, students were asked to use the data gathered through their play to complete their analyses and recommendations. If students failed to record this information then they would not able to complete the written portions of the game, and furthermore would have failed to use the game as the teachers wanted.

In John's implementation, there was no evidence that his classroom authority would have been challenged whether or not students filled out their notebooks. Instead, filling out notebooks was not required but only presented by John as a game supplement that students could use to keep their quotes organized. This use of the notebooks was consistent with someone using a game within a learning lab or study hall.

In contrast to John, Claire, placed a much different value on notebook use. From playing the game herself, she realized that there was a lot of information that students needed to keep track of (e.g., specific characters providing specific quotes, supporting a particular side, and locating specific locations within the virtual world of Ingolstadt). Therefore, she communicated

the expectation that taking notes was an essential part of taking on the role of an investigative reporter. Students who did not keep track of the information they encountered in the game would jeopardize their ability to produce a quality five-paragraph essay and thus Claire's ability to use the game to fulfill a major writing assignment. For this reason, Claire assigned a score of fifty points for completed notebooks. Throughout her implementation, she reminded students of the expectation to keep notes.

At the beginning of her implementation, Heather was less intentional to ensure that students were keeping their notebooks up to date compared to Claire and Mary. When Heather first handed out notebooks, she merely suggested that students take notes otherwise they would likely get lost; however, after a couple of days of not checking students' notebooks, she encountered a student who had gotten stuck. At a particular point in the game, the student was supposed to provide some specific pieces of data that he was supposed to collect and record. This student progressed without recording those data points, and the game would not allow him to go back and rerecord them. At this point, Heather inquired if the student had been taking notes, and he said no. Next, Heather immediately stopped everybody from playing Taiga and demanded that they finish filling out their notebooks. In this case, it appeared that by Heather not initially setting the expectation that students should fill out their notebooks, students had the freedom to circumvent her desired use of the game, and furthermore weakened the her ability to control her classroom. In response to this problem, Heather had to initiate an extra layer of control to get students back on track, and this extra measure of control required students to stop playing and use a third of a class period to complete the work.

Similar to Claire, Mary, introduced and initially set the expectation that taking notes was a crucial part of playing Taiga. She also placed a participation grade on notebook completion.

Similar to what occurred in Heather's class, one of Mary's students also progressed through the first couple of missions without taking notes. Luckily, Mary caught this problem before the student was blocked from going back, and directed the student to play that part of the game again and record the necessary information. Mary then reminded her class of the expectation that notebooks were going to be graded and that they needed to continue to take notes. That was the last that Mary had to reprimand students about their notebooks.

Produce written recommendations and analyses. As mentioned above, one of the major ways students engaged with academic content in Taiga and Plague was through the completion of various Quests (i.e., writing activities). Quests often asked students to produce detailed reports, analyses, and recommendations based on evidence they gathered through their engagement with the game (e.g. reading carefully, taking notes). The implementation data indicated that teachers did not assume that their students would automatically know that they had to produce a number of detailed written recommendations and analyses. Instead, each teacher gave their students explicit expectations that they would be producing a number of written reports and recommendations. Setting these explicit expectations were crucial in ensuring that students would use the game in ways the teachers wanted.

Of the four teachers in this study, John had the lowest risk of the game sabotaging his classroom authority. Without the need to formally assess his students' use of persuasive writing, John sought to motivate students to engage in the game so that they could have the ability to make an impact on their community. He accomplished this by facilitating a number of whole group discussions motivating students to continue their work. He also set the expectation that Plague was a game where students were required to complete a series of writing assignments,

and needed to use real evidence, not opinions, to support their reasons for addressing the main narrative problem.

Unlike John, Claire had a lot at stake using Plague to replace a major course writing assignment. If her implementation had failed, then she would have had to find another writing assignment to replace Plague. In her implementation, she explained to her students that they would be using Plague as a major writing assignment and reminded them that the format of this writing assignment resembled previous class research assignments and would be graded using an existing rubric.

Mary wanted to ensure that students were using the game as a virtual internship so she initiated her implementation by announcing that students needed to understand how to generate and test a hypothesis as a prerequisite for playing Taiga. Then, to ensure that students did not forget their purpose for playing, at the beginning of each class period, Mary conducted a "warm-up" activity in which she framed that class period's game play around applying specific academic concepts.

Of all the teachers in this study, Heather's authority was challenged the most. After several attempts to steer students toward producing quality work, she resolved to have her students concentrate on the elements of writing composition. This use of the game occurred only after she found that students were not following her explicit expectations to follow her feedback. When she saw that students were not following her directions, she decided that writing complete sentences and using correct grammar was the most appropriate use of her remaining implementation time.

We see across cases that teachers perceived and acted upon the implementation threat that students would not automatically engage with the writing activities in the way he or she

wanted by intentionally setting a number of explicit expectations that communicated how students were to engage.

Establishing quality of work. For all of the teachers, it was not enough that students realized that they had to write, read critically, and take notes; they also saw the need to express explicit standards of quality of work they wanted their students to produce. Expressing these explicit standards of quality was another way the teachers sought to buttress their authority when implementing the game.

Heather strongly emphasized quality in terms of following directions, and not about the content of the quests. At the beginning of her implementation Heather communicated that a quality quest was one in which students followed all of the directions. In her tutorial, she read out loud each guideline for the first quest and expressed that students were to submit quests that addressed each guideline. Students challenged her authority by continuously disregarding her instructions and continuing to submit and resubmit incomplete and poorly written quests. After witnessing this behavior, Heather sought to regain control of her class by altering the use of the game to focus on writing comprehension.

Mary sought to establish her authority over the quality of students' quests by positioning Taiga as a virtual internship. Mary's expectation of quality was related to students submitting quests in which they displayed evidence that they were applying the previously discussed concepts related to scientific inquiry. Unlike Heather, before students were told they would be playing a game, Mary established that they needed to know how to generate a hypothesis and be able to discern the difference between an opinion and fact. Once students were introduced to the game, Mary sought to establish her control over the quality of students' work by communicating

the expectation that students needed to continue to show evidence that they were applying these concepts in their quests.

The manner in which John used Plague eliminated quality of work as a threat to his classroom authority. For example, despite whether students produced exceptional work or if they produced poor work by other's standards, John's classroom authority was not affected. At the beginning of his implementation he suggested that students needed to use evidence to support their position, but he did not assess students by these same standards. Instead, he awarded participation points regardless of the quality of their work.

In stark contrast to John's implementation, Claire saw poor quality of work as a major threat to her intended use of Plague. In her implementation, Claire left little to chance in terms of communicating her expectations for students' work. Her strategy for maintaining control over the quality of students' work was to embed herself into the game through the NPC Scoop Perry. She was the only teacher, of the four, to infuse her authority through an NPC. Claire communicated to students that their final essay would be graded using a previously implemented grading rubric. When asked, Claire's students acknowledged that they remembered using this particular rubric. Lastly, Claire kept constant inventory of each student's progress. After the first two days, Claire spent the majority of class walking around asking students about the progress of their writing. If a particular student needed extra support, she took the time to sit down and support them through their problem. Surprisingly, Claire was the only teacher, of the four, to complement the quality of her students' work. On multiple occasions during her implementation, she announced to her students that their writing was the best writing she had received from them that year.

What is striking from this cross case analysis was how none of the teachers assumes that simply introducing Taiga or Plague into their classrooms would ensure their students would read carefully, take notes, and produce quality recommendations and analyses. On the contrary, the data indicated that each teacher's attempt, despite the intended results, executed a multifaceted strategy for ensuring that their students engaged with academic content in the ways he or she wanted. What this tells us is that teachers are to be intentional and proactive in shaping the ways that students are to engage with the academic content in educational video games.

Keeping students on task. The last major threat to teachers' implementation control was keeping students on task long enough for them to finish the game before the implementation ended. Thus free play, if not intentionally managed throughout the implementation, would create a threat to the teacher's intentions for the game. As each implementation progressed teachers were confronted with continuing to keeping students their students on task. In other words, setting explicit expectations at the beginning of the implementation was not enough for these teachers to feel secure that students would use Plague or Taiga as they intended. In addition to conducting tutorials and assigning points for completed quests (i.e., writing assignments), teachers combatted this threat by setting daily progress goals for their students. These expected progress goals were daily deadlines or expectations for how much work needed to be accomplished by students during individual class periods, thereby keeping the group on a relatively consistent pace. Each teacher would then monitor their students' progress by walking around the room checking individual student progress or making announcements from their seat if students' conversation was off task. These findings resonate with what was noted in previous QA research. Gresalfi et al. (2011) found that teachers were challenged to manage student progress because some students would speed ahead while others in the group would fall behind.

In this study, deadlines allowed teachers to gauge each student's daily progress and identify those students who were falling behind while also proactively finding solutions to get them caught up.

In this study, to ensure students were kept on task, each teacher checked student progress and set daily progress goals; however, the perceived threat of students not finishing the game appeared to be related to how the teacher was using the game. Figure 9.2 compares the one-on-one interactions focused on keeping students on task.

