

Learning via Games and Simulations

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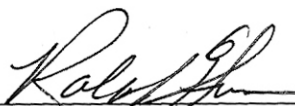
Chestnut Hill College

May, 2009

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This thesis has been presented to and accepted by the Instructional Technology Program in the School of Graduate Studies at Chestnut Hill College in partial fulfillment of the requirements for the degree Master of Science in Instructional Technology.

 4/16/09

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Abstract

The study discovers the essence of learning via games and simulations. The qualitative research uses a phenomenological interview process with data resulting in common themes. The data collection process aims to unravel the learners' experiences while interacting with the three-dimensional programming environment known as Alice.

The study's participants consisted of graduate students and instructors and spanned a wide range of ages. Findings revealed that the majority of participants were motivated to engage in the interactive learning tool, Alice, because they were provided with constant feedback, were given a sense of control, and felt that they could apply what they had learned to future learning situations. In addition, participants commented on how Alice helped to build their confidence with learning a new software program as well as spark their curiosity to investigate similar programs.

It is hoped that the study will aid educators, industry leaders, and professional trainers with gaining knowledge on the legitimacy of technological learning tools. It supports and expands previous findings that games and simulations are an effective tool for learning and training.

Chapter One: Problem Statement

The e-Learning Guild generated a 360° report focusing on the demands for simulations and games. In the report, they employ the terms Serious Games and Immersive Learning Simulations (ILS) in order to build the confidence of their members who strive to influence ILS into organizations. Utilizing the words Serious Games and ILS helps to create a positive connotation for games and simulations. Essentially, the terms aid ILS supporters in the process of introducing this innovative learning tool into companies and education systems (Wexler, Corti, Derryberry, Quinn, & van Barneveld, 2008). The e-Learning Guild's definition of games and simulations is as follows:

An Immersive Learning Simulation, also known as a Serious Game, is an optimized blend of simulation, game element, and pedagogy that leads to the student being motivated by, and immersed into, the purpose and goals of a learning interaction. Serious games use meaningful contextualization of well-designed games with serious learning goals. (p. 3)

The e-Learning Guild then goes on to discuss how Clark Aldrich, author of books and reports regarding educational simulations, envisions a simulation. Aldrich defines a simulation as follows:

A simulation is just a model; it becomes a scenario when we put the simulation in an initial state and ask the learner to achieve a goal state (and we typically wrap a story around it), and it becomes a game when we tune that experience to achieve engagement. (Wexler et al., 2008, p. 4)

Anne Derryberry, analyst and advisor for serious games, compiles responses debunking myths about serious games. With the goal of demystifying the confusion,

Derryberry includes the following myths: (a) games are too expensive; (b) games are difficult to develop; and (c) playing games is not learning. Dondlinger summarizes the effectiveness of online simulations.

There is a widespread consensus that games motivate players to spend time on-task, mastering the skills a game imparts...[a] number of distinct design elements, such as narrative context, rules, goals, rewards, multi-sensory cues, and interactivity, seem necessary to stimulate desired learning outcomes.

(Wexler et al., 2008, p. 114)

Games and simulations were a significant topic to study because the 21st Century is rapidly emerging into a technology-based environment, or what Friedman (2007) considers Globalization 3.0 and the flat world. Globalization 3.0 is a new process that gives individuals the power to collaborate and compete worldwide as well as providing the ability to enrich our culture's abundance of wealth (Friedman, 2007). Friedman notes further that "the phenomenon that is enabling, empowering, and enjoining individuals and small groups to go global so easily and so seamlessly is what I call the flat-world platform" (2007, p. 10). Friedman summarizes his position on people's role in the flat world.

We Americans will have to work harder, run faster, and become smarter to make sure that more of us are able to connect and compete, collaborate and innovate on the flat-world platform—and derive all the benefits it has to offer. (p. 635)

In preparation for new-age jobs, learners must learn and teachers must teach in an appropriate way. How do we know what is considered appropriate and what is not? Friedman (2007) shares his opinion, based on interviews with employers and educators,

on five approaches for how to prepare for learning in a flat world. The five skill sets are (a) understand that learners must “learn how to learn” (p. 309) because “so much learning is about being motivated to teach yourself,” (p. 310) (b) teach learners how to navigate through the virtual world (c) instill in learners a sense of passion and stimulate their curiosity, (d) encourage learners to think horizontally and to connect unrelated points, and (e) focus on exercising and expanding the use of the learner’s right brain (Friedman, 2007). Pink gives examples of how to develop the right brain “ ‘such as forging relationships rather than executing transactions, tackling novel challenges instead of solving routine problems, and synthesizing the big picture rather than analyzing a single component’ ” (Friedman, 2007, p. 321).

Friedman (2007) helps depict why future research efforts in this topic would be useful by listing and discussing the ten flatteners of the world. The progression of video games is part of Friedman’s tenth flattener of the world—*the steroids*. IBM’s Ivring Wladawsky-Berger states, “ ‘They are highly interactive and increasingly collaborative, and thus a good launch pad for thinking about how people should best interact with all kinds of computer applications as well with each other in the future’ ” (Friedman, 2007, p. 194). This emergent reality in which people communicate with each other, via technology, inspired me to investigate the spirit of learning through technology.

I explored reasons for how games and simulations could be considered an effective tool for learning and training, which I cover in detail later in my literature review. The purpose of this study is to describe how well a valuable learning tool works for a generation that is immersed in technology. Before I discuss my research questions, it is necessary for me to provide a description of the software that my participants

explored. Alice is a three-dimensional programming tool made up of a learning environment consisting of “animation for telling a story, playing an interactive game, or a video to share on the web” (Alice, 2009). The goal of Alice is to introduce users to rudimentary programming concepts while providing them with the opportunity to build virtual worlds using three-dimensional graphics. I searched to find what it is about this immersive learning simulation that embraces learners. I focused on capturing the learners’ experience of navigating through the simulation. The research question in my study is:

1) What is the experience of learning through games and simulations?

The answers were found in my discussions of:

1. What happens when learners interact with the three-dimensional programming environment known as Alice?
 - a. How may using Alice affect the learners’ learning?
 - b. How may using Alice affect the learners’ motivation?
 - c. How would learners expect to apply, or say they would apply, what they learn from using Alice to future learning situations?
2. How does good game design affect the users’ quality of learning?

Definition of Terms

Flow

“Flow is the way people describe their state of mind when consciousness is harmoniously ordered, and they want to pursue whatever they are doing for its own sake” (Csikszentmihalyi, 1990, p. 6).

Game

“An interactive experience, where the interaction has been play-balanced to achieve optimal playability. In learning terms, it is a tuned scenario that creates a game-level experience” (Wexler et al., 2008, p. 230).

Good Learning

“Helps learners understand and make sense of their experience in certain ways. It helps them understand the nature and purpose of the goals, interpretation, practices, explanations, debriefing, and feedback that are integral to learning” (Salen, K., Bogost, I., Gee, J. P., & Ito, M., 2008, p. 23).

Interactivity

“A term used in many fields, but typically as a measure of user influence. The higher the degree of interactivity, the more influence the user has on the form and course of a media product” (Wexler et al., 2008, p. 231).

Learning

“Learning involves change brought about by experience and interaction between people and their environment. These changes manifest themselves in intellectual aptitude, cognitive strategies, motor skills, and dispositions.” (Jones & Bronack, 2007, p. 93).

Meaningful Play

“What occurs when the relationships between actions and outcomes in a game are both discernable and integrated into the larger context of the game” (Derryberry, 2007, p. 5).

Play

When involved in play, we explore the set of rules given to us and then seek to understand and evaluate the meaning of the game (Salen et al., 2008, p. 136).

Playability

“A measure of how compelling and engaging the game is, how interesting and challenging the decisions are, and what kind of suspense and tension are created in the game” (Wexler et al., 2008, p. 233).

Quality of Learning

The ability to effectively understand, retain, and apply old and new knowledge in a given scenario.

Retention

“Used to describe delayed recall of knowledge” (Gage & Berliner, 1998, p. 619).

Scenario

“A simulation where the initial state has been set, and a goal (or goals) are provided for the player. Examples include determining when to open flood gates if an area has already experienced heavy rains (water and levee), how to find a file (Windows XP tutorial), how to make a withdrawal from an account (ATM), and how to administer an epidural for somebody with chronic back pain (human nervous system). Sometimes also considered to be a game level” (Wexler et al., 2008, p. 234).

Virtual World

“A simulation of a world that supports multiple players interacting, and typically emphasizes 2.5-D immersion (the appearance of 3-D immersion through a screen). Such worlds are not ILS; though the experience can be immersive, they typically do not have specific learning objectives (putting some in helps them become MMORPGS). Adding initial states and goal states aligned to a learning objective would turn them into an ILS” (Wexler et al., 2008, p. 236).

