ABSTRACT

STONE, SOPHIA JEFFRIES. Instructors' Perceptions of Three-Dimensional (3D) Virtual Worlds: Instructional Use, Implementation and Benefits for Adult Learners. (Under the direction of Dr. Brad Mehlenbacher and Dr. Diane Chapman.)

The purpose of this dissertation research study was to explore instructors' perceptions of the educational application of three-dimensional (3D) virtual worlds in a variety of academic discipline areas and to assess the strengths and limitations this virtual environment presents for teaching adult learners. The guiding research question for this dissertation study was: What are instructors' perceptions of the strengths and limitations of three-dimensional virtual worlds as learning spaces for teaching adult learners? The following four questions supported this research: a) How do instructors implement educational experiences in 3D virtual worlds, for adult learners? b) How do instructors facilitate adult learning in 3D virtual worlds across disciplines? c) What insights do instructors describe about the adult learners' needs in this virtual environment? and d) How do instructors describe a successful immersive learning experience implemented in a 3D virtual world?

This dissertation research study was conducted as a heuristic case study with instructors interviewed from multiple locations that taught in private and public institutions of higher education in the southeastern United States. Instructors were asked to reflect on their experiences teaching in a virtual world, and to describe their perceptions of characteristics of a successful virtual world implementation in their teaching practice. The study found instructors perceived the benefits of learning in 3D virtual worlds for adult learners as the ability to experience content, community, collective wisdom, immersion, authentic learning, and a "sense of academic home" in an online environment. The study found assessment methods are uniquely situated to take advantage of the attributes of 3D

virtual worlds, the social learning made possible, and the digital artifacts this space affords. The dissertation concludes with recommendations for faculty and higher education administrators that address the significant practice, policy, and institutional issues and concerns that arise with the application of virtual worlds as an instructional learning space.

Instructors' Perceptions of Three-Dimensional (3D) Virtual Worlds: Instructional Use, Implementation and Benefits for Adult Learners

by
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A dissertation submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements for the degree of
Doctor of Education

Adult and Higher Education

Raleigh, North Carolina

2009

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DEDICATION

I dedicate this dissertation to my two beautiful daughters, Christina and Elizabeth, for your inspiration, humor, insight, love, and endless patience. I dedicate this dissertation to my husband Walter, for your love, support, and understanding.

BIOGRAPHY

Sophia J. Stone is currently Assistant Director for Distance and Independent Learning at Duke University. In her role with the Talent Identification Program, she oversees the development and implementation of innovative distance education services for gifted and talented students. Sophia was born in Montreal, Quebec. She has a B.A. from McGill University, an M.L.S from the University of North Carolina at Chapel Hill, an M.Ed. from NC State University, and is currently a doctoral candidate for the Ed.D. at NC State University. She was inducted to Phi Kappa Phi in 2002.

Sophia's professional background includes more than 15 years experience in higher education and training and development. Her research interests include 3D virtual worlds, social learning, online learning, and assessment tools in 3D virtual learning environments. She most recently co-authored an article in *E-Learning* and has been recognized as a recipient of the Academy of Human Resource Development Cutting Edge Research Award Top Ten Paper, 2007 Conference Proceedings. Sophia was a member of the NC State development team awarded the 2008 Blackboard Exemplary Course Award, which recognized educational excellence for the course EAC 582 Organization and Operation of Training and Development Programs in the following four categories: design, interaction and collaboration, assessment, and learner support. Sophia lives in Cary, N.C. with her husband and two daughters.

ACKNOWLEDGMENTS

With deep gratitude, I would like to thank my dissertation committee: Dr. Brad Mehlenbacher and Dr. Diane D. Chapman, dissertation co-chairs, the late Dr. Colleen Wiessner, dissertation committee member and qualitative methodologist, Dr. Julia Storberg-Walker, who kindly served after Dr. Wiessner's sudden passing, and Dr. Len Annetta, dissertation committee member. Thank you for your guidance, feedback, and encouragement throughout this process. Dr. Mehlenbacher, thank you for your wisdom and guidance. You helped me keep the big picture in mind and you made this dissertation an enjoyable process. Dr. Chapman, you have been a great mentor, and I am deeply grateful for all you have done so I can reach this point today. Thank you Dr. Annetta, for subject matter expertise and for guiding me as I developed this dissertation. A very special thanks to Dr. Julia Storberg-Walker, who graciously agreed to serve on my committee after the very sudden and unexpected passing of Dr. Wiessner. A great qualitative methodologist, a very wise woman, and a genuinely lovable individual, Dr. Wiessner was one the kindest individuals I have ever had the privilege of knowing. Thank you Dr. Luckadoo, for giving me a roadmap after I defended the proposal, and for offering encouragement so I could complete this dissertation. Thank you to Dede Nelson, Dr. Lynne Gregorio, and Dr. Nancy Fire, for your encouragement and support. Thank you Shana Scott for taking care of all the important details. Now that I've completed this dissertation, I am so looking forward to writing!

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CHAPTER 1: INTRODUCTION

Three-dimensional (3D) virtual worlds are increasingly implemented as instructional spaces for teaching adult learners in academic and corporate settings (Kluge & Riley, 2008; NMC, 2008). While there are many potential educational benefits to learning in this virtual space, this innovative technology and its educational application in the field of adult education and training raise questions for research, policy, and practice. The problem is many instructors who implement 3D virtual worlds in their teaching are confronted with unforeseen issues and barriers that have not been fully addressed in the research, as many virtual worlds were not created specifically for educational purposes (Boulos, Hetherington, & Wheelert, 2007; Taylor & Chyung, 2008; Hayes, 2006). More extensive research is needed to identify the specific strengths and limitations these virtual learning environments present for teaching adult learners (Hayes).