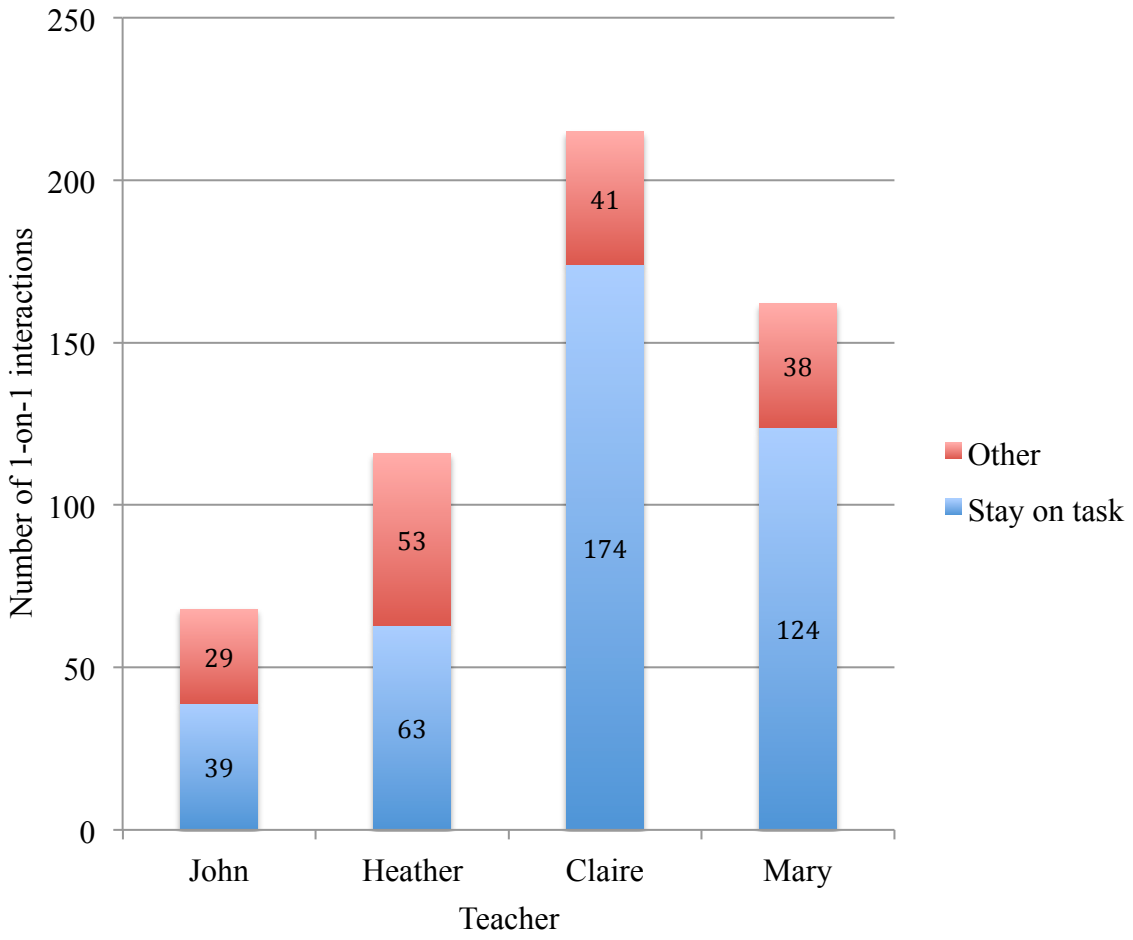

Figure 9.2 Comparison of progress related one-on-one interactions during Phase Three

What we see in Figure 9.2 is that Claire had the most one-on-one interactions focused toward progress compared to any other teacher. Close behind Claire was Mary, who initiated more progress-related interactions than all of Heather and John combined. When the numbers from Figure 9.2 are juxtaposed with the characterization of how each teacher used the game, and with the percentage of students who finished the final quest, we see that the value of keeping students on task has a direct relationship with those who finish.

From looking at the numbers in Figure 9.2 it is plausible that the risk of students not staying on task differed amongst teachers. Of the four teachers, Claire had the most to lose if her students did not finish in time. The last day of the grading period fell on the last day of her implementation. At the end of that day, she had to formally submit students' grades, which meant that if students had not finish their essay in Plague, they would likely fail that grading period. Consequentially, it is not surprising that of the four teachers, Claire had the highest number of students who had their final essays graded. (See Figure 9.3).

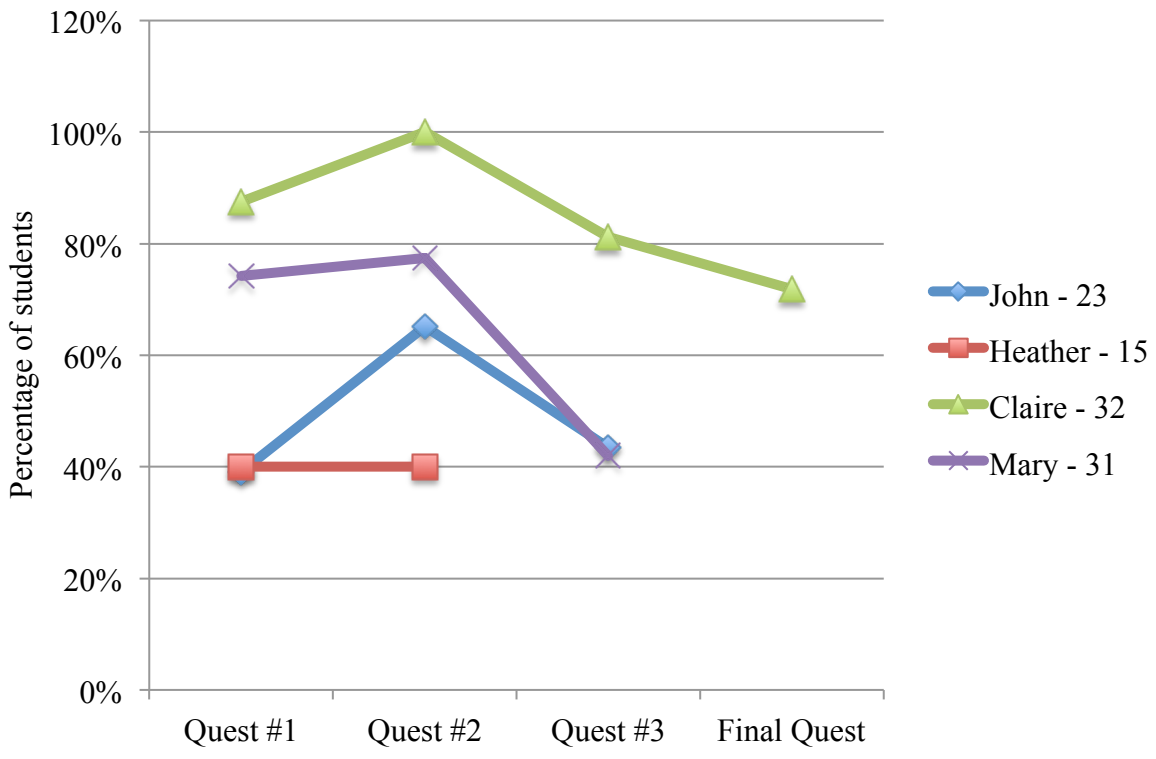

Figure 9.3 Comparison of the percentage of quests accepted by each teacher.

For John, the threat of students not staying on task was considerably lower compared to Claire. John wanted students to work so that they would not be disruptive to others. He was pleased if students were engaged in the game without disrupting class.

For Heather, the academic risk of students not staying on task did not appear to be as strong as the personal risk of Heather losing her authority and respect with students. None of Heather's implementation interactions that were coded as "staying on task" included considering content, solving the narrative problem, or helping the park. Instead, each interaction was focused toward reminding students to follow her explicitly communicated directions (e.g., following quest directions, writing in complete sentences, using proper grammar and spelling). Consequentially, having the smallest class of the four teachers (i.e., 15 students), with the highest number of technical problems, and support focused toward following her directions, it was not

surprising that her implementation resulted in only 40% of her class only finishing two of the four quests.

For Mary, the risk of her students not staying on task meant that they would lose the opportunity to practice and apply scientific inquiry. In contrast to Heather, Mary focused her authority toward mitigating the academic risk that her students would not use the game toward applying scientific inquiry rather than simply following her directions. Thus, Mary appeared to be intentional in focusing her one-on-one interactions to staying on task to ensure that students were applying content as they progressed through each mission.

At the beginning of this chapter, I argued that each teacher used these games in a way that was a continuation of their stated pedagogical preference and also buttressed their existing classroom authority. In this section, I have discussed how seeking to implement an immersive game involved teachers confronting a number of implementation risks to their existing classroom authority, and I argued that each teacher addressed these risks in relation to the manner in which they sought to use the game. What we can draw from this analysis is that simply bringing an immersive game into a classroom, presents a number of risks to a teacher's established classroom authority. What was surprising in this study, was how Claire and Mary appeared to foresee these risks before their implementation started. In the next section, I will seek to explain how Mary and Claire's strategy to preemptively seek to address these risks challenged the existing literature on integration.

To recap, this study focused on the implementation component of a teacher's immersive game integration process. I have built upon the idea that a successful implementation is an essential component of a teacher's messy and complex integration process, and integration is defined as the messy and complex process of converting a foreign technology into a useful

classroom tool. By comparing and contrasting each implementation, it was evident that immersive game implementations are complex and brittle. If one of the various implementation pieces falls out of place or is neglected, the integrity of the entire implementation is threatened. In this case, a failed game implementation could provide enough evidence for a teacher to decide the continued use of immersive games are too risky to continue using (i.e., integrate) in his or her classroom.

To begin equipping teachers to be prepared for addressing the various immersive video game implementation threats, teachers and administrators will need to be aware of whether or not their school's technology infrastructure can adequately support student play. Secondly, teachers will need to be made aware of and equipped to address the various implementation threats associated with implementing an immersive game. Depending on the content of the immersive game, teachers should expect that they will have to set similar types of explicit expectations about reading carefully, taking notes, and producing quality recommendations, analyses, and reports.