Chapter Two: Literature Review

Introduction

When debating if games and simulations are an effective tool for learning, it is essential to state positive factors related to interactive learning environments. First, prior to understanding and appreciating the full value of games and simulations, it is important to examine how people learn, through learning theories. These theories give instructional designers, those who design the technology-based curriculum, a framework to build valuable learning tools. Through these learning theories, also described as *lenses*, designers can view what is important to teach and which method of instruction to exercise (Kirkley & Kirkley, 2007). Second, an essential aspect in crediting games and simulations is the power that these tools exude. Third, regarding the importance of high-quality design, Kirkley and Kirkley (2007) list the following variables that make-up interactive environments: “Need and goals for learning, learning objectives, physical and/or virtual space, tasks and interactions, assessment methods, audience and their characteristics, domain area, community of learners and practice, and technological capabilities and possibilities” (p. 43). Throughout this review, I tie together the link between games and simulations and learning by reviewing learning theories, the attraction towards games, and design development.

The aim of this study is for educators, industry leaders, and professional trainers to gain knowledge on the legitimacy of technological learning tools. Galarneau and Zibit (2007) have found the world is coming to understand that today’s generation requires a different skill set, such as “critical thinking, teamwork, problem solving, collaboration, facility with technology, information literacy, and more” (p. 61). Individuals must

possess these skills in order to thrive in a society that is absorbed with new technologies, immediate and ubiquitous communication, and software tools that provide all individuals the ability to collaborate and release creativity. The playing fields are becoming more equal (Friedman, 2007).

My review of current literature illustrates the connective process of learning via games and simulations. I look to the literature to find out what makes games and simulations so powerful; resulting in the ability to attract and embrace adult learners. My discoveries surface from exploring the reasons behind how people learn based on a constructivist perspective, and ways for teachers to accommodate this learning style. It is important for teachers to implement appropriate learning tools and tactics in order to match the needs and pace of today's learners. Since change is happening rapidly, then individuals must start learning at a quicker rate (Galarneau & Zibit, 2007). I also look at how games and simulations teach and captivate, based on excellent design. To support this idea, I outline a study on the design of e-Learning.

Constructivism

Constructivism as a learning theory. The constructivist learning perspective relates to learning through games and simulations. It relies on learner motivation. The learner is responsible for the extent of education that is acquired, whereas, guidance and support are found within the facilitator. From a constructivist perspective, "the goal for learning is the creation and transfer of context-dependent, flexible and adaptive learning and complex problem solving" (Kirkley & Kirkley, 2007, p. 44). This means that learning is not acquired through structured problems and rules, rather the learning is obtained by constructing knowledge and making inquires. A point to mention is that

constructivism promotes a different type of structured learning environment. It requires the learner to: (a) be guided along, as opposed to being controlled; (b) emphasize understanding as opposed to memorize content; (c) make connections; and (d) use previous knowledge as the impetus for acquiring new information (*How people learn*, 2000).

Another aspect of constructivism is social constructivism, which explains that learners create meaning from interacting with other people. Reading, thinking, and learning are dependent upon a human being's involvement within different social and cultural groups, thus creating experiences (Gee, 2007). This process requires existing knowledge to channel new knowledge. For instance, humans participate in education with preexisting knowledge, skills, and beliefs. This influences how they organize and interpret new knowledge and environments. Merriam and Caffarella (1999) consider learning as an active attempt; therefore, learning arises through dialogue, collaboration, and engagement with others. As noted in Jones and Bronack (2007), "Knowledge is the artifact of decisions made by people in groups, based on their on-going interactions. In a sense, knowledge is a public record of transactions between like-minded people" (p. 93). Knowledge is *constructed* through individual (mental) and social (interactive) activities. *How people learn* (2000) represents this idea by using the example of different ways to watch a television program. Depending upon whether a viewer is watching solely, or among a group, a television program can create a variety of effects onto the viewer. The viewer's existing knowledge will also affect what that person will notice and can recall from the program. Galarneau and Zibit (2007) describe this idea by stating that online learning communities grow because of participants' involvement with knowledge sharing

and collaboration. These communities consist of users who contribute and share information, and result in an increase of the learner's knowledge as well as the group's knowledge. Jones and Bronack (2007) regard this idea of evolving knowledge by stating, "It is grounded in the inquiring activities and commingled tasks through which people relate" (p. 93).

Distributed cognition as a framework. Gee (2008) stresses that distributed cognition (knowledge and cognition that is distributed by previous knowledge, via tools) is the framework used to explain that there is a bigger picture of how people think and learn. He states, "These terms are meant to describe the ways in which people can act smarter when they combine or integrate their own individual knowledge with knowledge that is built into tools, technologies, environments, or other people" (p. 32). In addition, he stresses that teamwork and collaboration are other features of learning and developing knowledge. Gee shares a common idea with Valanides and Angeli (2008). These two authors claim that learners interact with technology as if it were a teammate. In the framework of distributed cognition, technology plays the role of a cognitive tool, rather than a medium for discharging information (Valanides & Angeli, 2008). This means that technology is an involved team member in cognition and not just a device that carries out information.

Situated learning and meaning as a model. Situated learning is learning that takes place in the same environment that it will be applied. If meanings are *situated* in terms of actions, images, and discussion, versus random definitions, then learners will be able to apply new knowledge to future situations. The reason that learners are able to *apply* is because games and simulations give players the information as soon as the learner needs

to understand (Gee, 2008). It is critical for learners to receive information when they are ready for it, rather than receiving content that is out of context, such as an overwhelming number of words that will go unused. This idea is displayed in the example of students exploring the 3D programming software, Alice. As noted in their article about how college students develop algorithmic thinking while using Alice, Cooper, Dann, and Pausch (2000) discuss how students use objects to inhabit their virtual world. Students are able to change and move their objects and see how the objects interact based on the results of the students' action statements.

Gee (2008) discusses learning from games in terms of situated learning. An aspect of this model of learning is that games do not just send players off to *figure it out*. Instead, games provide guidance in the form of game design. Games steer learners by providing instant information and encouraging players to seek help from peers. One specific tool that guides users through learning games is a model. Models elicit imagination in learners and allow them to experiment by providing learners with the opportunity to try again. To depict the benefits of models, Gee (2008) uses the example of a model airplane. A real airplane is an unrealistic learning tool because planes are multifaceted and unsafe. While building a model airplane, individuals can learn about a plane and explore different possibilities as they put it together.

In addition to games permitting users to learn by situated meaning, games also provide active learning. This approach to learning helps people take control of their level of comprehension by allowing them to recognize when they fully understand a concept or when they need to search for additional information in order to attain a more thorough understanding (Gee, 2007). This is a major theme in Katie Salen's prospective Game

School opening in New York City. Salen calls it *cognitive reflection*. This type of reflection causes children to seek help with things that they don't grasp (Salen, 2008).

Active learning results in metacognition. Learners engage in metacognition when they are aware of their own ability to predict how well they can recall information as well as their ability to monitor their progress. It seems that metacognition is a process that proves whether learners genuinely understand and know the information. The term *knowing* has developed a new connotation. Initially, the term insinuated memorization but now it entails people thinking critically and productively (*How people learn*, 2000).

Teaching with new learning approaches. There is a need for educators to stay up-to-date with how learners process information by absorbing, evaluating, and connecting given content. Gordon and Zemke (2000) provide insight into learners' preferences by quoting, " 'Allen Tough also has found that adults prefer learning that is self-paced, matches their own preferences, and is flexible and easy to change if results don't look like they are going to be in line with expectations' " (p. 52). Another perceptive thought is from Galarneau and Zibit (2007); a quote based on Bielaczyc and Collin's expression of their vision about a learning approach. " 'Classroom situations where students learn to synthesize multiple perspectives, to solve problems in a variety of ways, and to use each other's diverse knowledge and skills as resources to collaboratively solve problems and advance their understanding' " (p. 69). Not only do games allow learners to solve problems, but also games create an opportunity for educators to observe learners' methods for problem solving and collaborating (Beedle & Wright, 2007).

As well as educators acknowledging how learners process information, it is also vital for them to understand the characteristics of gamers and today's learners. This is

important so that they “know how to evaluate, select, and use games and simulations within a research-based framework” (Gibson, Halverson, & Riedel, 2007, p. 182). Specific gamer characteristics include (a) constant control of a situation, (b) quiet environment that is conducive to paying attention, (c) interacting with familiar, yet unknown peers with a desire to work among a team, (d) examining new situations and contexts, and (e) solving problems rapidly and independently (Gibson et al., 2007). Gibson et al., (2007) list the learning style for gamers: (a) aggressively ignores formal instruction; (b) learns by trial and error; (c) includes lots of learning from peers; and (d) sees that knowledge can be consumed in small bits, usually just before you need it” (p. 182). In accordance, Derryberry (2007) lists the following learning preferences for a digital generation: (a) instantly receive information from numerous multimedia sources; (b) initially process visuals and sounds followed by text; (c) access to hyperlinks; (d) networking with others; (e) learning “just-in-time”; (f) immediate fulfillment and rewards; and (g) learning useful, constructive, and entertaining information.

Once educators recognize and accept the traits of present-day learners, then it is necessary to design and establish curriculum that helps them to learn. Learning is possible (and games will work) when four learning environments are present: a learner centered environment, a knowledge centered environment, a community centered environment, and an assessment centered environment (Gibson et al., 2007). The next four paragraphs suggest concise ways for educators to implement tactics in order to capture one of the four learning environments. The categories are developed by Bransford and others (Gibson et al., 2007).