The purpose of this dissertation research study was to explore the educational application of 3D virtual worlds in a variety of academic disciplines and to assess the strengths and limitations this virtual learning environment presents for teaching adult learners. The guiding research question for this dissertation study was: What are instructors' perceptions of the strengths and limitations of three-dimensional virtual worlds as learning spaces for teaching adult learners? The following four questions supported this research: a) How do instructors implement educational experiences in 3D virtual worlds for adult learners? b) How do instructors facilitate adult learning in 3D virtual worlds across disciplines? c) What insights do instructors describe about the adult learners' needs in this virtual environment? And d) How do instructors describe a successful immersive learning

experience implemented in a 3D virtual world? By interviewing instructors who taught in a virtual world, I was able to understand their perceptions of the barriers virtual learning environments present for teaching adult learners. Instructors were asked to reflect on their experiences teaching in a virtual world, and to describe their perceptions of characteristics of a successful virtual world implementation.

This first chapter introduces the reader to 3D virtual worlds and describes the characteristics of virtual worlds and the immersive educational experiences they make possible. The chapter highlights current 3D virtual world implementations in adult education and training and explores the potential educational benefits these virtual spaces provide. Reports on the barriers and challenges instructors face teaching in virtual worlds are discussed. This first chapter describes the purpose, problem statement, research questions, and the significance for this dissertation research study.

Background

Instructors have available a variety of educational technologies for teaching adult learners, synchronously and asynchronously. Learning management systems, Web conferencing software, Web 2.0 technologies, and three-dimensional (3D) virtual worlds are just a few of the instructional technologies available for teaching adult learners in an online environment. 3D virtual worlds are receiving increased attention by educators for their potential to deliver immersive, authentic learning experiences in a socially situated context (Kluge & Riley, 2008). These immersive learning experiences are made possible by recent advances in technology including increased bandwidth, sophisticated graphic cards, and powerful microprocessors (Bainbridge, 2007; Delwiche, 2006). 3D virtual worlds, whose

historic antecedents lie in gaming and social networking, are spaces for collaboration, learning, training, work, and e-commerce (Messinger, Stroulia & Lyons, 2008).

Virtual worlds are characterized by a shared social space, user-created content, a graphical user interface, and a virtual space that can be experienced in multi-user mode within the context of a three dimensional (3D) virtual environment (Chittaro & Ranon, 2007; Hayes, 2006). Virtual worlds combine graphics and audio with the ability to communicate and interact synchronously with multiple users (Bell, Peters & Pope, 2007; Kushner, 2004: Meall, 2007). Shroeder (2008) explains what makes virtual worlds distinct from other virtual environments is they are persistent online social spaces that exist over time after the user has left the virtual environment, and they are a synchronous, immersive world for social interaction. A defining characteristic of 3D virtual worlds is their capacity to deliver authentic learning experiences rooted in context in a social environment (Dodds, 2007).

3D virtual worlds are increasingly being implemented as instructional spaces for teaching in the academic setting and in corporate training. According to *The Horizon Report*:

> Virtual worlds offer an opportunity for people to interact in a way that conveys a sense of presence lacking in other media. These spaces can be huge, in terms of the number of people that use them, and they are growing in popularity because they combine many of the elements that make Web 2.0 really exciting: social networking; the ability to share rich media seamlessly; the ability to connect with friends; a feeling of presence; and a connection to the community. (NMC, 2008, p. 18)

The latest developments in virtual worlds provide a new level of immersive experience, "incorporating rich visual elements and animations that provide a full-featured social

learning environment" (Carter & Click, 2006, p. 2). These virtual environments are designed to facilitate total immersion in context. As an innovative learning technology virtual worlds have the potential to "significantly enhance the experience and transfer of learning" by providing an enhanced visual and immersive virtual environment for social and collaborative learning in a context that closely mimics real-world scenarios (Cross, O'Driscoll & Trondsen, 2007, p. 1).

Statement of the Problem

The research on the instructional use and implementation of 3D virtual worlds, much of it based in the research on game-based learning, makes reference to the potential educational benefits of these virtual learning environments (Carter & Click, 2006; Chittaro & Ranon, 2007; Cross et al., 2007; Dede, 2005; Delwiche, 2006; Dickey, 2005;2005a; Gee, 2003; Hayes, 2006; Karagiorgi & Symeou, 2005; Steinkuehler, 2004). However, there are reports of the challenges these environments present for both instructors and adult learners (Boulos et al., 2007; Bugeja, 2007; Gronstedt, 2007a; Hayes, 2006; Johnson, 2007; Kluge & Riley, 2008; Taylor & Chyung, 2008). Challenges include the design, development, and sustainability of this virtual learning environment (Boulos et al.; Gronstedt). Boulos et al. caution many of the educational possibilities still need to be fully identified, explored, and carefully researched before virtual worlds can be used extensively in teaching. Prior to making the decision to select and implement a virtual world in their teaching, educators should inquire about the effectiveness for teaching adult learners, within the context and discipline of the technology's intended use.

For example, Second Life and many other virtual worlds were not created specifically for educational purposes; however, they are being adapted by educators for instructional use (Kluge & Riley, 2008). Kluge and Riley explain many of the features educators take for granted in learning management systems do not exist in virtual worlds. Learning management systems typically provide teaching functionalities such as a grade book, an assignment drop box, asynchronous discussion tools, online surveys, and objective assessments. Many of these teaching tools are not available in virtual worlds that are adopted for educational purposes.