Sense Making Leads to Integration

I began this study under the impression that a technology is integrated after it is properly implemented (Cuban, 1986, Cuban, 2001; Rodgers, 2005; Hall & Hord, 2006) and that a teacher's integration process is a complex and messy process in which he or she transforms a foreign technology into a useful classroom tool (Zhao & Frank, 2002; Zhao et al., 2003); however, after comparing and contrasting Claire's and Mary's integrations with John's and Heather's, I think that sense-making is another essential element to a teacher's integration process, which can easily be hidden, but if identified could prove essential in predicting whether or not a teacher integrates an immersive video game.

From this analysis, we will see how Claire's and Mary's implementations indicated that they were able to develop, what Rodgers (1995) would consider, the software component of the technology (i.e., game) before the start of the implementation. This finding challenged my initial assumption that teachers gained access to the development of the software side of a technology during an implementation. As noted earlier in Chapter Three, the software component of a technology consists of the knowledge which confirms that using a particular educational technology would buttress an existing classroom authority and help teachers do their job better. For Claire and Mary, the manner in which they addressed each of the implementation threats indicated that they had already taken the time to develop the software component of the game before the start of their implementation.

For Claire and Mary, if they had not developed the software component of Plague and Taiga, then we would have likely found evidence of both Claire and Mary still learning how the game worked throughout the implementation. For example, there would have been evidence of the teachers explaining that they needed more time to prepare, were unaware of how to keep students on task, or were unaware of how to manage students' immersive freedom that allowed them to explore the 3D world without completing written assignments. Nonetheless, no evidence of this nature was found.

The sophistication and forethought Claire and Mary displayed to carry out an implementation strategy challenged my initial assumption. For both teachers, this was their first implementation seeking to use an immersive game in their classroom. Nevertheless, before students ever touched a computer with QA loaded onto it, these teachers successfully foresaw a number of unknown and untested implementation threats. These two teachers then successfully carried out an implementation strategy that preemptively addressed and quenched each of these

threats and were able to use the game as a continuation of their existing teaching. If a teacher's integration process is realized through an implementation, then how did Claire and Mary know how to strategically avoid a number of unknown implementation threats? Was it luck? Did these teachers simply guess correctly on how to address these implementation threats? Though there may have been some elements of luck to each teacher's implementation, another conjecture seems more fitting.

Earlier, in Chapter Three, I explained that I drew upon the assumption that technology integration was the result of a properly supported implementation. Rodgers' (1995) innovation decision-making process outlined that only after a technology was tested (i.e., implemented) could users (e.g., teachers) confirm whether or not a new technology could help them achieve their intended goals. Similarly, Hall and Hord's (2006) principles of change management acknowledge that only after a technology is implemented does it become integrated. If we explain Claire and Mary's implementation through Rodgers' innovation decision-making process and Hall and Hord's change principles, then it would be plausible that Claire's and Mary's preparations were actually the first implementations in which they gained their first experience testing the game while developing their understanding of how to best implement the game (i.e., software component of Taiga or Plague); therefore, the reason why these two teachers were so prepared to implement Plague and Taiga was because it was actually their second implementation.

The two-implementation conjecture could, however, potentially mislead future users of immersive games by failing to acknowledge how the experience of playing the game translated into an implementation strategy. For example, how did logging into the game, learning to navigate their avatar, and complete missions translate into a sophisticated implementation plan?

If a new set of teachers were asked to use an immersive video game in their classrooms, but told their only implementation preparation was to play the game as a student, would that plan accurately portray what Claire and Mary did to implement the games in their classroom?

Another conjecture, which involves sense-making, appears to more accurately address how Claire's and Mary's preparations led to their implementation strategy. Engaging in sense-making could be the process in which teachers develop what Frank (2005) describes as the software component of a technology. Could it be that in the experience of playing through the games they would be implementing, engaging in the process of sense making, and, in doing so, gaining experience of the various implementation threats that they so eloquently planned to avoid? In other words, did playing through the game provide the teachers the experience needed to reflect, evaluate, and decide how they could instantiate their pedagogical preference through the game implementation? Adding the concept of sense-making to the composition of a teacher's immersive game integration process could offer a significant insight toward understanding Claire's and Mary's implementations. In the following section, I will define and explain the concept of sense-making. Then, I will connect how sense-making could explain the forethought and sophistication Claire and Mary exhibited in their implementations to plan against a number of unknown implementation threats. I will then conclude this section by analyzing how Claire's and Mary's implementations bid researchers to seriously consider how sense-making is an important element of a teacher's integration process.

Sense-making has been used in organization management to help researchers explain how executives make decisions when their companies are faced with new problems that their previous strategies failed to solve. Similar to executives seeking to navigate through new and unexplored problems, Claire and Mary sought to continue their existing classroom authorities

and pedagogical preferences with the adoption of new immersive game technology; therefore, sense-making seemed like an appropriate concept to explain Claire and Mary's implementation.

Mills (2003) defined sense-making as the search for meaning as a way to deal with uncertainty. Benner (1994) defined sense-making as an interpersonal process of individuals converting tacit knowledge into explicit useable knowledge and tools. Weick et al. (2005) defined sense-making as the transformation of a new or unknown circumstance into a situation that could be understood and expressed with words. The new understanding of the circumstance serves as a springboard for action. Central to sense-making is that people are incessantly bombarded with a continuous flow of ambiguous information. In order to not get overwhelmed by the sheer volume of new information, individuals are intentional to identify, categorize and organize the ambiguous sensory information in order to conceive a plan of action that enables one to continue one's preferred course of action within a given context (Weick et al., 2005).

According to the sense making literature, the first stage of sense making involves converting a circumstance into a story. Weick et al., (2005) explained the paradoxical nature of sense-making in that a new setting or circumstance cannot become actionable until someone transforms the raw sensory data of the new circumstance into a story. In other words, only after someone had intentionally reflected and processed the information in an event, can it become actionable. Using the language of sense-making, an event does not become an event until someone notices the sensory information, seeks to label that information, and then interprets that information. Weick et al. (2005) quote Marianne Page who explained this reflective stage of sense-making as she explained the process of how a wrong medical diagnosis becomes realized as a mistake. She explained:

> A mistake follows an act. It identifies the character of an act in its aftermath. It names it. An act, however, is not mistaken; it becomes mistaken. There is a paradox here, for seen from the inside of action, that is from the point of view of an actor, an act becomes mistaken only after it has already gone wrong. As it is unfolding, it is not becoming mistaken at all; it is becoming.

Page's example above acknowledged that a key aspect of sense-making is its reflective nature. Secondly, Page and Weick et al., (2005) acknowledge that sense-making is not a total cognitive process, but occurs through the everyday events in a context. By experiencing and perceiving something as new, an individual not only perceives something new, but also considers plausible solutions to address a this new scenario or problem. He or she seeks to further test the presumption that a solution is useful, worthless, beneficial, or threatening. Only after one has been able to identify, categorize, and organize new sensory information story can a story be born. The story enables the individual to communicate the tacit knowledge originally perceived and begin building a plan of action.

Once a story has been created, the individual then asks, "Now, what do I do?" The heart of this question is about the individual understanding how to maintain their current level of control in a context while seeking to address the new problem; therefore, the overall goal of sense-making is for the individual to reduce the chaos by integrating the new knowledge of how to address the problem into their existing framework (Weick et al., 2005).

The concept of sense-making applied to this study could help explain what may have occurred when each teacher prepared to implement Taiga or Plague. For example, when teachers were invited to join this study, they were likely entering into a new and unfamiliar circumstance. All four teachers in this study had never implemented an immersive game in their classrooms. The one-day professional training likely served to help the teachers by offering an opportunity in which they could begin understanding and articulating what this new circumstance (i.e.,

implementing Plague or Taiga) meant for them. Then, after the training, teachers went away and played through the game as a student. Their play likely created a conceptual bridge for making sense of how their existing pedagogical preferences, knowledge of their students, and goals could potentially be fulfilled by using the game in a certain way. At the same time, each teacher gained first-hand experience of the various ways the students could challenge a teacher's authority, thus giving Claire and Mary the ability to foresee and design an implementation strategy that preeminently, not retroactivity, addressed these potential threats. Then, once a conceptual bridge had been formed, teachers could develop a plan of action that involved creating specific expectations that would ensure students used the game in the way the teacher wanted. Implementation expectations encompassed more than ensuring students knew which buttons to click, but also included the setting of explicit expectations that framed how an educational video game was to be played in their classroom. After each teacher finished playing through the game as students paired with their sense-making experience, they were ready to implement Plague or Taiga in a very particular way. The end result of their sense-making process was an intentional and sophisticated implementation that suffocated a number of implementation threats before they had time to grow, while still maintaining ample classroom control to use the game as a continuation of their existing pedagogical preferences.

Based on the data from these two cases, it appears that the definition of technology integration Zhao et al., (2003) promote (i.e., the complex and messy process in which a teacher transforms a foreign technology into a useful tool) involves sense-making. As we seek to uncover what is involved in a teacher's immersive game integration process, one clear step toward that direction would be to further investigate the relationship sense-making has toward an implementation, which leads to integration. Though this relationship has not been directly

investigated, and given the complicated and brittle nature of an immersive game implementation, it is plausible that sense-making is a major piece of a teacher's integration process.