In a learner centered environment, the instructor should allow the students to choose their desired course/scenario as well as decide on the proper tools to work with. The instructor should also create a fast pace environment, and encourage the reality that play is hard work (Gibson et al., 2007).

In a knowledge centered environment, the instructor should provide hyperlinked content, references, and multiple and ever-present sources for acquiring information. The instructor should not overwhelm the learners with information overload; instead, they should introduce learners to less content and do so right before the learner will need to apply the new knowledge. The instructor should expect learners to learn-by-doing, which involves experimenting and making mistakes (Gibson et al., 2007).

In a community centered environment, the instructor should facilitate collaborative work and group learning, as well as provide the tools for learners to connect globally with international peers (Gibson et al., 2007). Cooper et al. (2000) discovered that Alice projects were stronger when created in a small group rather than individually. The researchers state, “Students take pride in their work and send copies of Alice worlds to friends via email, or post them on the web” (p. 5).

In an assessment centered environment, the instructor should provide instant feedback. Wheatley (2007) discusses the importance of feedback and asserts that learners cannot adjust or advance if feedback is concealed. Since the environment and humans are always changing, Wheatley (2007) declares that, “Without feedback, we shrivel into routines and develop hard shells that keep newness out” (p. 158). *How people learn* (2000) talks about different types of feedback in the form of assessment. Even though feedback is essential to learning, many traditional classrooms lack the opportunity for

students to receive adequate and constructive criticism. Summative feedback (given at the end of tests or projects) is more prominent in classrooms than formative assessment (given throughout a work in progress, such as drafts and presentations). Formative assessment gives students time to revise and rethink their ideas (*How people learn*, 2000). After discussing the positive traits of feedback, it is appropriate to mention that technology provides sufficient instances for responses. For example, within media-oriented learning environments, teachers and students can communicate more frequently, participate in more in-depth conversations, and are provided with unlimited access to course content and resources.

It appears that there is a clear necessity to train educators on how to incorporate games and simulations into learning in order to accommodate the learners' modern needs. The first step is for teachers to accept that traditional learning is a dying art form. In recognizing this idea, they must step away from comfort zones, which is in all actuality, a type of learning in itself. Gee (2007) explains his personal experience of learning that involves a deep level of frustration alongside life enhancement. The key to his idea is to create something that is difficult while simultaneously increasing personal growth. This will inspire people to progress rather than settle upon simple subject matter. *How people learn* (2000) suggests rethinking how teachers teach, what they teach, and the positive response students give from receiving assessment.

The Power of Games and Simulations: How Games Teach and Users Learn

How people learn (2000) explores a new learning theory that is emerging, which includes curriculum, teaching, and assessment designs that alter current theories in schools and businesses today. Stated directly, "Emerging technologies are leading to the

development of many new opportunities to guide and enhance learning that were unimagined even a few years ago” (p. 4).

Gee, a baby-boomer, shared his revelation of playing video games. It made him think in a completely different way that was foreign to him as well as made him learn in a style through which he viewed himself as incompetent (Gee, 2007). Another realization was that a game must have high quality learning principles developed within the design and curriculum. Gee notes, “The theory of learning in good video games fits better with the modern, high-tech, global world today’s children and teenagers live in than do the theories (and practices) of learning that they sometimes see in school” (p. 5). He argues that authentic learning emerges from the power of technology rather than a specific game (Gee, 2007). Gee (2007) notes that learning is attained through good games because games allow players to exercise the following capabilities: identifier, philosopher, producer, risk taker, discoverer, organizer, owner, creative problem solver, master (with practice), and critical thinker. “Games encourage players to explore thoroughly before moving on, to think laterally, not just linearly, and to use such exploration and lateral thinking to reconceive one’s goals from time to time” (p. 217). Beedle and Wright (2007) discuss the power of games in terms of role-play. They think that gamers build relationships, meaning, and skills while participating in role-play. Stated directly, “This allows the gamer the opportunity to create and experiment with different configurations and attributes while role-playing characters that might be unlike himself or herself or any other real-life people” (p. 151). Essentially, players are given the chance to experience different perspectives among different lifestyles.

Johnson (2006) asserts that games are powerfully captivating through the brain's reward and seeking circuitry. This means that it is not the theme of the game that attracts players but is the ubiquitous rewards that can be attained via a game. This is the formula for alluring minds; causing the players to want to continue exploring and seeking out the next step in the game. Another perspective that Johnson (2006) raises is that *knowing the way* users think holds more gravitas than *what* is being thought about while playing. This supports the idea of collateral learning, meaning that the learning experience contains more than just specific content. For instance, as opposed to other learning tools (books, movies, and music), games are the only tool that requires learners to decide. A quality of decision-making is that "learning how to think is ultimately about learning to make the right decisions: weighing evidence, analyzing situations, consulting your long-term goals, and then deciding" (p. 41).

Salen (2008) portrays the power of games by comparing a game to a gift. A game is strictly voluntarily, in the way it is "given and received freely" (p. 15). A game builds a connection with the players who willingly enter the environment. Contrary to the thoughtful nature of gift giving, games and gifts are not absolute. There are demands.

A game demands that something be given back, that players do their very best to receive increasing levels of challenge and to succeed. A game desires to be played, to be shared, to be critiqued. It demands that players compete, exploit any weakness, and teach others how to do the same. A game demands, finally, that it be beaten, so that it may be given as a gift to another. (p. 15)

According to game designer, Will Wright, the power of games is determined by the success of games and the success of games is determined when players become engaged. He talks about four types of interactions that help him assess a game's triumph. One, the player asks, "Can I try?" This illustrates the player's excitement, understanding, and confidence towards the game. Second, the player asks, "Can I save it?" This is evident that the player is invested and considers game playing a valuable experience. Third, one player says to another, "Want me to show you?" The player now has a desire to teach a peer. Fourth, the player says to another peer, "How did you do that?" The player enters the collaboration and community-supported phase by explaining to and sharing knowledge with other players (Salen, 2008).

The e-Learning Guild (Wexler, Corti, Derryberry, Quinn, and van Barneveld, 2008) conducted a report on Immersive Learning Simulations (ILS), which resulted in key findings that depict the power of games. ILS (a) are functional, (b) provide a good return on investment, (c) converge with mobile learning, (d) are less expensive to develop than assumed, and (e) are becoming of more interest to educators. In contrast, a significant myth about serious games is that game playing is not a form of learning. The majority of society considers that the term *game* means all fun and no work. I think that people are conditioned to view games as only fun due to childhood. Generations of parents have lectured that reading and writing were more valuable than being immersed in a game. In concurrence, Bogost (2008) mentions that parents worry about their children playing games in place of doing homework and going outside. He states, "Video games are perceived to interrupt learning and social life, acting as a leech on normal childhood development" (p. 120). Gibson et al., (2007) depict this idea of how games

only promote fun, noting that, “new technology takes time away from other things. It does not work any better than other teaching techniques” (p. 176).

Enjoyment. The myth that fun and learning cannot be synonymous is debunked because serious games have goals. Derryberry (2007) stresses that serious games focus on specific learning and are designed for the intention to teach. The goal of serious games is to “achieve serious, measurable, sustained changes in performance and behavior” (p. 4).

It is evident in Csikszentmihalyi (Flow: The psychology of optimal experience, 1990) that having goals makes fun and learning equal activities. He juxtaposed pleasure and enjoyment:

Pleasure helps to maintain order.... Enjoyable events occur when a person has not only met some prior expectations or satisfied a need or desire but also gone beyond what he or she has been programmed to do and achieved something unexpected, perhaps something even unimagined before. (p. 46)

To discover what makes people enjoy specific hobbies, Csikszentmihalyi (1990) interviewed a variety of people, consisting of rock climbers, music composers, athletes, surgeons, mothers, teenagers, et al. He collected data based on what was felt when individuals experienced an enjoyable activity and he was able to unravel results that were harmonious in that each individual revealed one or all of the elements of enjoyment: (a) a challenging activity that requires skill, (b) the merging of action and awareness, (c) clear goals and feedback, (d) concentration on the task at hand, (e) the paradox of control, (f) the loss of self-consciousness, and (g) the transformation of time (Csikszentmihalyi, 1990). To thoroughly understand what makes enjoyable activities satisfying, it is

necessary to go more in-depth with these elements by illustrating examples from Csikszentmihalyi's (1990) interviews.

A challenging activity that requires skill. Reading, socializing, games, sports, and artistic and literary forms gave individuals enjoyment, but only at a specific point in time: “whenever the opportunities for action perceived by the individual are equal to his or her capabilities” (Csikszentmihalyi, 1990, p. 52). This means that enjoyment will abate if skill levels are mismatched.

The merging of action and awareness. Dancers, rock climbers, and chess players described their performances in terms of optimal experience. They spontaneously responded to their activity and saw themselves as completely connected to their natural-seeming performances. Flow is referred to as “the sense of seemingly effortless movement,” (p. 54) when in all actuality “it often requires strenuous physical exertion or highly disciplined mental activity” (p. 54).