3D virtual worlds are evolving and experimental learning spaces. According to Hayes (2006), "As we launch such educational experiments, we need to bear in mind issues such as the balance of control and freedom granted to learners in such worlds. At the frontiers of adult learning, they offer unanticipated riches as well as unforeseen challenges" (p. 159). The problem is many instructors who implement 3D virtual worlds in their teaching are confronted with a host of unforeseen issues and barriers that have not been fully addressed in the research, as many virtual worlds were not created strictly for educational purposes. In addition, the skills and competencies instructors need to teach adult learners in these virtual spaces have not been fully examined and documented (Boulos et al., 2007). Taylor and Chyung (2008) explain there is a need for considerable research before this technology can be "realized in an appreciable manner by instructors or trainers" (p. 24).

Purpose of the Study

Cross et al. (2007) suggest virtual worlds require careful examination prior to their selection as a teaching tool. Rather than asking how to build a virtual classroom, they advise

us to ask: “What can this technology do that will enhance the learner’s experience that my current learning technology portfolio cannot?” (p. 2). The Distance Education Report (2007) cautions educators to look critically at virtual worlds, not simply as a representation of a learning space, but to question how this space can enhance learning in a way the physical space can not, given the challenges unique to virtual worlds. Hayes (2006) explains:

> Despite growing interest in such spaces for adult education, we know little about their strengths and limitations as environments for learning. There have been isolated studies of attributes of these worlds, but little attempt to develop holistic analyses of how features of particular worlds (they are not all alike by any means) contribute to and combine with emergent social and cultural properties to create distinctive “learning ecologies” (Seely Brown, 2000, as cited in Hayes, p. 154).

The purpose of this case study was to explore instructors’ perceptions of the educational application of 3D virtual worlds in a variety of academic discipline areas and to critically assess the strengths and limitations this virtual learning environment presents for teaching adult learners. By interviewing instructors who taught in a virtual world, I was able to understand from their perspective the barriers these environments present for teaching adult learners. The study reflected a variety of academic disciplines, and examined the types of learning experiences instructors delivered in virtual worlds for adult learners. Instructors were asked to reflect on their experience teaching in a virtual world, and to describe their perceptions of characteristics of a successful virtual world implementation.

Research Questions

The guiding research question for this dissertation study was: *What are instructors' perceptions of the strengths and limitations of three-dimensional virtual worlds as learning spaces for teaching adult learners?* The following four questions supported this research:

1. How do instructors implement educational experiences in 3D virtual worlds for adult learners?
2. How do instructors facilitate adult learning in 3D virtual worlds across disciplines?
3. What insights do instructors describe about the adult learners' needs in this virtual environment?
4. How do instructors describe a successful immersive learning experience implemented in a 3D virtual world?

Significance of the Study

This dissertation study has significance for research, policy, and practice. As an emerging and innovative technology in the adult education area, research is needed that describes the instructional use and implementation of learning experiences using this platform, and the potential educational benefits for adult learners. A considerable amount of research exists documenting the effectiveness of virtual worlds as learning environments in K-12 education. However, a limited amount of research specifically addresses the effectiveness of this virtual learning environment and its ability to meet the needs of adult learners, from the instructor's perspective in the field of adult education.

The study findings provided much needed analysis and documentation of the potential benefits and disadvantages virtual worlds present for teaching adult learners. In addition, transfer of learning is a critical part of the educational experience, and this study

provided documentation on assessment techniques used in virtual worlds to evaluate adult learning. Further, the reflective nature of the research design, case study approach, facilitated instructors' reflection on their own assumptions about teaching adult learners in an online environment, providing much needed research on how to facilitate adult learning in this virtual space. The findings of this dissertation study provided insights into the need for faculty development, support and training for those teaching or designing educational experiences in 3D virtual worlds.

The implementation of virtual worlds raises a host of policy issues in educational organizations, in universities and in corporate training, and an awareness of these issues is particularly relevant to instructors who are considering using virtual worlds for educational purposes. Virtual university campuses have had incidents of "griefing" "cyber-shootings" and "harassment and immoral behaviors" (Bugeja, 2007). As Bugeja notes:

> When it comes to Second Life, we're not only talking about money. We're talking about whether you as a professor or administrator will be held accountable for introducing your students and/or employees to a virtual world that accepts little responsibility for anything that happens among avatars, including online harassment and assault.

Student privacy, intellectual property ownership, student services infrastructure, and accessibility issues are important considerations. For instructors, additional administrative policy issues concern funding the development and sustainability of the virtual world project, intellectual property ownership, access to content, and the implications of purchasing virtual land to teach in this environment (Boulos et al., 2007; Kharif, 2007; Kluge & Riley, 2008).

Bugeja notes: “Any one of those purchases could result in personal or institutional liability with few, if any, processes in place to resolve legal or ethical complaints.”

Conceptual Framework and Literature

Understanding the needs of adult learners, how they learn best, and the potential for virtual worlds to meet their learning needs will become more important as the number of adults entering higher education continues to increase. Recent reports on the increase of adult learners in higher education and the advanced digital literacies they possess imply a changing adult learner student demographic. According to Howell, Williams, and Lindsay (2003), online learners are becoming an “entirely new subpopulation of higher-education learners” unlike past generations, with new requirements for literacy that extend beyond text, to media rich environments. Foreman (2004), Dede (2005), and Oblinger (2004) speak of the Net generation learners as digital learners, who possess multiple media fluency. In addition, the adult learner population is growing in higher education as Howell, Williams and Lindsay (2003) point to a 170% increase in the number of adult students between 1970 and 2000.