In this chapter I have answered research question #4, "What were the integration themes across cases?" The results from comparing and contrasting the themes generated from research questions one through three affirmed that teachers play a large role in how an initial implementation is shaped and that a game implementation is a complex and brittle process. We saw that each teacher was intentional in shaping their implementation to use Plague and Taiga in the ways that they wanted. In order to use the game in the ways that they wanted, the teachers had to be intentional in addressing a number of implementation threats associated with the affordances in an immersive game. Addressing the various implementation threats involved mitigating technology breakdowns, training students on how to operate the game, setting explicit expectations for how students were to engage in the writing activities, and constantly monitoring students' progress in meeting those expectations. Surprisingly, the data indicated teachers engaged in the process of sense-making as a means to shape and manage the use of a new and complicated technology to meet their needs. When teachers were able to make sense of the game before their implementation, they were able to foresee and address a number of implementation threats before they were realized in their implementation. Therefore, the data in this research point to sense-making as a critical component of a teacher's immersive game integration process.

CHAPTER 10 – DISCUSSION and CONCLUSION

Immersive Game Are Difficult For Education

This exploratory research aimed at gaining a clearer picture of the implementation component of a teacher's immersive game integration process. After reviewing the literature related to educational technology integration, I built this research upon the assumption that an implementation was an essential component in technology integration: the complex and messy process of a teacher transforming a foreign technology into a useful classroom tool (Cuban, 1986; Cuban 2001; Zhao et al., 2002, Zhao & Frank, 2003; Hew & Brush, 2007). I was motivated by the potential educative power immersive 3D video games could offer in improving how teaching and learning occurred in K-12 classrooms. I saw this study taking an important step toward understanding what educators needed to do in order to unleash that power for their teachers and students. Surprisingly, I am concluding this study with an overwhelming impression that immersive video games, like the ones researched in this study, are good for education, but require significant content-specific professional development and reflection.

Supporting Teachers Will Lead to Immersive Game Integration

This exploratory research sought to understand the implementation component of a teacher's integration process. Applying concepts of change management, (Rodgers, 1995; Hall & Hord, 2006) acknowledges that a teacher's initial implementation becomes a testing ground for deciding whether or not an educational technology will support his or her educational duties in a more efficient or profound manner. After initially testing the technology (i.e., conducing an initial implementation) the teacher will make a decision to either continue or stop using the new

technology. The results from this study revealed that an immersive game implementation is also a complex, messy, and brittle process.

In this study, the teachers' ability to control how students used these games was challenged by technology breakdowns and the game affordances. Immersive games are undoubtedly advanced educational technologies. Yet, these technologies require a complex technology system and a team of skilled support staff in order to run smoothly. Zhao et al. (2003) would classify an immersive game technology has having a high dependence on others, meaning that teachers would have to place a large amount of dependence on others to ensure that a game ran smoothly. For example, if any part of the technology system would breakdown (e.g., server fails, laptops fail, internet connection fails) or teachers could not gain access to support staff, the teachers would likely be unable to resolve a technical problem themselves, thus threatening their ability to control how the game was used in their classroom. In their research, Zhao et al. found that when technologies had a high dependence on others, they would be less likely to be integrated; therefore, if we want to see immersive games, like QA, become integrated into schools, then administrators need to recognize that teachers will have to be given access to the proper measure of technology infrastructure, support, and offered significant amounts of time to be trained, play the game, and reflecting on how the game could be used to help them buttress their existing classroom authority.

If administrators fail to recognize the technology requirements and the complex and brittle process required to implement immersive games, then we should expect to see the shameful and disheartening side of technology integration history repeat itself (e.g., Cuban, 2001). If administrators or teachers simply give students access to an immersive video game, without considering and addressing the technological and pedagogical risks, then they will likely

put their teachers at a disadvantage for promoting academic success. For example, Heather's implementation was the most affected by technology breakdowns. Despite the numerous technology breakdowns, her students still remained engaged; however, the focus of their engagement was in direct opposition to how Heather wanted the game to be used. Her students wanted to use Taiga to create their own mini-games, but Heather wanted students to follow her writing directions, and so her struggle was not related to her students' lack of engagement but her desire for control in her classroom. The evidence was clear that Heather cared deeply about her students and exhibited a tremendous effort to use the game to meet her needs. Nevertheless, the technology breakdowns mixed with how she miscalculated the amount of time needed to prepare for this type of curriculum, left her unable to leverage the game's affordances to meet her goals.

By reviewing the technology integration literature, Postman (1992) wrote how the main problem with early adopters of educational technologies was their assumption that simply wiring schools and offering greater technological access to knowledge would make it easier for students to learn. The fatal flaw with this approach was that it overlooked the process by which teachers could make sense of and use new technologies to accommodate and support their existing practices. If games are to make any impact on education or survive in an educational setting, it will be because administrators (i.e., non-teachers) have adequately assessed their technology capabilities in addition to aligned their perception of learning with their teachers' explicit use of educational technology. The technology integration research is profoundly clear that teachers use technology in ways that help them accomplish their goals in a more efficient manner (e.g., Cuban 1986; Cuban 2001). Thus, immersive games should not be used only because students find them fun and engaging, but because they can offer teachers assistance in providing a high level of

feedback difficult, but not impossible, to duplicate when implementing other instructional practices.

In future scenarios, if teachers do not have access to adequate technology infrastructure, technology support, and/or could not be provided with the time to make sense of the game they would be implementing, then students may be better served engaging in activities that the teacher is comfortable with and has experience with in obtaining academic results. It may be difficult to accept that denying a student the opportunity to play a pedagogically advanced curriculum is a good thing. Yet, this research suggests that inadequate technology resources mixed with a lack of game preparation could create major implementation hindrances. We should expect teachers to be discouraged from integrating an immersive game if their initial implementation was faced with numerous technology breakdowns or they felt unprepared to support this complex curriculum.

On the other hand, when teachers work in a context with a robust technology infrastructure and have been given enough time to prepare and reflect on how their existing pedagogical beliefs and practices could dovetail with the use of a new immersive video game, then I believe there would be a higher rate of continued used after the initial implementation (i.e., integration). The time and effort needed to make sense of the game is not trivial. For example, I was amazed at the level of complexity and forethought of Claire's and Mary's implementations. They were able to address specific implementation risks before they started. This did not happen by accident, but was the result of two veteran teachers who spent between twelve and sixteen hours preparing for a two-week implementation. Their preparation involved playing the game as a student, reflecting on their own pedagogical preferences in reference to the unique needs of their students, and creating a number of expectations aimed at managing students' free play. If

Claire and Mary had not taken the time to make sense of the game, then they would not have had the level of classroom control to use the game in the ways that they wanted.

Therefore, immersive game professional development should include the explanation of the complex and brittle nature of a game implementation. Teachers seeking to adopt an immersive game into their classrooms should be given a full disclosure of the amount of work needed to successfully use one of these games. Additionally, training should include the opportunity for teachers to reflect on how their existing pedagogical preferences and practices will dovetail with implementation preparation and student play management. We should expect that when teachers are given such opportunities, we will see a higher rate of integration.

Adoption of Immersive Games Will Not Likely Change Teachers' Beliefs or Practices

I went into this study with the assumption that immersive video games, or any other educational technology, cannot teach students. After completing my analysis, I am even more convinced that immersive video games are not teachers but powerful tools in the hands of teachers only when they have been given enough support to use them as an extension of themselves. Postman (1992) warns educators to be constantly reflective toward their perception of the role of technology in learning and the role of teachers in the learning process. He wrote:

> How is the belief created that computers are human and humans are computers? Computers get viruses and get sick. If they get healthy, then they can become better calculators. Humans, when compared to computers are not as good at calculating, and therefore, when compared on this level, are less powerful computers. (p 117)

Over twenty years later, Postman's words still ring true with the results of this study, in that we should not assume that games can magically do something that teachers cannot. Given our tendency to elevate an immersive game above the role of a teacher (Hays, 2005; Dalgarno & Lee, 2010; Young et al., 2012), the findings from this research have reminded me that educators

and game scholars should be extremely cautious in assuming that the introduction of immersive games into classrooms will be enough of an intervention to change teachers' pedagogical beliefs and practices. The research, which has focused on teachers' beliefs, is vast, yet, there have been only a few studies, which have been able to show significant changes in pedagogical beliefs with the introduction of a new type of curriculum. In this study, teachers used Taiga and Plague in ways that were consistent with their stated pedagogical preferences. This finding was consistent with Cuban's findings (1986) (2001), in which teachers used classroom technology as a continuation of their existing pedagogical beliefs and practices. By reviewing belief literature, it becomes abundantly clear that teacher beliefs have been found difficult, but not impossible, to change. However, it has been well documented that merely introducing a new technology into a classroom will not change a teacher's beliefs or practices; therefore, we should not expect that by merely introducing a new and advanced technology like an immersive game will be enough to alter a teacher's beliefs. In the section below, I briefly review the literature involved with teachers' pedagogical beliefs. Based on this belief literature, I will suggest an intervention that involves structured reflection that could potentially work toward changing a teacher's pedagogical beliefs.

There is no argument amongst researches that teachers' beliefs are important to implementing new curriculum (Fenstermacher, 1979; Pintrich, 1993; Nespor, 1987; Pajares, 1992, Kegan, 1992; Ertmer, 2005, Harris, Mishra, Koehler, 2009). Marcinkiewicz (1993) noted,

> Full integration of computers into the educational system is a distant goal unless there is reconciliation between teachers and computers. To understand how to achieve integration, we need to study teachers and what makes them use computers.

Ertmer (2005) explained that if educators are going to use technology in higher order teaching practices, then there needs to be a systematic examination of, "teachers themselves and the

beliefs they hold about teaching, learning, and technology" (pg 27). Cuban (1998), explained the source of the "low end" use of technology problem is not giving teachers more access to technology, but a melding of core teaching values.