Clear goals and feedback. Gardeners, sailors, music composers, and teenagers considered the element of goals to be significant, even if the activities required an extensive time to see results. On the other hand, if goals were not clear, then it was necessary for the person to develop *internal guidelines*. This means that the person must become self-motivated in deciding personal intentions. Feedback was enjoyable, necessary for individuals to gauge their level of success, and came in many forms: (a) blood for a surgeon, (b) non-verbal communication for a psychiatrist, (c) sound combinations for musicians, and (d) Braille readings for the sightless.

Concentration on the task at hand. When immersed in their activities, rock climbers, basketball players, sailors, mountaineers, and hurdlers completely focused on

their activity. This high level of attention forced them to forget about irrelevant and unpleasant information. A sailor interviewee said, “Life was, for a while, stripped of its artificialities; [other problems] seemed quite unimportant compared with the state of the wind and the sea and the length of the day’s run” (p. 59).

The paradox of control. Athletes who enjoyed dangerous sports, such as hang-gliding, spelunking, and racecar driving, felt a sense of control and lacked the need to worry about losing control. This example of risky sports illustrates “what people enjoy is not the sense of *being* in control, but the sense of *exercising* control in different situations” (p. 61).

The loss of self-consciousness. Runners, violinists, surgeons, and members of a motorcycle gang experienced a connection with themselves and the environment in which they performed their enjoyable activity. The individuals became one with their activity and “became part of a system of action greater than what the individual self had been before” (p. 65). This happens because “there is not enough attention left over to allow a person to consider either the past or the future, or any other temporarily irrelevant stimuli” (p. 62).

The transformation of time. Activities transform time in two ways: time seems to pass more slower or more quickly than imagined by the individual. For example, in the situation of students interacting with the 3D software, Alice, the researchers were surprised with how much time the students willingly spent on building their animated world. Cooper et al. (2000) state, “The more time students spend in the animation, the more realistic the animation becomes” (p. 4). This scenario demonstrates that the students enjoyed creating a virtual world.

Kirkley and Kirkley (2007) believe that fun elicits pleasure, which drives motivation. They state, “a sense of pleasure is a key driving motivator for people in all environments and thus in constructivist environments which are driven by learner inquiry” (p. 44). In Csikszentmihalyi’s (1990) comparison of pleasure to enjoyment, he states that pleasurable experiences can be enjoyable, yet the two feelings are different. He states that pleasure can be felt “without any effort” (p. 46); whereas, enjoyment requires the individual to “fully concentrate on the activity” (p. 46) and feel a sense of accomplishment. There is a disparity between these authors’ ideas in the way that Kirkley and Kirkley think pleasure drives motivation whereas Csikszentmihalyi suggests that pleasure is effortless. If pleasure is effortless, motivation would not be exercised.

In their article, Kirkley and Kirkley’s (2007) goal is to show the importance of including fun and engagement in the design of a next generation learning environment. What is a next generation learning environment? It is technology comprised of mixed and virtual reality with the objective to “take learning and training into the real world and embed it within the context, situations, problems and environments where people work and learn” (p. 46). This new environment provides designers with the opportunity to create a fun, engaging, valuable, significant, and powerful learning experience (Kirkley & Kirkley, 2007). Essentially, Kirkley and Kirkley’s aim is to emphasize the significance of incorporating fun within learning environments.

In the words of Ralph Koster, fun is “ ‘the feedback the brain gives us when we are absorbing patterns for learning purposes’ ” (Kirkley & Kirkley, 2007, p. 45). In this sense, games teach, because users explore the games’ patterns with the goal of mastering the game or level. Fowlkes et al. praise fun and engaging simulations because challenges

emerge, which constitute effective training tools (Kirkley & Kirkley, 2007). An idea that echoes the benefit from challenges surfacing is what Galarneau and Zibit (2007) classify as a 21st century skill, thriving on chaos. This means that players have the “ability to learn from unforeseen situations and circumstances” (p. 70) and are able to make quick decisions. Galarneau and Zibit (2007) emphasize that in order to thrive on chaos, an individual must have creativity, that is, “to make sense of disparate ideas and make decisions based on incomplete information” (p. 70).

Learning through engagement. The e-Learning Guild conducted interviews to help promote the positive aspects of using games as learning tools. The first interview is with Katie Salen, the Executive Director of the Institute of Play, regarding her current project of opening up a Game School in New York City. Salen’s purpose for developing this school is to create engaged learners. The idea is not for the students to play all day, but to teach in the way that games teach. The school promotes *gaming literacy*, which is the play, analysis, and creation of games, as a foundation for learning, innovation, and change in the 21st century. Through a variety of programs centered on game design, the Institute engages audiences of all ages, exploring new ways to think, act, and speak through gaming in a social world. (Institute of Play, 2007)

Salen plans on measuring the success of her students by using state standards as well as measuring parent involvement and the level of student engagement and application. The latter will be softly measured by observing students and discovering if there are participating in after school programs (related to their work) and if they are excited about their involvement with the subject matter (Wexler et al., 2008).

The second interview is with Alec Lamon, Senior Director at Wharton Computing. Lamon discusses the goals and benefits of the AI West Learning Lab. This lab is an initiative to stimulate the use of technology as an education tool and to deepen the relationships between faculty and students. Lamon introduced the Wharton Securities Exchange, a trading simulation, as an example of one of the lab's simulations. The function of the simulation is to recreate a trading scenario like the New York Stock Exchange. The goal of the simulation emulates social constructivism. That is, traders combine what they know (previous knowledge) with what they see on the screen (new knowledge). Then, they anticipate what is going to happen, leading them to make a trading decision (Wexler et al., 2008).

Lamon measures the success of the virtual training in two ways: (a) how frequently the faculty utilizes the software and (b) student engagement, which is identical to Salen's goal for the Game School (Wexler et al., 2008). Aldrich (2007) indicates that engaged learners become immersed in the game's environment when they acquire total control and every aspect of the game depends on their actions.

Learning through play. The idea behind the play theory is that play supports learning. "Play theory says that play is the most effective instructional technique" (Van Eck, 2007, p. 277). Van Eck (2007) considers interaction as the impetus to effective play because players must respond and provide input. It forces players to follow a cycle made up of preparation, action, feedback, and reaction. This cycle decreases any possibility for learners to be passive. For example, Cooper et al. (2000) consider instant feedback as the reason students understand, through using Alice, the way programming language is

created. The researchers affirm, “Students are immediately able to see how their animated programs run” (p. 4).

Bogost (2008) points out that we are always *playing* when immersed in a game; however, the term *play* is synonymous with exploring and interpreting the meaning of the game. In agreement, Derryberry (2007) declares, “Play, an important contributor to human development, maturation, and learning, is a mandatory ingredient of serious games.”

As stated earlier, video games make arguments about how the world works. Johnson (2006) describes the way gamers’ minds work when playing. “It’s not about tolerating or aestheticizing chaos; it’s about finding order and meaning in the world, and making decisions that help create that order” (p. 62). This means that when playing a video game, the player can interpret the arguments and evaluate where they fit into their lives. Becker (2007) raises the question, “Are motivated players also learners?” (p. 24). She attempts to seek answers by mentioning Piaget and Bruner’s theories that indicate play is essential for meaningful learning. The author also draws upon and gives her interpretation of Csikszentmihalyi’s concept of *flow*.

Flow is a state that today may be referred to as ‘being in the zone’—it involves absolute concentration on a task. Although flow is sometimes used in connection with fun, having fun is not a requisite condition for being in a state of flow, nor is learning. (p. 24)

It is evident that the above authors share the same optimism regarding the notion that playing is equal to learning. Their contributions to this concept comprise of the idea that

playing and learning elicit (a) learner responses, (b) exploration, (c) interpretation, and (d) meaning making.

Learning through procedural rhetoric. Video games make claims about how the world works via processes, as opposed to making arguments via writing and speaking. Bogost (2008) proposes the idea of procedural rhetoric, which is “the practice of effective persuasion and expression using processes” (p. 125). An example of procedural representation is a model. (Refer back to p. 4 for Gee’s example of a model airplane.) The goal is to teach the learner (the creator of the model) how something works.

Learning through High Quality Game Design: A Study in e-Learning

Prensky (2007) presents a variety of elements that make up good game design. He asserts that good games are challenging, original, fun, memorable, and cause the players to feel tense and energetic. He additionally emphasizes “that a game should have a clear overall vision with highly adaptive, easy to learn but hard to master structure offered via a very user-friendly interface” (p. 13). It should focus on the player’s experience and keep the player in a state of flow, consisting of “exploration, discovery, and frequent rewards, not penalties” (p. 14). This impeccably correlates with Csikszentmihalyi’s (1990) concept of optimal experience. He states, “They are situations in which attention can be freely invested to achieve a person’s goals, because there is no disorder to straighten out, no threat for the self to defend against” (p. 40). Lastly, Prensky (2007) states that a game should provide shared assistance. This means that “achieving one thing in the game helps to solve another and the ability to save this progress” (p. 14). The ability to save is important because it encourages problem solving. If players get

frustrated from having difficulties on a level, then they can save the game and revisit it when they are mentally prepared (Beedle & Wright, 2007).