Andragogy: A Model for Adult Learning

The andragogical model provides a framework specific to the needs of the adult learner and is a useful model for instructors teaching adults in 3D virtual worlds. Andragogy provides adult educators with a framework for understanding how adults learn. Knowles’ (1998) six core adult learning principles carry implications for the design and implementation of educational experiences to meet the needs of adult learners. Knowles’ principles of adult learning emphasize a self-directed, problem-solving, experiential approach to adult education. From the assumptions of how adults learn, Knowles’ proposed a programming

model for designing, implementing, and evaluating educational experiences with adult learners (Merriam, 2001). These core adult learning principles serve as a model for teaching adults—"the art and science of helping adults learn" (Sandlin, 2005, p. 25). As a guiding framework, andragogy helps instructors to evaluate (a) instructional strategies, (b) instructional design models, (c) teaching techniques/assumptions, (d) content presentation, and (e) the use of appropriate learning theories. Self-directed learning focuses on the process of learning, and makes the assumption that adult learners will assume primary responsibility for their own learning. The role of adult educators is to facilitate or guide the learning process (Merriam, Caffarella & Baumgartner, 2007). Self-directed learning theory is favorable to virtual learning environments, as the environment is unbounded in time and space and requires learners to assume a higher level of autonomy and self-direction.

Although andragogy has a long tradition in the field of adult education, it has been critiqued by Hartree (1984) who questioned whether andragogy was a theory, suggesting instead the six assumptions are simply principles of good practice. Sandlin (2005) summarized the five main critiques as (a) andragogy makes an incorrect assumption that education is value neutral and apolitical and fails to recognize that knowledge is value-laden (Tisdell, 1998), (b) andragogy promotes an adult learner with white, middle-class values (Collins, 1995; Flannery, 1994; Guy, 1996; Pratt, 1993), (c) andragogy does not include other ways of knowing and ignores voices of the disenfranchised (Flannery, 1994; Welton, 1995), (d) andragogy is very individualistic and does not consider the relationship between self and society by decontextualizing the learning process, and (e) andragogy perpetuates the status quo (Colin & Preciphs, 1991; Flannery, 1994; 1995; Heaney, 1996).

Theories of Adult Learning

There are several adult learning theories that are relevant for learning in 3D virtual worlds. Traditional theories of adult learning, such as andragogy and self-directed learning pertain to online learning as they focus on the characteristics that make adults unique as learners, the six assumptions, mentioned previously. Other adult learning theories, such as experiential learning, situated learning, and constructivist theories are useful tools of analysis as we examine how learning takes place in these multi-user, social virtual spaces.

Experiential Learning

Experiential learning involves the reflective construction of meaning through critical reflection and dialogue. Net generation learners are experiential learners (Oblinger and Oblinger, 2005). David Kolb (1984) argued that learning must be experiential, proposing a four stage model of the learning process: (a) a concrete experience, (b) reflection on the experience, and (c) abstract generalization from the experience and the application of the concepts to another situation (Holmes & Gardner, 2006). Experiential learning involves the reflective construction of meaning with emphasis on critical reflection and dialogue (Fenwick, 2000; 2000a). According to Fenwick, a learner's reflection on lived experience and the subsequent interpretation that forms knowledge is constructivist in nature and reflected in the writings of Schon (1983), Kolb (1984) and Brookfield (1987). Schon examined how adults learn from experience and found learning occurs through reflection-in-action and reflection-on-action. Rogers (2002) as well as Bersin (2004) asserted the highest level of mastery comes from experiential learning as this creates a high level of understanding, context, and retention. Feinstein, Mann and Corsun (2002) and Gredler

(2004) noted the role experiential learning plays in simulation-based environments. Tennant and Pogson (1995) affirmed that experience plays a central role in the practice of adult education. “Focusing on the learner’s experience is an integral part of the tradition that places the learner at the center of the education process” (p. 149). The justification for placing experience at the center of learning is founded on Dewey’s assertion that education rests solidly on experience as a foundation for learning.

Situated Learning

Situated learning theory suggests that knowledge must be socially situated in an authentic context for learning to occur (Lave & Wenger 1991). Situated learning theory is relevant for adults learning in virtual worlds because the theory takes into account adult cognition with a focus on the importance of socially situating learning in an authentic context. Situated learning theory considers the interaction of a number of factors that influence learning: the adult learner, the context, the learning task, the process for learning, and the social environment in which learning takes place. Situated learning theory has two main tenets: (a) knowledge needs to be presented in an authentic context, i.e., settings and applications that would normally involve that knowledge; and (b) learning requires social interaction and collaboration, as learners become part of a “community of practice.” According to Lave and Wenger (1991), meaning is contextual, and learning takes place when individuals become increasingly involved as participants in social communities of practice. Individuals learn through participation and interaction with the community, its history, assumptions and cultural values, rules, and patterns of relationship, the tools at hand including objects, technology, languages, and images, and the activity of the moment, its

purposes, norms, and practical challenges. Knowledge emerges as a result of these elements interacting. When problems and context are similar to real-world scenarios, situated learning is possible (Hayes, 2006).

Constructivism

Constructivism has three main tenets: (a) understanding comes from interactions with the environment, (b) cognitive conflict is the stimulus for learning and determines the organization and nature of what is learned, and (c) knowledge evolves through social negotiation with the learning environment, providing alternative views to test the learner's understanding of the knowledge construct. Constructivist theorists (Jonassen, 1991; Savery & Duffy, 1996) believe learners construct their own reality and form their own interpretations based upon their perceptions of experiences. Constructivists maintain learners construct knowledge through relationships, rather than acquire knowledge through the transmission of information (Dickey, 1999). Knowledge is dynamic and built around the process of discovery (Huang, 2002).