The nature of belief that has been theorized to develop in the midst of everyday practice, is episodic in nature, and contextually bound (Rokeach, 1968; Nisbett & Ross, 1980; Nespor, 1987; Goodman, 1988). Beliefs function as a focusing and organizing mechanism individuals use to decide which actions are appropriate and inappropriate for negotiating and maintaining new settings (Nisbett & Ross, 1980, Pajares, 1992, Guskey, 1986, 2002; Wieke, Sutcliffe, Obstfeld, 2005).

Pedagogical belief research is dense, spanned across several disciplines, focused on the influence teacher beliefs have on instructional practices (Schommer, 1990), and linked technology integration and technological pedagogical content knowledge (Harris, et. al, 2009). Ertmer (2005) explains that despite the large amount of survey studies seeking to understand which factors influence teachers' integration of technology, few have examined, "how these beliefs influence teachers' adoption and use of technology" (pg. 27). Yet, there are fewer studies, which have successfully implemented teacher change through the use of technology despite the fact that many have theorized how it can happen (Nisbett & Ross, 1980; Pajares, 1992; Kegan 1992). In the expansiveness of belief research, researchers have found difficulty defining belief (Pajares, 1992), even more difficulty changing belief (Nespor, 1987; Snyder, et. al., 1992; Pajares, 1992), and this has led to many researchers talking about the importance of belief yet avoiding research aimed at changing belief (Ertmer, 2005).

Few studies have sought to change teacher beliefs and have been successful to do so. Park and Ertmer (2007) were able to use problem-based learning to change pre-service teachers'

epistemological beliefs. The results revealed that 48 pre-service teachers shifted their intended teaching practices to match student-centered approaches. Derry, et. al, (2002) documented successful belief change with pre-service teachers after having them engage in authentic teaching activities through videos and case studies. The common thread connecting these studies focused not on merely demanding that teachers use a new technology and expect change, or persuading teachers to use new epistemologies or technology differently, but focused on offering teachers new experiences. These studies are consistent with Guskey's (1986, 2002) model of belief change, in which new teacher practices led to different student outcomes, which led to changing beliefs about the functionality of enacting certain practices (Guskey, 1986, 2002).

Therefore, based on how teacher beliefs are formed and changed, we should not expect that a teacher's pedagogical beliefs would automatically change with the introduction of an immersive video game. Instead, when a new immersive game is introduced, we should only expect teachers, new to using immersive games, to repeat what the teachers did in this study: implement a new game in a way that would be consistent with their existing pedagogical beliefs and practices.

Still, we do not have to exclude the possibility that implementing immersive games could change teachers' beliefs. For example, we would likely see positive change results if we designed an intervention that mirrored Park and Ertmer's (2007) study. The success of Park and Ertmer's study was due to their attention to structuring an intervention that appreciated the nature of beliefs and offered subjects the chance to reflect on the results of implementing a new set of practices. In other words, the belief change occurred because of an intentional and well-supported intervention (e.g., implementation) that focused on addressing the need for teachers to process and make sense of a new way of teaching; therefore, we should expect that merely

introducing a new immersive game into a classroom would not change a teacher's pedagogical beliefs or practices.

In conclusion, we know that billions of dollars have already been spent showing that teachers will use classroom technologies as a continuation of their existing practices. This research has shown no indication that this trend has shifted with the investigation of immersive games; therefore, we should expect that immersive games would only find a niche within classrooms when adopted into school contexts in which the teachers have been adequately supported and prepared. In such contexts, teachers will be more likely to be positioned to provide their students with meaningful learning experiences in which they are challenged to interpret, apply, and reflect on their game play versus putting students in front of computers and hoping for the best. We need to find ways to better understand how immersive games help teachers promote their academic goals in a more efficient manner, otherwise this type of technology will likely become an educational fad like laser discs or film strips projectors.

REFERENCES

Barab, S.A., Dodge, T., Gentry, E., Saleh, A., Pettyjohn. P. (2011). Uganda's road to peace may run through the river of forgiveness: Designing playable fictions to teach complex values. In K. Schrier & D. Gibson (Eds.), *Designing Games for Ethics: Models, Techniques and Frameworks*. 312-333.

Barab, S., Dodge, T., Ingram-Goble, A., Pettyjohn, P., Peppler, K., Volk, C., Solomou, M. (2010b). Pedagogical Dramas and Transformational Play: Narratively-Rich Games for Learning. Mind, Culture, and Activity, 17, 235–264.

Barab, S. A., Gresalfi, M., & Ingram-Goble, A. (2010a). Transformational Play: Using games to position person, content, and context. *Educational Researcher*. 39(7), 525-536.

Barab, S. A., Hay, K. E., Barnett, M. G., & Squire, K. (2001). Constructing virtual worlds: Tracing the historical development of learner practices/understandings. *Cognition and Instruction*, 19(1), 47 – 94.

Barab, S. A., & Luehmann, A. (2003). Building sustainable science curriculum: Acknowledging and accommodating local adaptation. *Science Education*, 87(4): 454-467.

Barab, S. A., Zuiker, S., Warren, S. J., Hickey, D., Ingram-Goble, A., Kwon, E.-J, & et al. (2007). Situationally embodied curriculum: Relating formalisms and contexts. *Science Education*, 91(5).

Barron, A. E., Kemker, K., Harmes, C., & Kalaydjian, K. (2003). Large-scale research study on technology in K–12 schools: Technology integration as it relates to the National Technology Standards. *Journal of Research on Technology in Education*, 35, 489–507.

Bebell, D., Russell, M., & O'Dwyer, L. (2004). Measuring teachers' technology uses: Why multiple- measures are more revealing. *Journal of Research on Technology in Education*, 37(1), 45–63.

Becker, H. (1994). Analysis and trends of school's use new information technologies. Washington, DC: Office of Technology Assessment.

Becker, H. (1999). Internet use by teachers: Conditions of professional use and teacher directed student use. Irvine, CA: Center for Research on Information Technology and Organization.

Benner, P. (1994). The role of articulation in understanding practices and experience as sources of knowledge in clinical nursing. J. Tully, ed. *Philosophy In An Age of Pluralism: The*

Philosophy of Charles Taylor In Question. New York: Cambridge University Press, 136–155.

Berman, P., & McLaughlin, M. W. (1974). Federal programs supporting educational change, Vol. I: A model of educational change (No. R-1589/1-HEW). Santa Monica, CA: Rand.

Berman, P., & McLaughlin, M. W. (1975). Federal Programs Supporting Educational Change, Vol. IV: The findings in review. (No. R-1589/4-HEW). Santa Monica, CA: RAND.

Berman, P., & McLaughlin, M. W. (1978). Federal programs supporting educational change, Vol. VIII: Implementing and sustaining innovations (No. R-1589/8-HEW). Santa Monica, CA: Rand

Brown, J, S., Collins, A. & Duguid, P. (1989). Situated cognition and the culture of learning. Educational Researcher 18, 32-42.

Campbell, B., Collins, P., Hadaway, H., Hedley, N. & Stoermer, M. (2002). Web3D in ocean science learning environments: Virtual Big Beef Creek. In M. G. Wagner, K. S. Candan & M. T. Beitler (Eds), Proceedings of the Seventh International Conference on 3DWeb technology (Web3D'02) (pp. 85–91). New York: ACM.

Cattagni, A., & Westat, F. E. (2001). Internet access in U.S. public schools and classrooms: 1994-2000. Retrieved on August, 12, 2012, http://intranet.onec.go.th/world_ed/2001071.pdf.

Chen, C. J. & Toh, S. C. (2005). A feasible instructional development model for virtual reality (VR)-based learning environments: its efficacy in the novice car driver instruction of Malaysia. *Educational Technology Research and Development*, 53, 1, 111–123.

Clark, R. E. (1983). Reconsidering research on learning from media. *Review of Educational Research*, 53(4), 445–459.

Clark, R. E. (1994). Media will never influence learning. *Educational Technology Research and Development*, 42(2), 21–30.

Christensen, C., Horn M., & Johnson, C. W. (2011). *Disrupting class: How disruptive innovation will change the way the world learns*. New York : McGraw-Hill.

Crookall, D. (2010). Serious games, debriefing, and simulation/gaming as a discipline. *Simulation & Gaming*, 41(6), 898-920.

Crosthwaite, J., Macleod, N. & Malcolm, B. (1997). Case studies: Theory and practice in natural resource management. A paper submitted for the Proceedings of the Australian Association for Social Research Conference, Charles Sturt University, Wagga Wagga.

Cuban, L. (1986). Teachers and machines. New York: Teachers College Press.

Cuban, L. (1998). High-Tech Schools and Low-Tech Teaching. A Commentary. Journal of Computing in Teacher Education, 14(2) 6-7.

Cuban, L. (2001). Oversold and underused: Computers in the classroom, Cambridge, MA: Harvard University Press.

Cuban, L., Kirkpatrick, H., & Peck, C. (2001). High access and low use of technologies in high school classrooms: Explaining an apparent paradox. American Educational Research Journal, 38(4), 813–834.

Earle, R. S. (2002). The integration of instructional technology into public education: Promises and challenges. ET Magazine, 42(1), 5–13. http://bookstoread.com/etp/earle.pdf. Retrieved August 29, 2012.

Ertmer, P. A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. Educational Technology Research and Development, 47 (4), 47-61.

Ertmer, P. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? ETR & D, 53(4), 25–39.

Dalgarno, B., Lee, M. (2010). What are the learning affordances of 3-D virtual environments? *British Journal of Educational Technology*, 41(1), 10–32.