Allen (2003) introduces priorities for e-Learning trainers to implement in order to acquire design success. First, e-Learning is executed via multimedia, which creates an experience filled with stimulation, expectation, and the awareness of success and rewards. Second, e-Learning instantly communicates concise information to the users through the navigation of the program. Third, the interactivity of an e-Learning course motivates learners and exerts a meaningful and memorable experience. Why is meaningful, memorable, and motivational learning significant?

Learning is meaningful, memorable, and motivational. Allen (2003) believes that if learning is neither memorable nor meaningful, then a learner will not grasp the knowledge that is the goal of a given activity. He uses the example of employees returning to work with a lack of new and improved abilities. If learners fail to see how to apply the learning, then the new content will subside and never be used. On the other hand, if learning is meaningful and memorable, then it will accommodate the learners' performance and identify the learners' needs. This type of learning can identify their needs through self-discovery, which is generated through feedback and guidance. This facilitation will aid the learners in grasping their level of comprehension, determining how much time is required and what content needs more attention in order to reach maximum understanding. In order to build effective elements within a meaningful, memorable, and motivational learning environment, Allen et al. (2003) suggest implementing fresh situations, authentic environments, simulations, engaging themes and media.

Motivation consists of a variety of positive attributions and is expelled from learners who are genuinely stimulated. Motivation is a cycle: it is an ingredient to successful learning which then develops learner confidence; confidence then increases motivation and the cycle repeats itself. “Motivation is essential to learning because it energizes learner attention, persistence, and participation in learning activities” (Allen, 2003, p. 59). Taken from observations of motivated learners, Allen (2003) concluded that motivation: (a) filters out distractions, (b) strengthens ability to retain knowledge, and (c) stores new connections in the long-term memory. In concurrence with motivation improving retention skills, Moskal, Lurie, and Cooper (2004) discovered the same results. They developed a course curriculum, using Alice software as the foundation, with the goal to increase and better retention rates among *at risk* introductory computer science majors. The educators selected Alice because the software (a) “ is attractive and highly motivating to today’s generation of media-conscious students” (p. 76), (b) is visual and (c) provides immediate feedback. The results of the project demonstrated that the high risk students who enrolled in the Alice course experienced an 88% retention rate while the high risk students who did not enroll in the Alice course experienced a 15% retention rate (Moskal et al., 2004).

Becker (2007) discusses another positive response from motivation, that is, the enthusiasm that encompasses motivated learners. They take pleasure in what they are doing which results in persistence and dedication. Even though players may not always have fun, they still enjoy playing games, preferably when the games contain the following features: (a) challenging yet achievable goal; (b) fair playing field with equal

chances; (c) easy failure opportunities; and (d) adequate and valuable positive and negative feedback (Becker, 2007).

To depict Gee's (2008) affirmation that motivation is intrinsic within games, it is helpful to focus on the idea of failure. What does failure mean when used as a feature in a game? Failure is deemed as a positive outcome. For instance, players become more motivated because the conventional negative connotation of failure is nonexistent when playing games. This means that players have unlimited opportunities to try again. Since players can always start over, there is no chance to fear failure. Gee, Beedle, and Wright share the view that the impossibility of failure generates motivated learners who investigate possibilities. Beedle and Wright state, "Students use their intellect to solve complex problems and issues within games and try different solutions to find the best possible answer" (p. 153). Starting over is not failure; it is part of the problem solving and learning process. As noted by Cooper et al. (2000), solving part of a problem gives students ideas for how to tackle other aspects of the problem. They state, "Over time, our ideas gradually evolve to more complex, more effective, methods of solving the problem" (p. 3). This causes me to think that winning is always an attainable outcome. I also understand that winning has a different undertone. Rather than collecting a trophy or ejecting bragging rights, winning comes in the form of self-enhancement. That is, players achieve the ability to problem solve, understand, analyze, evaluate, etc. They can then take the newly acquired knowledge and apply towards real life scenarios.

This optimistic outlook on failure coincides with Wheatley's (2007) view on a specific challenge that educators face when met with a new worldview, such as the challenge for leaders to accept failure. She compares learners to explorers and states, "No

one has yet drawn the accurate maps – explorers learn as they go” (p. 169). Wheatley (2007) states the importance of failure: “We seldom give adequate time for the explorations and failures that are part of mapping a new territory” (p. 169).

In addition to the failure opportunities that motivate players, Wexler et al., (2008) note that games also motivate players to take more time on mastering the skills needed to score highly. This determination to score higher can be attained because of the opportunity for multiple chances and it can be accredited to the individual’s necessity to win. The competitive nature of good games is another way that gamers become motivated. This is because of the gamers’ option to (a) select specific levels, (b) participate in collaborative play, (c) organize teams, and (d) compete with peers. Gee (2008) agrees that participation is a necessity for learning. Amongst a group, learners are able to understand their experiences as well as make sense of the integral components to learning (interpretation, explanation, feedback, etc.).

Navigational value. After reviewing why meaningful, memorable, and motivational learning is important, it is logical to discuss a couple of valued elements of game design. The first valued component is the navigation in e-Learning, which is evident through the services it has to offer. Users can preview and assess learning expectations, time limitations, and level of difficulty. Users can also determine which accomplishments have been met and still need to be met. Overall, users have the ability to back up, move ahead, preview, restart, resume, and utilize resources such as a glossary (Allen, 2003).

Interactive value (active participants and tools). The second valued component is the interactivity in e-Learning. Beedle and Wright (2007) mention that games were the

first interactive tool, including video and audio elements. This interactive medium introduced users to problem solving, exploring, and competing. Instructional interactivity is defined as an interaction that stimulates the mind, which then increases the learners' ability to reach achievement. Allen notes, "The purpose of instructional interactivity is to wrestle our intellectual laziness to the ground—to reawaken our interest in learning, strengthen our ability to learn, and provide an optimal environment in which to learn" (p. 93). Allen (2003) comments on how computer interactions are effective because they force users into making a decision. This is important, because it allows instructors to offer feedback and identify the learners' level of ability. The latter is essential because, based on the learners' productivity level, instructors can reassess the course content and can immediately reorganize where the educators may see fit.

Allen (2003) examines the components to instructional interactivity, consisting of context, challenge, activity, and feedback. Since researchers consider learners to use mental images as a medium for reasoning, then context (framework) should be realistic. This will enable the learner to envision the scenario as a real-life situation, which will then allow the learner to imagine a variety of actions and results. Allen (2003) explains this process as a "mental exercise that will increase the probability of transferring learning to real behavior" (p. 270). To briefly touch upon the idea of challenge being a component, a challenge is a question that should be answered. The primary purpose of a challenge is to encourage effective behavior, whereas, activity is the physical medium for how learners respond to the context and challenge. A central idea to feedback, the final component of interactivity, is that it reflects the variety of outcomes rather than passes judgment upon learners' actions and results. Learning involves making connections, so it

is essential to receive feedback in order for learners to build positive or weaken negative relationships.

Conclusion

In totality, I have drawn that learning environments, contained with games and simulations, are an effective and valuable learning medium. The literature supports the need to explore the ways in which games, simulations, educators, industry leaders, and professional trainers can accommodate the desires of learners and how high-quality design can captivate the learners.

Games respond accurately to learners' needs. Based on a constructivist approach, games force players to construct knowledge and make inquiries. Distributed cognition is exercised while playing games in the way that learners not only *use* technology, but consider technology an integral teammate. Situated learning and meaning shine through games in the sense that players are provided guidance as opposed to being left alone to figure it out. Active learning and metacognition emerge while learners are occupied with games. This gives learners the ability to control their level of comprehension, causing them to search for additional information until understanding is fully attained. The literature review helps one to understand feedback from a student and educator perspective. This review has shown that feedback is a crucial element to apply when teaching. From a learning perspective, feedback gives learners the opportunity to alter and rework their initial ideas.

The elements of games fit into the context of everyday life, making them powerful to the point that the learners' outlook towards games increases their enthusiasm to continue interacting with the content. Herbert (2009) questions if an assignment is

illustrated in a specific way, could it “actually affect our attitude toward the task itself and ultimately our willingness to put our head down and work” (p. 66)? This concept can be described as inadvertent learning but what is happening is that learners are creating *automatic judgments*, which establishes their viewpoint resulting in an increase in exploration or a decrease in desirability. Beedle and Wright (2007) reference other experts’ perspectives on the importance of unintended learning, “Incidental learning has been identified as the foremost way language skills are developed and learned” (p. 152). To take this idea one step further, the authors note that peer interaction is needed: “According to Hosen, Solovey-Hoson, and Stern, in order for useful learning to take place, incidental learning and peer interaction must be key elements in the educational process” (p. 152). What this means is that the concept of incidental learning is powerful because it is a type of authentic learning rather than learning that is constructed with artificial elements.

Games have a variety of positive characteristics. Becker (2007) has shown that motivated learners find games to be pleasurable and fun because they are challenging and provide feedback. Johnson (2006) has exposed that games are captivating because they emit rewards. Allen (2003) has shown that games are a form of memorable, meaningful, and motivational online learning built upon navigation and interactive value. Essentially, games build confident learners who explore, engage desire, decide, and interpret meaning. As noted by Dondlinger, “A number of distinct design elements, such as narrative context, rules, goals, rewards, multisensory cues, and interactivity, seem necessary to stimulate desired learning outcomes” (Derryberry, 2007 p. 5).