From a constructivist perspective, learning is a process of making sense of the world and negotiating meaning with others (Kirkley & Kirkley, 2005). Constructivism suggests learning is an active process and learners construct knowledge by understanding new information built upon their current understanding and expertise. Problem-based learning is one example of constructivist learning. Constructivists such as Dewey (1916), Piaget (1973), Vygotsky (1978) and Bruner (1996) each proposed learners could learn to actively construct new knowledge based on their prior knowledge. According to Dewey (1916), knowledge is based on active experience with the learner's interaction with his environment.

Constructivism implies that learning is effective when it is contextual, active, and social (Oblinger & Oblinger, 2005). Constructivists claim individuals learn through a process of knowledge construction that takes place when learners are intellectually engaged in "personally meaningful tasks" (Chittaro & Ranon, 2007). Virtual worlds are favorable to constructivist design because they provide first person interaction with the environment, and a "first-person experience allowing for spontaneous knowledge acquisition" (Chittaro & Ranon).

Summary of Conceptual Framework and Literature

The guiding conceptual framework for this dissertation research study is andragogy, and the adult learning theories, experiential, situated learning, and constructivism, that facilitate learning in the virtual world environment. The andragogical model provides a framework specific to the needs of the adult learner and is a useful model for instructors teaching adults in 3D virtual worlds as it provides adult educators with a framework for understanding how adults learn within the framework of Knowles' (1998) six core adult learning principles. The literature review includes a discussion of adult learning theories relevant to learning in 3D virtual worlds: experiential learing, situated learning, and constructivism, discussed in depth in chapter two.

Definitions

There are many definitions relevant to this study. A review of literature on the history of virtual worlds finds the term virtual worlds is used interchangeably with a multitude of terms, including 3D virtual worlds (Dickey, 2003), 3D social virtual worlds (Hendaoui, Limayem & Thompson, 2008), multiplayer online games (MMOs), multi-user virtual environments (MUVEs), synthetics worlds, MMOs, MMORPGs, social virtual worlds, MUDs, MOOs, and MUSHes (Delwiche, 2006). The historical roots of virtual worlds in social networking and massively multiplayer online games (MMOGs) require a glossary of terms that emerge from the literature base for Web 2.0 technologies as well. The categories of definitions are (a) gaming and simulations, (b) social networking, and (c) virtual worlds.

Gaming and Simulations

Multi-User Domain (MUD). A MUD as a "synchronous, networked, communication that accesses a shared database of text descriptions of "rooms" exits" and "objects" which users access and interact by way of a textual interface" (Dickey, 1999, p. 12 – 13). Most MUDs are user-extensible systems providing for the creation of "objects" and "rooms" for interaction with other users.

Multi-user virtual environments (MUVEs). Virtual worlds, also called MUVEs, are three-dimensional virtual environments that combine graphics and audio with the ability to communicate and interact with multiple users in a synchronous 3D virtual environment (Bell, Peters & Pope, 2007; Meall, 2007).

Massively multiplayer online games (MMOGs). MMOGs are graphical multi-user 3D games played in persistent virtual worlds, also referred to as massive multi-user online role-playing games (MMORGPs) (Dickey, 1999).

Simulations. Simulations are open-ended evolving situations with a host of interacting variables and options. Simulation programs have several general characteristics in common. They (a) present a similar model of a real-world situation with which the student interacts, (b) have a specific role for each participant, (c) offer a data rich environment that gives students a range of strategies and opportunities to choose from, and (d) provide feedback for participant actions (Gredler, 2004).

Social Networking

Social networking site (SSN). Social networking sites are defined by (Boyd & Ellison, 2007) as "web-based services that allow individuals to: (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system" (p. 2). Facebook and MySpace are two popular social networking sites.

Profile. Profiles are web pages that typically include descriptors such as age, location, interests, and an "about me" section, and a profile picture, and/or multimedia content (Boyd & Ellison, 2007). Facebook, Myspace, Linked In, and other social networking sites display a user-created profile.

Mashup. "A mashup is a web application that combines data from more than one source via a single, unified tool." (NMC, 2008). Google Maps is one example of a mashup.

Web 2.0. A concept that refers to a host of social, collaborative Internet tools such as grassroots video, digital storytelling, web collaboration tools, and data mashups (Downes, 2007).

Virtual Worlds

Virtual World (VW). Dickey (2003) describes three important features of virtual worlds: (a) The illusion of 3D space, (b) avatars that serve as visual representations of users, and (c) an interactive chat (or audio) environment for users to communicate with one another. Virtual worlds are persistent, multi-user spaces where individuals, in the form of avatars, interact with one another over the Internet. Boulos et al. (2007, p. 233) describe a virtual world as a "computer-based, simulated multi-media environment, usually running over the Web, and designed so that users can 'inhabit' and interact via their own graphical self-representations known as avatars."

Avatar. An avatar is a form of a virtual self, an online persona (Cross et al., 2007). According to Castronova (2003) an avatar is a surrogate for the physical body in the virtual environment.

Virtual learning environment (VLE). A virtual learning environment is defined as "a three-dimensional world where multiple students can interact in real-time while using avatars as representations of themselves" (Annetta & Holmes, 2006, p. 27). A VLE is also referred to as a virtual world in this study.

Online persistent world. Shroeder (2008) explains what makes virtual worlds distinct from virtual environments is they are persistent online social spaces, they exist over time, and they are experienced together with others as an immersive world for social interaction. An

online persistent world is a virtual community that exists even after a user exits, or has left the virtual world.

*Metaverse***.** A 3D virtual reality (VR)-based space in which people interact and communicate with each other through their avatars (graphical representations of themselves). Metaverse is another term for 3D virtual worlds (Hendaoui, Limayem & Thompson, 2008**).**

Active Worlds. A popular 3D virtual world, also used in education and training. www.activeworlds.com. Active Worlds dates to 1995 and remains one of the most active 3D virtual world applications online today (Dickey, 2003).