Dalgarno, B., Lee, M., Carlson, L., Gregory, S. & Tynan, B. (2011). An Australian and New Zealand scoping study on the use of 3D immersive virtual worlds in higher education. Australasian Journal of Educational Technology, 27(1), 1-15.

Dalgarno, B., Hedburg, J. (2001). 3D learning environments in tertiary education. In G. Kennedy, M. Keppell, C. McNaught & T. Petrovic (Eds). *Meeting at the crossroads. Proceeding of the 18th annual conference of Australian Society of computers in learning in tertiary education*. pp. 253-262, Melbourne Australia: ASCILITE.

Dickard, N. (Ed.). (2003). The sustainability challenge: Taking ed-tech to the next level, Washington, DC: The Benton Foundation Communications Program and EDC Center for Children and Technology.

Derry, S. J., Siegel, M., Stampen, J, & the STEP Research Group. (2002). The STEP system for collaborative case-based teacher education: Design, evaluation and future directions. In G. Stahl (Ed), Proceedings of computer support for collaborative learning (CSCL) 2002 (pp. 209-216). Mahwah, NJ: Erlbaum.

Fang, Z. (1996). A review of research on teacher beliefs and practices. *Educational Research*, 38(1), 47–65.

Fenstermacher, G. D. (1979). A philosophical consideration of recent research on teacher effectiveness. In L.S. Shulman (Ed.), *Review of research in education*, 6, 37-49.

Fishman, B. J., & Pinkard, N. (2001). Bringing urban schools into the information age: Planning for technology vs. technology planning. Journal of Educational Computing Research, 25(1), 63–80.

Fullan, M. G. (1993) Change Forces: probing the depths of educational reform. Bristol, PA: Falmer Press.

Fullan, M.G., & Pomfret, A. (1977). Research on curriculum and instruction implementation. *Curriculum and Instruction*, 47, 335-397.

Gamage, V., Tretiakov, A. & Crump, B. (2009). Educators' perceptions about using MUVE for teaching. In Same places, different spaces. Proceedings ascilite Auckland.

Gee, J. P. (2003). What video games have to teach us about learning. New York: Palgrave.

Gamage, V., Tretiakov, A., & Crump, B. (2009). Educators' perceptions about using MUVE for teaching. In Same places, different spaces. Proceedings Ascilite Auckland 2009.

Gee, J. P. (2003). *What video games have to teach us about learning*. New York: Palgrave.

Gee, J.P., & Levine, M. H. (2009). Welcome to our virtual worlds. Educational Leadership, 66(6), 49-52.

Glaser, B., & Strauss, A. (1967). The discovery of grounded theory: Strategies for qualitative research. Chicago: Adline.

Goodman, J. (1988). Constructing a practical philosophy of teaching: A study of preservice teachers' professional perspectives, *Teaching & Teacher Education*, 4, 121-137.

Greeno, J. G. (2006). Learning in activity. In K. Sawyer (Ed.) The Cambridge handbook of the Learning Sciences (pp.79-96), Cambridge, MA: Cambridge University Press.

Gresalfi, M.S., Barab, S., Siyahhan, S., Christensen, T. (2009). Virtual worlds, conceptual understanding, and me: Designing for Critical engagement. On the Horizon, 17,1, 21-34.

Gresalfi, M.S., Barnes, J.L., & Pettyjohn, P. (2011). Why videogames are not teacher-proof: The central role of the teacher when using new technologies in the classroom. In G. Vincenti & J. Braman (Eds.), Multi-User Virtual Environments for the Classroom: Practical Approaches to Teaching in Virtual Worlds, 267-284.

Guba, E. G., & Lincoln, Y. S. (1983). Epistemological and methodological bases of naturalistic inquiry. Educational Communication and Technology, 30(4), 233-252.

Hall, G., & Hord, S. (2006). Implementing change: Patterns, Principles and potholes (2nd ed.). Boston: Pearson Educational Inc.

Hall, G., & Loucks, S. (1976). A developmental model for determining whether or not the treatment really is implemented. Austin: Research and development center for teacher education, University of Texas.

Harris, J. (2005). Our agenda for technology integration: It's time to choose. Contemporary Issues in Technology and Teacher Education, 5(2), 116 -122.

Harris, J., Mishra, P., & Koehler, M. (2009). Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed. JRTE, 41(4), 393–416.

Halverson, R. (2005). What can K-12 school leaders learn from video games and gaming? *Innovate Journal of Online Education*, 1(6).

Hennessy, S. Ruthven, K., & Brindley, S. (2005). Teacher perspectives on integrating ICT into subject teaching: Commitment, constraints, caution, and change. *Journal of Curriculum Studies*, 37(2), 155–192.

Hew, K. F., Brush, T. (2007). Integrating technology into K-12 teaching and learning: current knowledge gaps and recommendations for future research. *Education Technology Research Development*, 55, 223–252.

Hew, K.F., & Cheung, W.S. (2010) Use of three-dimensional (3-d) immersive virtual worlds in k-12 and higher education settings: A review of the research. *British Journal of Educational Technology*, 41(1), 33–55.

Honey, M., Culp, K., & Carrigg, F. (2000). Perspectives on technology nad educational research: Lessons from the past and present. Educational Computing Research, 23(1), 5-14.

Huberman, M.A. & Miles, M. B. (1984). Innovation up close: How school improvement works. New York: Plenum.

Jonassen, D. (1992). What are cognitive tools? In P. A. M. Kommers, D. H. Jonassen & J. T. Mayes (Eds.), Cognitive Tools for Learning, pp. 1-6. Berlin: Springer-Verlag.

Jarmon, L., Traphagan, T., Myrath, M., Trivedi, A. (2009). Virtual world teaching, experiential learning, and assessment: An interdisciplinary communication course in Second Life. Computers & Education, 53(1), 169-182.

John, N. W. (2007). The impact of Web3D technologies on medical education and training. Computers & Education, 49, 1, 19–31.

Kagan, D. M. (1992). Implications of research on teacher belief. Educational Psychologist, 27(1), 65–90.

Kena, G., Aud, S., Johnson, F., Wang, X., Zhang, J., Rathbun, A., Kristapovich, P. (2014). The condition of education 2014 (NCES 2014-083). Washington, D.C.: U.S. Department of Education, National Center for Education Statistics. U.S. Department of Education, National Center for Education Statistics.

Kickmeier-Rust, M., Steiner, C., & Albert D. (2011). Technology-enhanced systems and tools for collaborative learning scaffolding. Studies in Computational Intelligence, 350, 221-238.

Kirriemur, J., & McFarlane, A. (2004). Literature review in games and learning. NESTA Futurelab series. Bristol: NESTA Futurelab.

Kotter, J.P. (1995). Leading change: Why transformation efforts fail. *Harvard Business Review*, 87(2): 59-67.

Kulik, C. C., Kulik, J. A. (1991). Effectiveness of computer-based instruction: An updated analysis. Computers in Human Behavior, 7, 75-94, 1991

Kontogeorgiou, A. M., Bellou, J. & Mikropoulos, T. A. (2008). Being inside the quantum atom. *PsychNology*, 6, 1, 83–98.

Lave, J. (1988). *Cognition in practice*. New York: Cambridge University Press.

Lave, J., Wenger, A. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.

Lee, M. J. W. (2009). How can 3D virtual worlds be used to support collaborative learning? An analysis of cases from the literature. *Journal of e-Learning and Knowledge Society*, 5(1), 149-158.

Lenhart, A., Kahne, J., Middaugh, E., Macgrill, A., Evans, C., & Vitak, J. (2008). Teens, videogames, and civics. Washington, DC: Pew Internet & American Life Project. Retrived June 10, 2011, from http://www.pewinternet.org/

Lim, C. P., Teo, Y. H., Wong, P., Khine, M. S., Chai, C. S., & Divaharan, S. (2003). Creating a conducive learning environment for the effective integration of ICT: Classroom management issues. Journal of Interactive Learning Research, 14(4), 405–423.

Lim, C. P., & Khine, M. S. (2006). Managing teachers' barriers to ICT integration in Singapore schools. Journal of Technology and Teacher Education, 14(1), 97–125.

Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. Beverly Hills, CA.: Sage.

Lincoln, Y. S., & Guba, E. G. (2000). Paradigmatic controversies, contradictions, and emerging confluences. pp. 163-188 InN. K. Denzin & Yvonna Lincoln (Eds.) Handbook of qualitative research, second edition. Thousand Oaks, CA: Sage.

Luft, J., & Roehrig, G. (2007). Capturing science teacher' epistemological beliefs: The development of the teacher belief interview. *Electronic Journal of Science Education*, 11(2), 38-63.

Marcinkiewicz, H. R. (1993). Computers and teachers: Factors influencing computer use in the classroom, *Journal of Research on Computing in Education*, 26, 220–237.

Market Data Retrieval. (2002). Technology in education 2002. Shelton, CT: Market Data Retrieval.

McLaughlin, M. W. (1990). The Rand change agent study revisited: Macro perspectives and micro realities. *Educational Researcher*, 19(9), 11-16.

Mills, J. H. 2003. Making Sense of Organizational Change. London, UK: Routledge.

National Commission on Excellence in Education (1983). A nation at risk: The imperative for educational reform, Washington, DC: Government Printing Office.

National Center for Education Statistics. (2000). Teachers' tools for the 21st Century. *Education Statistics Quarterly*, 2(4), 48-53.

Nespor, J. (1987). The role of beliefs in the practice of teaching. Journal of Curriculum Studies, 19, 317-328.

Nisbett, R., Ross, L. (1980). Human inference: Strategies and shortcomings of social judgment. Englewood Cliffs, NJ: Prentice-Hal.