Technology-based learning is a necessity in order to succeed during the 21st Century as well as meet the demands of and reflect the 21st Century. I have shown this in the literature by including the following highlights: (a) the 3D learning environment, Alice; (b) learner centered, knowledge centered, community centered, and assessment centered learning environments; (c) The e-Learning Guild's report on ILS; and (d) interviews with Salen and Lamon on their initiatives for creating engaged learners. These points in the literature emphasize the reality that today's generation is rapidly surpassing past generations in the use of technology due to the value and power that technology provides. According to the Federation of American Scientists "50% of all Americans and 75% of American households play computer and video games...On average, kids aged 8-18 spend 50 minutes per day playing video games. The average adult male spends 7.6 hours per week playing video games, and the average adult female spends 7.4 hours per week" (Derryberry, 2007, p. 11). These statistics, alongside the literature review's support that learning, via games and simulations, is effective in a variety of ways, have shown reasons for educators, industry leaders, and professional trainers to acknowledge and accept innovative learning in order to mirror the new age learning preferences. Gordon and Zemke (2000) have shown that learners prefer a self-paced environment alongside the ability to change their outcomes in order to match their expectations. Galarneau and Zibit (2007) have revealed that learners favor the option to synthesize multiple viewpoints as well as creatively and collaboratively solve problems. Gibson et al. (2007) have noted that characteristics of today's learners include the need for them to be in control as well as interact yet work quickly and independently. Their preferred learning styles consist of informal instruction, trial and error, and learning at the exact

time it is needed. Why would mirroring these learning preferences be a good thing? Fundamentally, wouldn't educators want to empower the current and future generations of learners as well as accommodate to their needs? By providing learners with their desired learning tools, content, and processes, educators will be supporting learners in acquiring an educational experience that is filled with value, respect, and enjoyment.

As a final thought, I ask, "How do games fit into our lives?" It is advantageous to understand that we live in a world of constant growth and change and the only way to survive is by exercising the human being's gift to adapt. Wheatley said, "In this chaotic and complex twenty-first century, the pace of evolution has entered warp speed, and those who can't learn, adapt, and change moment to moment simply won't survive" (p. 145). Our ability and desire to adapt may be the reason that we are attracted to the characteristics that make up high-quality games and simulations. I agree with Hawkins (2004) as he praises the human brain for being extremely flexible and adaptive. He states, "The human brain has an incredible capacity to learn and adapt to thousands of environments that didn't exist until very recently" (p. 53). In accordance, Wheatley (2007) asserts, "We develop the skills we need: we become resilient, adaptive, aware, and creative" (p. 1). The need and desire to develop skills and the capacity to adapt could be the reason learners of today consider games and simulations an influential learning tool. This could pave the way for the implementation of games and simulations into the education and training field.

Chapter Three: Methodology

Sample

A purposive sample of three men and three women participated in this phenomenological study. Participants were college instructors and graduate students of both genders. Two participants were in the 40-60 year-old bracket. Four participants were in the 20-35 year-old bracket.

Research Design

I chose to do a qualitative study so that I could explore and capture the *essence* of a common experience. No statistics were utilized; however, I discovered patterns by conducting interviews and then finding the common themes between each individual's responses. I implemented the phenomenology paradigm by focusing on the *essence* of the learners' experiences while using Alice, a three-dimensional learning tool. As an introduction for beginners in computer science, Alice introduces learners to programming concepts within an environment that provides users with the ability to story tell by building an interactive world. I was able to study individuals that have shared similar experiences while creating their world in Alice.

As a graduate student in the Instructional Technology program at Chestnut Hill College, it was appropriate for me to explore the education community and their experiences with an innovative learning tool. I have professional knowledge as well as an advanced comprehension of technology and its potential to facilitate learning. I have experience with reviewing resources about this topic, but have minimal experience with playing games and simulations. My connection with the participants is through my

graduate level coursework. Throughout the graduate program, I've learned to “apply instructional design theories to educational technology, develop strategies to integrate educational technologies into the learning process and develop web-based tools to support e-learning communities” (www.chc.edu).

Procedure

Through Blackboard (www.blackboard.com), a Learning Management System, I used a distribution list to email all Instructional Technology instructors and graduate students from Chestnut Hill College (along with a graduate student from the University of Pennsylvania). In the first email, I asked if anyone was “interested in learning new software, as well as providing helpful information towards a unique subject” and included a brief list of participation requirements. I sent an additional email to those who responded by stating their interest in being a participant. In the second email, I talked about specific details and instructions for the task. Correspondence through the two emails can be found in the appendix B.

My interviews were conducted over six weeks. After collecting signed consent forms (found in appendix A) and joining in casual conversation, I asked participants to discuss their experience with Alice. I asked participants to share what they actually did while creating their world through Alice. For instance, what steps did they take to build their project and how did they interact with the software? At times, I used my developed set of questions (found in appendix D) to guide the interview process in order to emerge more information regarding their experience with their exploration of Alice. I videotaped

and transcribed four interviews and conducted two investigations via email. Each interview lasted between twenty to sixty minutes.

Data Analysis

There were many common themes throughout the six interviews, which will be demonstrated in the next chapter. In the following paragraphs, I will summarize the individual interviews.

Participant A was a graduate student in the 20-35 year-old bracket. She started off the task by working through the tutorials before diving into her own project. She stated, “I really liked the tutorials because it provides step-by-step instructions and it was just enough information to not overwhelm me. I liked having the small bits of information and being able to do it at the same time.” Once she began her personal project, she tried to figure out the software by using trial and error. Even though she enjoyed her experience, she felt overwhelmed because there was too much on the screen. She believed that Alice was equal to her capabilities because she has a lot of experience with technology but no experience with a program like Alice. She found that the most challenging part of Alice was with navigating the objects. She stated, “It took me awhile to understand which way it was going and trying to figure out how far away it was.” She was aware of what she was doing because it was pretty simple to add objects. She felt that the only feedback Alice provided was through the tutorials by telling her she did something incorrectly and to go back and try again. She felt that she personally decided on her own goals as opposed to the program deciding for her. She felt in control as the software gave her the freedom to choose what objects to use whereas her frustration came about when trying to control the direction of the objects. While making her own world,

she was able to concentrate solely on Alice and felt connected to the program because she was able to create whatever she wanted. Nothing else was telling her what to do and how to design. Even though she didn't keep track of her time spent, she felt that time passed quickly because of the fun she was having. She was motivated to continue building her world because she feels accomplished and more confident when she learns how to do something new and can keep building from it.

Participant B was a computer science instructor in the 40-60 year-old bracket. She started off the project by using the tutorials, which she found straightforward and helpful. She also paged through Alice in Action by Joel Adams. She had a previous sense of what Alice was about and had a decent programming background. She thought about using Alice for a first year course for her majors and would offer one introductory course that uses Alice, but only if our college were bigger. She is, however, planning on highlighting Alice during the Technology Day for Women at her college (The motivation behind this day is for high school girls to get interested in technology.) She struggled most with the perception and direction of the objects. She stated, "The most difficult part of this program is understanding movement in relation to the world or an individual object in the world." For instance, she would place an object in one location and it would end up somewhere else. She felt she was in control over everything except for the navigation of the objects. She found the most beneficial thing for learners who are new to programming is the way that Alice can "give them an appreciation of the concepts and logic needed for programming without getting into the syntax of it." She was aware of what objects she was using, what actions she wanted them to perform, and what property she wanted to change. She felt that Alice provided feedback in the way it did something after she gave

it a command. She decided her goals by looking at the program and seeing what she thought she could do. Her goals unraveled as she continued to play with the software. Her main focus was on Alice because it felt like her *whole world*. Time went fast for her. She spent one hour on the tutorials and two hours on her project (when she intended to spend 30 minutes). Her motivation to continue building her world is due to her personality of wanting to finish things flawlessly. Specifically, she wanted to figure out how to separate two speak bubbles that she used in her world.

Participant C was a graduate student in the 20-35 year-old bracket. She began the assignment by using the tutorials, which she complained were difficult to find. She suggested that an enhancement to the tutorial could have been verbal instructions. She felt confident because the tutorials mentioned that she didn't need to catch everything on the first attempt. She liked how the tutorials stopped her if she didn't follow directions correctly. She had no background with programming, yet she worked with a lot of developers. Alice demystified her intimidation of code writing while at the same time she understood the general concept of programming. She enjoyed her experience of using Alice because she felt in control of what she programmed. She was challenged and overwhelmed in the beginning because this was new for her. Once she jumped into the program, she found it to be pretty easy, in which she suggested, may be because she was not given specific directions. She mentioned that she may have felt more challenged if she was given goals and directions to complete specific tasks as opposed to the idea and deadline being her choice. She was aware of what she was doing and found the tasks to be intuitive and enjoyable. She believed that if she was more experienced with the program, that it could potentially become automatic. She felt that the tutorials provided

feedback and that being able to watch her work immediately was the best feedback possible. She was able to focus on Alice because she scheduled time to work on the assignment for when she didn't have any pressing work to complete. She felt in complete control because she could make any modification without depending on anything else. She believed the program is successful because it is an entry level program that provides learners with a positive experience. She did not experience flow because she needed to concentrate but felt that she could have reached flow if she became more familiar with the software. Having worked on the project for one hour, she felt that she lost track of time. She was motivated to continue building her world because she didn't want to abandon it after putting work and time into it. On the other hand, she would be more confident in creating a brand new world if she were given a specific goal. She felt that Alice was a great confidence builder in the way that it gave her the assurance to try out new programs. She felt proud because she realized she could watch tutorials and succeed on her own.