Second Life. A popular 3D virtual world, also used in education and training, www.secondlife.com. Hendaoui, Limayem and Thompson (2008) describe Second Life as a social virtual world in which people, called *residents*, can communicate, collaborate, and buy, sell, and rent virtual goods and services such as clothes and real estate through their customized virtual spaces and avatars.

Authentic learning environment. Authentic learning involves tasks that focus on real-world, complex problems and their solutions, using role-playing exercises, problem-based activities, case studies, and participation in virtual communities of practice. The learning environment is similar to a 'real world' application (Lombardi, 2007).

Immersive Education. Immersive Education is a combination of interactive virtual reality and digital media tools such as voice chat, audio/video and authentic learning environments in a 3D virtual world that immerse and fully engage students in the learning experience (http://immersiveeducation.org/about.html).

Chapter Summary

Virtual learning spaces, well suited to social learning and constructivist ways of knowing are potentially effective learning spaces for today's adult learner. However, an understanding of the unique needs of adult learners is critical to designing immersive learning experiences that support this learner demographic and promotes their academic success. 3D Virtual worlds are currently explored in many educational institutions, and they are being implemented with limited research that speaks to the host of practice, policy, and institutional issues and concerns that surround their use and implementation. Prior to making the decision to select and implement a virtual world in their teaching, educators should inquire about the overall strengths and limitations this technology presents within the context of its intended purpose. The goal of this dissertation case study was to explore how instructors implement virtual worlds in their teaching, to describe the learning experiences they deliver in a virtual world, to assess the barriers and challenges to implementation, and to document the educational benefits this virtual learning environment presents for teaching adult learners.

This first chapter explained the background, problem, purpose, research questions, and significance for the dissertation research study. Chapter two provides a review of the literature. Included is a review of the origin, predecessor technologies and contemporary uses of 3D virtual worlds as learning spaces, an overview of the conceptual framework and the foundational learning theories suited to teaching adults in virtual worlds, and a description of the barriers and potential educational benefits virtual worlds present for teaching adult learners.

CHAPTER 2: LITERATURE REVIEW

Introduction

The purpose of this case study was to explore instructors' perceptions of the educational application of 3D virtual worlds in a variety of academic discipline areas and to critically assess the strengths and limitations this virtual learning environment presents for teaching adult learners. By interviewing instructors who taught in virtual worlds, I was able to understand from their perspective the barriers and challenges these environments present for teaching adult learners. The study reflected a variety of academic disciplines, and examined the types of learning experiences instructors delivered in virtual worlds for adult learners. Instructors were asked to reflect on their experience teaching in a virtual world, and to describe their own perceptions of characteristics of successful virtual world implementations. The guiding research question for this dissertation study was: *What are instructors' perceptions of the strengths and limitations of three-dimensional virtual worlds as learning spaces for teaching adult learners?* The following four questions supported this research:

1. How do instructors implement educational experiences in 3D virtual worlds for adult learners?
2. How do instructors facilitate adult learning in 3D virtual worlds across disciplines?
3. What insights do instructors describe about the adult learners' needs in this virtual environment?
4. How do instructors describe a successful immersive learning experience implemented in a 3D virtual world?

The chapter is divided into the following literature areas that inform the supporting research questions: Part I: Origin, Predecessor Technologies and Contemporary Uses describes virtual worlds, their characteristics, how they originated, and the tools and technologies that influenced their development. An overview of the contemporary uses of 3D virtual worlds as learning spaces is included. Part II: Conceptual Framework and Learning Theories describe the conceptual framework and the foundational learning theories that pertain to learning in virtual worlds. Part III: Barriers and Potential Educational Benefits describe the challenges and potential educational benefits virtual worlds present for teaching adult learners.

Part I: Origin, Predecessor Technologies and Contemporary Uses

Virtual worlds, whose origins lie in gaming and social networking, are three-dimensional virtual environments populated by thousands of users around the world simultaneously. They combine graphics and audio with the ability to communicate and interact with multiple users in a synchronous 3D virtual environment (Bell, Peters & Pope, 2007; Meall, 2007). Virtual worlds, often referred to as MUVEs have been called persistent worlds, 3D virtual worlds, and MMOs (massively multiplayer on-line games). A virtual learning environment is defined as "a three-dimensional world where multiple students can interact in real-time while using avatars as representations of themselves" (Annetta & Holmes, 2006, p. 27). Often referred to simply as 3D virtual worlds, this technology allows many users to immerse themselves in the virtual environment and to create, communicate, learn and interact with one another (Kushner, 2004). There are over 30 virtual worlds on the market (Hedley, 2007). Popular virtual worlds include *Active Worlds*, *Second Life*, *Protosphere*, *There*, *Forterra* and *Open Croquet* (Cross et al., 2007).

3D virtual worlds have been influenced by several predecessor technologies, including gaming and social computing, and contain a combination of many of the tools offered by simulations and social networking. Messinger, Stroulia and Lyons (2008) explain virtual worlds represent a blending of the elements of immersive 3D gaming environments, together with the elements of online social networking.

3D virtual worlds have been strongly influenced by the multi-user virtual gaming environment and predecessor technologies such as simulation programs, video/role-playing games, MUDs (Multi-User Domains/Multi-User Dungeons), MOOs (Multi-user Object-Oriented environment), IRC (Internet Relay Chat) and the Internet gaming community. Holmes & Gardner (2006) explain the more recent 3D virtual worlds are founded on the text-based virtual worlds of MUDs and MOOs. As role-playing games, MUDs and MOOs have been instrumental in the emergence of highly engaging and innovative e-learning environments.