Olson, David R. Torrance, Nancy. The Handbook of Educational and Human Development, New Models of Learning, Teaching and Schooling. Blackwell Publishers, 75-99.

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. Review of Educational Research, 62(3), 307–332.

Papert, S. (1990). A critique of technocentrism in thinking about the school of the future. Epistemology and Learning Memo #2, MIT.

Papert, S. (1987). Computer criticism vs. technocentric thinking. *Educational Researcher*, 16(1), 22-30.

Park, S. H., Ertmer, P. (2007). Impact of problem-based learning (PBL) on teacher's beliefs regarding technology use. Journal of Research on Technology in Education, 40(2), 247–267.

Pea, R. (1985). Beyond amplification: Using the computer to reorganize mental functioning. Educational Psychologist, 20(4), 167-182.

Pea, R. (1987). The aims of software criticism: Reply to professor Papert: Educational Researcher, 16(5), 4-8.

Pea, R., & Kurland, M. (1983). On the cognitive effects of learning computer programming. *New Ideas in Psychology*, 2, 137-168.

Pintrich, P. R. (1993). Beyond cold conceptual change: The role of motivational beliefs and classroom contextual factors in the process of conceptual change. Review of Educational Research, 63, 167-199.

Postman, N. (1992). Technopoly: The surrender of culture to technology. New York: Aldfred A Knoph.

Randi, J., & Corno, L. (1997). Teachers as innovators. In B. J. Biddle, T. L. Good, & I. F. Goodson (Eds.), The international handbook of teachers and teaching (Vol. II, pp. 1163-1221). Dordrecht, The Netherlands: Kluwer.

Rieber, L. P. (1996). Seriously considering play: Designing interactive learning environments on the blending of microworlds, simulations, and games. Educational Technology Research & Development, 44(2), 43-58.

Rideout, V.J., Foehr, U.G. & Roberts, D.F. Generation M2: Media in the lives of 8- to 18-YearOlds. A Kaiser Family Foundation Study, January 2010. http://www.kff.org/entmedia/upload/8010.pdf, accessed on 10/06/2012.

Resnick, L. B. (1987). Learning in school and out. Educational Researcher. 16, 13-20.

Rodgers, E. (1995). Diffusion of innovation (5th ed.). New York: Free Press.

Rokeach, M. (1968). Belief, attitudes, and values: A theory of organization and change. San Francisco: Jossey-Bass.

Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. Journal of Educational Psychology, 82, 498-504.

Shi, M., & Bichelmeyer, B. A. (2007). Teachers' experiences with computers: A comparative study. Educational Technology & Society, 10 (2), 180-190.

Slavin, R.E., Madden, N.A., & Wasik, B.A. (1996). Roots & wings. In S. Stringfield, S. Ross, & L. Smith (Eds.), Bold plans for educational reform: The New American Schools. Hillsdale, NJ: Erlbaum.

Snyder, J., Bolin, F., & Zumwalt, K. (1992). Curriculum implementation. In P. W. Jackson (Ed.), Handbook of research on curriculum (pp. 402-435). New York: Macmillan.

Squire, K. (2006). From content to context: Videogames as designed experiences. Educational Researcher, 35(8), 19–29.

Squire, K., MaKinster, J., Barnett, M., Luehmann, A. L., & Barab, S. A. (2003). Designed curriculum and local culture: Acknowledging the primacy of classroom culture. Science Education, 87(4), 468-489.

Stake, R.E. (1995). The art of case study research. Thousand Oaks, CA; Sage.

Stake, R.E. (2006). Multiple case study Analysis. New York, London: The Guilford Press.

Thomas, M. K., Barab, S. A., & Tuzun, H. (2009). Developing critical implementations of technology-rich innovations: A cross-case study of the implementation of Quest Atlantis. *Journal of Educational Computing Research*, Vol. 41(2), 125-153.

U.S. Department of Education. (2003). Federal funding for educational technology and how it is used in the classroom: A summary of findings from the Integrated Studies of Educational Technology. Office of the Under Secretary, Policy and Program Studies Service: Washington, D.C. Retrieved August 27, from http://www2.ed.gov/rschstat/eval/tech/iset/summary2003.pdf.

U.S. Department of Education. (2010). Transforming American education: Learning powered through technology. National Educational Technology Plan. Office of Educational Technology, U.S. Department of Education. Washington, D.C. Retrieved November 16, 2012, from http://www2.ed.gov/about/offices/list/os/technology/netp.pdf.

Warren, S. J., Stein, R. A., Dondlinger, M. J., Barab, S. A. (2009). A look inside a MUVE design process: Blending instructional design and game principles to target writing skills. Educational Computing Research, 40(3), 295-321.

Weick, K. M., Sutcliffe, D., Obstfeld. 2005. Organizing and the process of sensemaking. Organ. Sci. 16(4) 409–421.

Wenger, E. (1998). Communities of practice: Learning, meaning, and identity. New York: Cambridge University.

Williamson, S., Squire, K., Halverson, R., & Gee, J.P. (2005). Video games and the future of learning. Phi Delta Kappan, 87(2), 104-11.

Wilson, K., Bedwell, W., Lazzara, E., Salas, E., Burke, C. S., Estock, J, Orvis, K., & Conkey, C (2009). Relationships between game attributes and learning outcomes: Review and research proposals. *Simulation & Gaming*, 40(2), 217-266.

Winn, W. & Jackson, R. (1999). Fourteen Propositions about Educational Uses of Virtual Reality. *Educational Technology*, July-August 1999.

Yin, R. K. (1981). The case study as a serious research strategy. Knowledge: Creation, Diffusion, Utilization, 3, 97-114.

Yin, R. K. (2009). Case study research: Design and methods. Forth Ed. Thousand Oaks, CA: Sage.

Young, M. F., Slota, S., Cutter, A., Jalette, G., Mullin, G., Lia, Benedict, Simeoni, Z., Tran, M., & Yukymenko, M. (2012). Our princess is in another castle: A review of trends in serious gaming for education. Review of Educational Research, 82(1), 61-89.

Zhao, Y., Pugh, K., Sheldon, S., Byers, J. L. (2002). Conditions for classroom technology innovations. Teachers College Record, 104, 482–515.

Zhao, Y., Frank, K. (2003). Factors Affecting Technology Uses in Schools: An Ecological Perspective. American Educational Research Journal, 40(4), 807-840.

APPENDICES

Appendix 1. Base Line Semi-Structured Interview Questions

1. What were the influences that encouraged you to become a teacher?
2. How would you describe yourself as a teacher?
3. What are the types of habits and practices you seek to encourage your students to use?
4. Do you find any relationship between what you do in the class today and your earlier educational experiences?
5. How would you describe that relationship? (Applicable if teacher responded "yes" to previous question)
6. Do you have any concerns about supporting Quest Atlantis with your students? Please explain.
7. How do you feel about my active involvement and presence in the classroom as you implement QA?

Appendix 2a. Teacher-Researcher Interview Questions and Topics

1. Have you noticed any students more or less engaged than normal?
2. How does the grading of QA compare to grading other types of assignments?
3. How do you feel about the speed and progress the implementation is going?
4. Do you need any help with computers, connecting student computers to the Internet, or any other technical issue?

Appendix 2b. Supportive Topics Addressed During Teacher-Tesearcher Interviews

1. Addressing computer and Internet problems.
2. Navigation assistance in the virtual world.
3. Troubleshooting glitches in the game.
4. Assistance using the learning management system

GLOSSARY

Implementation – The process a teacher engages with her to ensure that the game is used in a way that he or she wants.

Technology Integration - The process in which a teacher transforms a foreign technology into a useful classroom tool.

Game Integration Process - The relationship between a teacher's desire to use a game for a particular use and the process of realizing that purpose in their classroom

Technocentricity – The assumption that an educational technology (e.g., computer, software program, Internet) can affect student cognition and learning in unique ways that can not be duplicated through other forms of instruction.

Monitoring - a type of classroom activity in which the teacher's initiated engagement with students to identify individual student progress, address any technical, narrative, or academic concerns.

Pedagogical Preferences - are the routines and practices each teacher seeks to use to frame and deliver content.

Case - The main unit of analysis was each 7^{th} and 8^{th} grade teacher's game integration process.