Participant D was a technology instructor in the 40-60 year-old bracket. He was enthused to begin his Alice project so that he could compare it to MIT's two-dimensional object oriented programming software, Scratch. He found that the three-dimensional objects were impressive. He preferred that the tutorials had the ability to play while he worked on his project because it was challenging to remember the procedures, causing him to quit and reopen the tutorials to figure out how to do something. He also would have preferred text-based tutorials to accompany the video tutorials as well as a crib sheet. The tutorials gave him the confidence to begin working in the program. He found that Scratch's "drop and drag components easier to remember and visualize programming

concepts.” He enjoyed his experience and considered it rewarding. To learn about Alice’s advanced potential, he went online to view other projects. This helped him develop a storyboard for his project (which is found to be the most challenging). Initially, he thought that his actions were automatic because he just followed the tutorials, but became more aware of the programming concepts once he started to create his project. He found the feedback to be in the form of his successful or unsuccessful actions, which was easy to visualize. He felt that Alice did not set goals, but considered this strength to the program because he could work at his own level. He admitted to being immersed through the program and felt that he “entered a virtual world.” He felt a sense of control but felt limited by his knowledge of the program. Time went by fast as he admitted to his obliviousness of time and the need to force himself to stop so that he could work on other commitments. He was motivated to continue building his world so that he could enhance it based on other online projects. He also stated his interest in purchasing a book or taking a course in Alice. In terms of applying Alice to future learning situations, he stated, “I felt the self-paced discovery process applicable to investigating problem solving software tools. I was also intrigued by Alice’s capabilities and comparing it to logo-based programs and Scratch.”

Participant E was a graduate student in the 20-35 year-old bracket. At first, he played around with the interface before jumping into the tutorials. Once he worked through the tutorials, he thought they gave a good overview but could have been more in-depth. For instance, he recalled the tutorial mentioning that he could change an objects’ color, but it never told him how to do it. Also, one tutorial had a speech bubble but it never told him how to add a speech bubble. Overall, he found the tutorials to be helpful.

He had previous coding experience and recognized terms, such as *actions*, *behaviors*, *events*, and *triggers*. He thought Alice was limited with the objects but enjoyed the ability to connect to the web to retrieve objects that other people created. He felt his creativity *breaking through* and felt at ease because Alice was straightforward as opposed to his previous programming experiences. The most challenging element was the navigation of the three-dimensional world. He struggled with the camera aspect of the program and found it to be limited. For instance, he was curious if there were different ways to move around the camera to make it look more cinematic. He felt in control because of his freedom to place the objects and decided on their actions. He thought that Alice provided feedback in the way that he could play back his world to see how it acted and if it worked. Alice did not provide him with a goal; however, it sparked ideas. He was focused on what he was doing and completing his project but admitted to being conscious of the time and other work assignments that he needed to complete. He stated, “I wouldn’t say I was in flow or anything.” Even though he was conscious of his time, he mentioned that time seemed to have gone faster than anticipated. He spent 30 minutes on the tutorials, less than 30 minutes on the design, and an additional 20-30 minutes on the coding section. He was not motivated to continue building his world because he felt the program was limited, yet he understood it was a free download and could only offer so much. He mentioned he may be more motivated to continue if he was given an assignment that required him to use Alice. Other than that, he felt he already experienced programming above the basic level that Alice offers.

Participant F was a graduate student in the 20-35 year-old bracket. He started off the assignment by working through half of one of the four tutorials to get an

understanding of how the functions worked in the environment. He found Alice to be intuitive and easy and thought that the drop-down boxes made it easy to “add a behavior, check it, and then revise it with just a few clicks.” He thought the functions were user-friendly and helped to make complex motion in a programming context very simple. He enjoyed working in Alice and found it “easy to get lost in an exciting and exploratory fashion.” He liked receiving instant gratification by immediately viewing his actions. He denied being challenged but agreed that there was a short learning curve in the beginning, though it was easy to figure it out. The biggest limitation was his creativity. He couldn’t decide if Alice was equal to, above, or below his capabilities, but claimed that it was *just different* than his usual experience with programming interactive content. He believed that the interface was intuitive which made it easy for him to *automatically* accomplish what he wanted to do. On the other hand, he didn’t feel a loss of self-consciousness because he was *aware* of his actions throughout the activity and felt in control of his outcomes. He thought that Alice provided feedback in the way that he could instantly see his results and readjust based on what he saw. He was able to concentrate solely on Alice and considered it to be *highly engaging and immersive*. He felt in control while using Alice because of the combination of the program’s intuitive nature and immersive environment. He worked on the project for 45 minutes and did not feel a transformation of time. He was motivated to continue his world because of his the entertainment value and the ability to simply and quickly add and review actions. He was inspired to research an immersive software program like Alice, but one that focused on the subject that he teaches to middle school students. He stated, “I’d like to investigate ways to include this

type of engaging, intuitive program in my own teaching of higher difficulty material/concepts.”

Having collected and compiled my data, I will scrutinize the common experiences in the next chapter.

Chapter Four: Narrative

In this chapter, I discuss the common themes that emerged throughout the six interviews by uncovering *what* the participants experienced and *how* the experiences happened. The essence of the participants' experiences can be understood in the verbatim examples taken from my data collection.

Alice's game design affected the users' quality of learning by providing them with memorable, meaningful, and motivational learning. All participants appreciated the free and easy to download software, the interactive graphic interface, and the step-by-step tutorials. Participant A said, "I thought it was very easy to download. I liked how it was a free program. I figured out many things after viewing the tutorial by trial and error, just playing with the different buttons and menus." All participants enjoyed using Alice because it was intuitive, and easy to learn and interact with, for example, the process of adding objects and giving commands. Participant D and E took pleasure in going on the Internet to view other Alice projects as well as find and integrate additional objects into their projects. Participant F stated, "It was easy to get lost in an exciting and exploratory fashion." Participant B said, "It is a good learning tool especially for people who are creative. I think graphic students, in particular, would really enjoy the graphic component of development." Participant F said, "The way the functions are set up in the environment is really user-friendly and makes complex motion in a programming context very simple." All participants found the tutorials to be helpful in learning the basics of Alice; however, Participant C and D thought that text-based instructions would have been a beneficial addition to the video-based instructions whereas Participant E would have

liked to see more in-depth tutorials. Overall, each participant found the tutorials to be a confidence-builder in preparation for trying out Alice. Participant D said, “Following along with the tutorials gave me confidence that I could easily get started with the program.” Participant C said, “I work with a lot of developers, though I do not write code. This simple coding program demystified the whole code writing process.”

Participant A, B, and E agreed that the most challenging component of using Alice was the navigation of the three-dimensional world. Participant A stated, “It took me awhile to understand which way my object was going and to figure out how far away it was and how it adjusts to the program.”

All six participants found that Alice provided them with instant feedback. Participant A found feedback through the tutorials, which she believed “was a big stepping-stone to using the Alice software.” Participant B said that she received feedback by doing something after she gave it a command. Participant C found that watching her video project was the greatest form of feedback. She said, “If my bunny did what I wanted, it worked. If not, I had to go back and rework it.” Participant D received feedback in the sense that what he planned to do worked or did not work. Participant E would replay his project as a form of feedback. This would let him see if everything was working in the manner in which he wanted it to. Participant F found beneficial feedback through “my ability to automatically view the results of my additions to the script. I could quickly view the results of the functions I had just entered and readjust based on what I saw.” In addition he felt that “the graphic interface created a sense of instant gratification: actions and behaviors that I added to the program were immediately viewable.”

Each participant felt a sense of freedom and control while exploring Alice. They didn't consider Alice to provide them with goals, but instead, gave them the control to decide what they wanted to accomplish. Participant A said, "I felt connected to the program because I was able to create whatever I wanted to. There wasn't someone telling me what to do and how to design something." Participant D felt in control but also felt limited, due to his "incremental knowledge of the program's capabilities." Participant F felt in complete control as he stated, "The intuitive nature of the program, combined with the immersive environment it creates allows you total control."

Five out of the six participants felt a transformation of time, being that time passed faster than expected. Participant A confessed to not looking at the time until she completed her project. She said, "I noticed after using the program that I had spent a lot of time on it because I was having fun with it." Participant D admitted, "I became oblivious to time and sometimes I had to force myself to stop because of other obligations."