Simulations

3D virtual worlds, as simulated environments, have been influenced by the use of simulations as experiential instructional tools. The use of simulations for experientially based learning is extensively documented in the education literature (Bersin, 2004; Billhardt, 2004; Gredler, 2004; Green & Sulbaran, 2006; Rogers, 2001). Simulations have been used to enhance adult learning in corporate and military settings for over 50 years (Carter & Click, 2006). Simulations enjoy widespread usage in the military, medical education, language/science education, and corporate training, and in recent years have become popular

in industry and retail areas such as architecture, interior design, and landscaping (Green & Sulbaran).

Gredler (2004) defines simulations as open-ended evolving situations with a host of interacting variables and options. According to Gredler, simulation programs have several characteristics in common. They (a) present a similar model of a real-world situation with which the student interacts, (b) have a specific role for each participant, (c) offer a data rich environment that gives students a range of strategies and opportunities to choose from, and (d) provide feedback for participant actions. The simulated environments in 3D virtual worlds such as Active Worlds and Second Life, with role-play, experiential learning, and problem-solving activities situated within an authentic, social context, share these characteristics.

Simulations and games offer several benefits as an instructional tool. According to Carter and Click (2006), they help adult learners manage reaching levels of attainment without feeling overwhelmed. They allow learners to link learning to goals and roles, they present a safe, multimodal-learning environment, and they support a framework of inquiry (Carter & Click; Jenkins, 2005). They promote cooperative learning, and they develop problem solving and critical thinking skills. Simulations help learners work through complex problems, and they motivate students by providing authentic environments for learning (Billhardt, 2004). Bersin (2004) and Rosenberg (2006) promote the potential of interactive simulations to foster deep learning through immersion. Simulations give students an opportunity to direct their own learning and to interactively engage with course content and concepts to shape and enrich their learning experience. In fact, technology-based games and

simulations have become one of the fastest growing segments of the e-learning industry (Rosenberg).

Simulations have many of the elements found in games, although they are less likely to involve competition between learners. Thus, they offer adult learners a safe learning space to practice and receive reinforcement for skills training. A well-known benefit of using simulations is the experiential learning opportunity for students. Students can address the issues and problems that arise in a given situation by selecting among available options/solutions. Students receive immediate feedback on how effective their problem-solving skills are with regards to their decision-making abilities (Bersin, 2004; Gredler, 2004).

3D virtual worlds share many characteristics of these simulations. Simulation exercises facilitate learning through experience and the learner is "directly in touch with the realities being studied" (Pimentel, 1999). For example, in 3D virtual worlds learners can interact with content by manipulating objects in their environment. Simulations provide a student-centric, interactive learning environment with immediate feedback and the ability to develop students' problem solving strategies (Lean, Moizer, Towler & Abbey, 2006). As Billhardt (2004) states, "The learners' individual choices determine where they find themselves later in the simulation" (p. 38). According to Dede (2004), simulations foster immersive presence and enhance learning. Dede explains that simulations in 3D virtual worlds combine action along with symbolic and sensory factors that induce a "psychological sense of sensory and physical immersion" (p. 11) in the movement and manipulation of one's avatar to feel that one is inside the virtual environment.

MUDs and MOOs

The influence of simulations is one part of the historical perspective on 3D virtual worlds along with the text-based virtual worlds of MUDs (Multi-User Domains/Multi-User Dungeons) and MOOs (Multi-user Object-Oriented environment). A MUD is a virtual world in which one can interact with other participants in real time. Dickey (1999), Childress and Braswell (2006) and Holmes and Gardner (2006) offer detailed accounts of the history of MUDs and MOOs and their influence on 3D virtual worlds. Childress and Braswell (2006) explain that MUDs combine text instant message chat and role-playing, with most MUDs based in a fantasy or mythical world context. Dickey (1999) defines a MUD as a "synchronous, networked, communication that accesses a shared database of text descriptions of "rooms" exits" and "objects" which users access and interact by way of a textual interface" (p. 12-13). MUDs have multiple users logged in at one time. Although MUDs were originally text based, they now have visual graphic interfaces (Holmes & Gardner, 2006). As a shared virtual environment MUDs allow users to manipulate database content from inside the environment, and to speak to one another via text chat. The early MUDs (from the 1960s) were single user games, such as fantasy or combat games, and they were influenced by the early text-based Dungeon and Dragons fantasy game. These single user games evolved into multi-user games played by email or through bulletin boards (Dickey; Holmes & Gardner). In summary, MUDs, which were text-based environments, were an early precursor to the social multi-user virtual worlds that are popular today.

MOOs, originally developed by Stephen White (Dourish, 1998) and based on the MUD system (MUD-Object Oriented), supported synchronous interaction, evolving into

text-based virtual communities and later into graphical multi-user environments (Dickey, 1999). LambdaMOO was the largest MOO implemented environment (Dourish). The ability of avatars in 3D virtual worlds to role-play, to take on multiple identities, and to view scenarios from multiple perspectives is founded on these early MOOs. The significance of MOOs is their learning design was modeled on a constructivist framework. In addition, they promoted many of the learning benefits of simulations, such as cooperative learning, developing problem-solving/critical thinking skills, and authentic learning. However, they lacked the 3D visual representations of space available today in platforms such as Active Worlds and Second Life (Dickey, 1999; 2005).

MMOGs/MMORPGS

MMOGs evolved from the role-playing MUDs. By the late 1980s, graphical, multi-user, persistent world games were available on proprietary servers. The first MMOG available via the Internet was *Meridian 59* released in 1996. *EverQuest*, released in 1999 became the first fully three-dimensional game that could truly support a massive community, and quickly reached over 500,000 subscribers (Kent, 2003). Popular games such as World of Warcraft, Everquest, Lord of the Rings Online, and Age of Conan offer "quests" or "designer-provided objectives that serve as games within the larger game" (p. 5). MMOGs are highly graphical multi-user 3D games played in persistent virtual worlds, and some of these worlds are very large. For example, *World of Warcraft* has over 10 million subscribers (Messinger et al., 2008).