MUVE – Multi-User Virtual Environment

3D MUVE Game – A type of game in which the technology has a visual three-dimensional space, avatars which are visual representations of the players interacting and inhabiting the system, and an interactive chat space for players to communicate with each as they play

Curriculum Vitae

Patrick K. Pettyjohn

EDUCATION

PhD **Indiana University, Bloomington**
Counseling and Educational Psychology, Learning Sciences focus
Kelly School of Business, Strategic Management Minor
April 2015

MS **Indiana University, Bloomington**
Counseling and Educational Psychology, Learning Sciences focus
2008-2011

BS **Huntington University, Huntington Indiana**
Educational Ministries with Cross-cultural emphasis
1997-2001

AREAS OF SPECIALIZATION

Learning context design, Technology Integration, Learning Strategy and Consulting, Change management, Human performance improvement, Belief innovation, Creating cultural change, Designing 3D immersive learning contexts, Supporting inquiry teaching, Transformational Play, Mentoring and coaching, Instructional design

RESEARCH EXPERIENCE

08/08 – 06/12 **Graduate Research Assistant: Center for Research in Learning Technologies, Department of Education, Indiana University**
Supervisor: Sasha Barab, Ph.D., Professor of Educational Psychology/Learning Sciences, Indiana University

Research Responsibilities

1. Designed, assessed, and researched multiple cutting edge online immersive educational video games
2. Successfully coordinated and implemented research studies for The Bill and Malinda Gates Foundation and The MacArthur Foundation

3. Conducted needs and gap analysis for teacher training
4. Redesigned instructional teacher training
5. Researched, designed, trained and coached teachers on how to teach with video games in their classroom
6. Co-authored multiple peer-reviewed publications on games and learning
7. Mentored and coached new doctoral students
8. Conceptualizing, designing and implementing how immersive 3D educational video games can support standardized content learning.
9. Created multiple ethnographies of learner activity systems
10. Collaborated with international researchers.
11. Designing and implementing cross-cultural scaling research project.
12. Created and used grounded and a priori data analysis coding

FORMAL UNIVERSITY CLASSROOM TEACHING EXPERIENCE

07/10 – 08/12 **Associate Instructor: Indiana University School of Education**
Supervisor: Melissa Gresalfi, Ph.D., Professor of Educational Psychology/Learning Sciences, Indiana University

Courses Taught

Educ-P251 Educational Psychology for Elementary Majors	Fall 2010
Educ-P251 Educational Psychology for Elementary Majors	Fall 2010
Educ-P251 Educational Psychology for Elementary Majors	Spring 2011
Educ-P510 Educational Psychology	Summer 2011

Descriptions of duties:
1. Solely taught multiple undergraduate and graduate courses in educational psychology
2. Designed new assignments to intentionally bridged theory into everyday teaching practices
3. Facilitated students to realize the cost and benefits of using various learning and motivational theories in their classrooms
4. Intentionally executed multiple unique instructional styles to maximize student engagement and motivation
5. Integrated web-based online technology for grading and reviewing of student work
6. Recipient of a competitive Outstanding Associate Instructor teaching award

06/00-12/00 **Associate Dean of Students, International School of Missions, Kenya, Africa**

Courses Taught

R151 Survey in World Religions	Summer / Fall 2000
B252 New Testament Survey	Summer / Fall 2000

Descriptions of duties:
1. Designed and developed ISOM's yearly curriculum

2. Designed and instructed R151 – Survey in World Religions
3. Designed and instructed B252 – New Testament Survey
4. Designed and implemented vocational learning activities
5. Designed, implemented and taught curriculum for national youth camp

RELEVANT TEACHING AND LEADERSHIP EXPERIENCE

01/14 – Present Instructional Designer, ED Plus - ASU Online, Scottsdale AZ

Descriptions of duties:

- Lead and facilitate master course redesign project for the Health Sciences and Nutrition online courses
- Proactively learn, promote, and integrate Quality Matters with faculty and adjunct staff
- Provide ongoing instructional design and teaching support for online faculty and staff
- Collaborate with colleagues to redesign, refine and facilitate online instructor orientation course
- Train new online instructors on how to transition from face-to-face to online instruction
- Completed Quality Matters Peer Reviewer Training

01/13 – 01/2014 Technology Integration Specialist - University Public Schools, Inc., Arizona State University Preparatory Academy, Tempe AZ

Descriptions of duties:

- Evaluate and restructure entire technology department
- Analyze technology usage to discover past trends, highlight existing issues, and forecast future growth
- Organize and execute multiple concurrent projects for multiple school departments
- Develop and maintain relationship with sponsoring university technology staff and external technology venders

08/09-12/09 Student Athlete Mentor, Indiana University, Bloomington IN

Descriptions of duties:

- Mentored students and helped create strategies for note taking, reading comprehension, studying, and writing papers.
- Instructed students in how to discern the learning theories of professors in order to discern assignment requirements.
- Guided students in follow through of semester, monthly, weekly, and daily goals.
- Equipped students in discovering their academic interests.

09/06-03/08 **Director of Student Programs and Staff Development, International Christian Church of Provence, Aix-en-Provence, France**

Descriptions of duties:

- Spearheaded, designed and directed multiple new student programs
- Coordinated, designed and planned yearly curriculum for middle school, high school, and university students.
- Planned and taught weekly lessons for middle school, high school, and university students.
- Supervised, trained, mentored, and developed new adult staff to lead junior high and high school youth program.
- Developed, planned, and executed policy for staff and individual development
- Initiated and facilitated team change efforts to coordinate and maximize individual strengths

01/07-07/08 **Independent Individual and Team Development Coach**

Descriptions of duties:

- Conducted need and gap analysis for three different non-profit organizations
- Converted newly acquired vision and mission statements into actionable solutions
- Facilitated team change efforts to coordinate and maximize individual strengths

08/01-05/06 **Director of High School Programs, Youth For Christ Northeast Indiana, Auburn Indiana.**

Description of duties

- Oversaw and managed a team of seven full time high school program directors
- Lead, designed, coordinated logistics, launched, keynoted, and assessed large scale high school events
- Designed curriculum, trained and coached new and senior employees, volunteers, and students
- Planned and taught weekly lessons for high school students.

01/06-05/06 **Head Coach of Varsity Boys Track and Field Team, Angola, Indiana**

Description of Duties

- Coached and trained team of 60 high school boys
- Organized and trained sprinters program
- Coached one athlete to state competition

AWARDS:

1. Outstanding Associate Instructor award, 2011
2. Best Empirical Paper (2011). Why video games are not teacher proof: The central role of the teacher when using new technologies in the classroom. *Media, Culture & Curriculum Special Interest Group, American Educational Research Association*

PUBLICATIONS

Peer-reviewed publications

Barab, S., Dodge, T., Ingram-Goble, A., Pettyjohn, P., Peppler, K., Volk, C., Solomou, M. (2010). Pedagogical Dramas and Transformational Play: Narratively-Rich Games for Learning. *Mind, Culture, and Activity*. 17, 235–264.

Barab, S. A., Pettyjohn, P., Gresalfi, M., Volk, C., Solomou, M. (2012). Game-based curriculum and transformational play: Designing to meaningfully positioning person, content, and context. *Computer and Education*. 58(2), 518-533.

Book chapters and invited articles

Barab, S. A., Pettyjohn, P., & Gresalfi, M., Solomou, M. (in press). Game-based curricula and the Modern Prometheus design project. In C. Steinkuehler, K. Squire, and S. A. Barab (eds.) Games, Learning, and Society. Cambridge, MA: Cambridge University Press.

Gresalfi, M.S., Barnes, J.L., & Pettyjohn, P. (2011). Why videogames are not teacher-proof: The central role of the teacher when using new technologies in the classroom. In G. Vincenti & J. Braman (Eds.), *Multi-User Virtual Environments for the Classroom: Practical Approaches to Teaching in Virtual Worlds*, 267-284.

Barab, S.A., Dodge, T., Gentry, E., Saleh, A., Pettyjohn. P., (2011). Uganda's Road to Peace May Run through the River of Forgiveness: Designing Playable Fictions to Teach Complex Values. In K. Schrier & D. Gibson (Eds.), *Designing Games for Ethics: Models, Techniques and Frameworks*. 312-333.

PROCEEDINGS

Pettyjohn, P, Barab, S.A., (2011) Scaling Disruptive Technologies. Research paper presented at the American Educational Research Association Conference. New Orleans, Louisiana.

Pettyjohn, P. (2010). Designing Games for K-12 Classrooms. Research paper presented at *IST Conference, Bloomington, Indiana.*

Pettyjohn, P., Barab, S.A. (2010). Modern Prometheus: Example 3 of transformational play. Research paper presented at *International Conference of the Learning Sciences*, Chicago, Illinois.

Sasha, S.A., Saleh, A., Pettyjohn. P, Arici, A., Gentry, E., Jameson., E. (2010). Playable Fictions with Metaphorical Loft: Using Games Towards Pedagogical Ends. Research paper presented at *Games Learning Society Conference*, Madison-Wisconsin.

CREATIVE PRODUCTIONS

1. Modern Prometheus: Persuasive writing unit in Quest Atlantis.
2. Agents of Change: Personal agency unit Quest Atlantis.
3. River of Justice: Civil liberties unit in Playable Fictions

ACADEMIC SERVICE

2009 **Reviewer for IST Conference, Bloomington, Indiana**
Reviewed two papers

04/2010 **Guest Lecturer**, P-251: Educational Psychology on Performance Assessment. Indiana University, Bloomington, Indiana.

PROFESSIONAL AFFILIATIONS

1. American Society for Training and Development, Member
2. American Educational Research Association, Member
3. International Society for the Learning Sciences, Member
4. Games and Learning Society, Member
5. Quality Matters

VOLUNTEER EXPERIENCE

01/10 – 05/10 **Student Aid, Educ-P251 under Kim McCormick**
Indiana University, Bloomington

07/03-05/06 **Angola High School, Angola Indiana**
Personal Athletic Trainer
Freshmen and Varsity Football Coach
Event Chaperon
Prep Rally MC
Athletic Department Aid

05/04-05/05 **Garrett High School, Garrett, Indiana**
Athletic Department Aid
Event Chaperon
Track and Field Sprint and Relays Coach

08/01-05/04 **Westview High school, Emma, Indiana**
Track and Field Sprint and Relays Coach
Event and Trip Chaperon
Athletic Department Aid

08/01-05/03 **West Noble High School, Ligonier, Indiana**
Track and Field Coach
Wrestling Coach
Personal Athletic Trainer
Event and Trip Chaperon
Athletic Department Aid

REFERENCES

Melissa Gresalfi, Ph.D.
Department of Counseling and Educational Psychology
Vanderbilt University
Peabody College
Nashville TN, 37203-5721
Email: melissa.gresalfi@vanderbilt.edu

Barbara Bichelmeyer, Ph.D.
Instructional Systems Technology
Indiana University
W. W. Wright School of Education
Bloomington, Indiana 47405
Email: bic@indiana.edu