Five out of the six participants believed they could apply what they learned while using Alice to their future learning situations. Participant A and D credit their assurance to apply Alice due to the confidence it gave them to try out new programs. Participant B and F felt they could apply Alice to their careers in education. Participant B said, "We are hoping to have Technology Day for Women and Alice is one of the sessions that we would have for high school girls to try and motivate their interest in technology." Participant F said, "I'd like to investigate ways to include this type of engaging, intuitive program in my own teaching of higher difficulty material/concepts." Participant D

considered Alice appropriate in researching different software tools. He stated, “I felt the self-paced discovery process applicable to investigating problem solving software tools.”

Having analyzed my data by depicting examples of common experiences, for instance, an appreciation for helpful tutorials, the opportunity to receive feedback and be in control, and to be able to apply the demonstrated learning process to other scenarios, I will proceed forward to the next chapter by explaining the relationship with my findings and literature review.

Chapter Five: Conclusion and Implications

Having collected and analyzed my data, I now discuss the connections made between my literature review and my findings. In Chapter 1, I asked, “What happens when learners interact with the three-dimensional programming environment known as Alice?” The answers surfaced as most participants genuinely learned and were motivated to discover a new program.

It was evident that learners *learned* through the following quotes: Participant A, “This program was new to me and I was able to understand the program and use the program.” Participant C, “Even though Alice is a basic program, I was able to get the general concept of what it is like to write code.” Participant F, “I was motivated to keep on going because it was entertaining and I’d have to say the ability to quickly add and review actions made it easy to continue building the world I’d created.” It was evident that learners were *motivated* through the following quotes: Participant A, “I am motivated to continue building my world because I am curious of how it will look when I am finished.” Participant D, “I was motivated to enhance my world as I sampled other peoples’ projects that I found online. I would definitely buy a book to continue with the program.” The catalyst for learner motivation may have been in the way that Alice provided participants with clear feedback. In addition, participants felt in complete control. Aldrich (2007) indicates that engaged learners become immersed in the game’s environment when they acquire total control and every aspect of the game depends on their actions. Participant A, “I felt in control when picking the objects that I wanted.” Participant C, “I felt in control when I could make any modifications that I wanted, without dependence on anything else. That also goes to show that the program is very

successful. Since it is an entry level program, making it a positive experience is very important.” Participant D felt immersed in the program in the form of time transformation. He had to force himself to step away from the program because he needed to spend time on other projects. Participant E, “I felt in control because I was able to place all the objects and decide which actions each object had.” Participant F felt in complete control due to the nature of Alice, that is, a “highly engaging, even immersive” environment. Finally, participants were certain that they would be able to apply what they had learned to future learning situations. If meanings are *situated* in terms of actions, images, and discussion, versus random definitions, then learners will be able to apply new knowledge to future situations. The reason that learners are able to *apply* is because games and simulations give players the information as soon as the learner needs to understand (Gee, 2008). Participant A felt that after learning a new software tool, she was then more confident to learn new technologies in her future graduate courses. Since Participant B was an experienced programmer, she felt that she could take her knowledge of Alice and apply it to future technology courses that she would teach. Similarly, Alice had an effect on Participant F as a science teacher. He stated an interest to applying, not necessarily the specific programming method, but the concept of immersive software into his science classroom. Through the Alice tutorials, Participant C believed that she would be less nervous when trying out other new programs. She said, “I know I can watch a tutorial and have success on my own.” Participant D learned Alice so that he could then compare it to, specifically, MIT’s two-dimensional software program called Scratch. He said, “I was intrigued by Alice’s capabilities and comparing it to logo-based programs and Scratch.”

Alice helped build the users' confidence, created an enjoyable learning environment, and identified their needs through self-discovery. Many participants stated, multiple times, that Alice provided them with constant feedback. The facilitation of feedback and guidance will aid the learners in grasping their level of comprehension, determining how much time is required and what content needs more attention in order to reach maximum understanding. Gee (2007) indicates that active learning helps users to take control of their level of comprehension by allowing them to recognize when they fully understand a concept or when they need to search for additional information in order to attain a more thorough understanding. Alice provided constant feedback by showing users' the reactions to their commands. This form of formative feedback gave participants time to assess their decisions in order to rethink if they should alter their work or continue onward. Cooper et al. (2000) consider instant feedback as the reason students understand, through using Alice, the way programming language is created. The researchers affirm, "Students are immediately able to see how their animated programs run" (p. 4).

The relevance and social meaning of my study is that it provides educators with research on the most valuable ways to facilitate learning in the 21st Century. Kirkley and Kirkley (2007) show the importance of incorporating fun, engaging, valuable, significant, and powerful elements within learning environments for the next generation. For instance, a new learning environment represents technology comprised of mixed and virtual reality with the objective to "take learning and training into the real world and embed it within the context, situations, problems and environments where people work and learn" (p. 46).

In future studies, it would be beneficial to investigate the experience of confidence-based learning as a result of learning via games and simulations. Many participants stated, multiple times, that Alice was a confidence-builder. Frey (2007) describes the design of confidence-based learning as a guarantee that learning occurs and comprehension is reached. He states, “It ensures learning by assessing precisely what people know and what they don’t know without guesswork and doubt skewing the results.” After assessment, confidence-based learning works on “closing knowledge gaps at the moment users are most inclined to learn – right after being evaluated and their own misinformation and doubt has been exposed” (Frey, 2007).

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Appendix A

Consent Form

Learning via Games and Simulations

Thank you for your interest and commitment of time, energy, and effort in my thesis research on learning through technology. I value the unique contribution that you can make to my study. I hope to understand the essence of learning through online games and simulations as it reveals itself in your experience.

The research model I am using is a qualitative one. The participants chosen for this study are available professors and graduate students.

Your confidentiality will be secure at all times. Only I will have access to personal data that could be used to identify you. Data will be stored in a secure place only known to me. Personal information can only be released if it indicates a threat of harm to yourself or to others or in the very unlikely event that it would be ordered by a judge. It is your decision whether or not to participate in this study and you are free to withdraw from this study at any time.

Please indicate your willingness to participate in the study by completing the following:

I, _____, agree to participate in a research study titled Learning via Games and Simulations. I understand the purpose and nature of this study and I am participating voluntarily. I grant permission for the data to be used in the process of completing this master's level study. I understand that a brief synopsis of each participant, including myself, will be used. I grant permission for my personal data to be used. I grant permission to tape-recording of the interview(s).

Signature (Research Participant)

Date

Researcher:
Lauren Milstid, Graduate Student
Instructional Technology Program
Chestnut Hill College

Appendix B

Correspondence via Email

Email 1

To IT graduate students and faculty:

Are you interested in learning new software, as well as providing helpful information towards a unique subject? If so, then you could be an immediate participant for my research on learning through technology. I will provide a small monetary reward for your time.

Your participation would require you to:

- * Download free software (software name will be given later)
- * Work through the four tutorials (approximately 1-hour total)
- * Develop your own world (time may vary)
- * If you don't prefer tutorials, then dive right into the software and begin developing
- * Finally, I will interview you based on your experience with using the software

Please let me know if you are interested.

Thanks.
Lauren Milstid, Graduate Student
Instructional Technology Program
Chestnut Hill College

Email 2

Hi all,
Thank you for being the first respondents to offer your help regarding my study. I've attached the consent form that will need to be signed, which I can collect during our interview. Also, I've attached directions for how to complete the task. Let me know if you have any questions before you begin.

Thanks.
Lauren Milstid, Graduate Student
Instructional Technology Program
Chestnut Hill College

Appendix C

Directions for Participants

Your participation requires you to:

1. Download the free software, *Alice 2.0*, from www.alice.org.
2. Work through the tutorials, or if you prefer, dive right into the software and begin developing.
3. Develop your own world.
4. Let me know when you have finished, so that we can set up a face-to-face interview on your experience with using *Alice*.

Suggestions that will help me to collect valuable data:

1. Time requirement: Work on *Alice* as long as it takes you to create your own world.
2. Record your time spent on *Alice*.
3. Take notes while working through *Alice* (regarding your experience, what you like, what you don't like, what you learned, general comments, etc.).
4. I can start doing interviews Jan. 12 and after. It is your decision whether you'd like to wait closer to our interview date or if you have time over the holidays to work on it.
(This is why the notes are important).

Appendix D

Questions to Guide Interview

Essentially, what did you do, how did you interact, and what did you see and hear?

1. How did Alice work for you?
2. Did you enjoy the experience?
3. What did you feel when working with Alice?
4. Were you challenged? If so, what was challenging?
5. Was this activity equal to, above, or below your capabilities?
6. Were you aware of what you were doing or were your actions automatic?
7. Did Alice provide you with clear feedback?
8. Did Alice provide you with clear goals or did you decide what was intended for you to accomplish?
9. Were you able to concentrate solely on Alice without thinking of everyday issues?
10. Did you feel a sense of control?
11. Did you feel a loss of self-consciousness? In other words, did you feel yourself separate from the world while feeling more connected with the program, Alice?
12. Did you feel a transformation of time? If so, did time seem to pass faster or slower?
13. Were you motivated to continue building “your world” in Alice? If so, what motivated you?
14. Do you feel that you can apply what you’ve learned, while using Alice, to future learning situations? If so, how would you apply?