Virtual Reality Modeling Language (VRML), Java, and chat applications have facilitated the emergence of desktop web-based 3D multi-user worlds. Malaby (2006)

explains that today's virtual worlds are three-dimensional multi-user Internet communities that are graphically intensive, persistent worlds sharing many similarities to MMOGs (massively multiplayer online games) and MMORPGs (massively multiplayer online role-playing games). However, the environment of today's 3D MUVEs is more open-ended and lacks the fantasy genre and science fiction settings of MMOGs (Book, 2004).

Web 2.0: The Social Web

Social networking sites have also influenced the development of virtual worlds (Messinger et al., 2008). Social networking sites (SNS) are defined by Boyd and Ellison (2007) as "web-based services that allow individuals to (a) construct a public or semi-public profile within a bounded system, (b) articulate a list of other users with whom they share a connection, and (c) view and traverse their list of connections and those made by others within the system" (p. 2). These virtual spaces popular with today's college students allow them to create a profile and build an expansive network of contacts by sharing textual, pictorial, audio and video content (Messinger et al.). Social networking sites (SNS) have proliferated, with many sites supporting a wide range of interests. The most popular sites include MySpace (2003), Facebook (begun as a Harvard only SNS in 2004), Bebo, and Cyworld. As the sites continue to develop and become more sophisticated, they support additional features such as such as blogging and photo/video-sharing.

Additional social tools on the web include digital video, which ranges from user-created content on popular video sharing sites such as *YouTube, Google Video, Viddler, or Blip.tv* to machinima (Second Life), to live, interactive broadcasting with Ustream (www.ustream.tv) which allows users to build social networks around their broadcasts.

According to recent statistics “In January 2007 alone, 7.2 billion videos were viewed online by nearly 123 million Americans” (NMC, 2008, p. 10). Video for educational content is available through *iTunes U* and *You Tube*. Online collaborative workspaces (Facebook, Ning, and Pageflakes) allow students to share resources, socialize, and collaborate on projects. Web conferencing tools such as Elluminate Live support virtual meetings. Social software, in the form of blogs, wikis, social networking tools, and videoblogs is a major component of the Web. 2.0 movement (Alexander, 2006).

Web 2.0 collaboration tools converge to build a collective intelligence through data mashups. Collective intelligence implies knowledge imbedded within societies or large groups of individuals and is evident on the web with Wikipedia, Cellphedia, and del.icio.us social bookmarking (NMC, 2008). Web 2.0 sites allow users to pull data from different sources, creating data mashups (Ankolekar et al., 2008). Mashups are a combination of data from multiple sources in a single tool, and they allow information to be shared, collectively among a group of users (Ankolear et al,; NMC).

Collective intelligence is a characteristic of 3D virtual worlds. Virtual worlds take the power of simulations, gaming, and Web 2.0 tools combined to create a learning space that exploits the power of many technologies, which have previously found their way in education as separate tools. Some of the more popular Web 2.0 tools like grassroots video, digital storytelling, web collaboration tools, and data mashups have a special emphasis on their link to virtual world platforms. According to Downes (2007), the significance of Web 2.0 is it provides a personal learning environment (PLE) for users, redefining the concept of online learning. “The values that underlie the PLE and Web 2.0 are the same: the fostering of

social networks and communities, the emphasis on creation rather than consumption, and the decentralization of content and control" (p. 2).

3D Virtual Worlds: Use and Implementation as Learning Spaces

Today's 3D Virtual Worlds

Virtual worlds are defined by the following characteristics (a) a shared social space, (b) user-created/generated content, (c) a graphical user interface, and (d) a world that can be experienced in multi-user mode, within the context of a three dimensional (3D) virtual environment (Chittaro & Ranon, 2007; Hayes, 2006). Castronova (2005) refers to these virtual spaces as "synthetic worlds" to capture the virtual reality of these worlds as a product of human action. Malaby (2006) states:

> [S]ynthetic worlds are domains that present for their users an increasingly varied and complex set of affordances, including technical and architectural constraints, market forces, regularly applied national and other law, and social conventions. Domains are not set apart from everyday life—their separability from each other is practical, not fundamental. (p. 144-145)

3D virtual worlds are immersive, allowing avatars to interact in real time with other avatars, and with graphical objects, in a visually rich, simulated environment. Childress and Braswell (2006) explain the principle behind 3D virtual worlds is they provide a virtual social world with 3D online representations that supports thousands of users simultaneously (massively multiplayer capabilities).

Virtual worlds are highly interactive in a number of ways. 3D virtual worlds offer interaction in real time in the form of synchronous in-world interaction among avatars. Users

can create and interact with content and with 3D objects and with each other via one another's avatars. Shroeder (2008) explains what makes virtual worlds distinct from virtual environments is they are persistent online social spaces, they exist over time, and they are experienced together with others as an immersive world for social interaction.

According to *The Horizon Report* (2008), organizations are exploring various forms of virtual reality, in platforms like *Open Croquet*, Second Life, and Active Worlds, where the benefit of enhanced visualization these immersive environments provide facilitates teaching. Since 1999, 3D virtual worlds have proliferated, and currently there are over 30 major virtual worlds available, although not all of these are used for educational purposes (Hedley, 2007). Two popular virtual worlds receiving increasing attention in education are Second Life and Active Worlds, and both have separate areas designated for educational purposes. Active Worlds, with over 2 million users, has its own "Educational Universe" (AWEDU), which includes over 80 educational worlds (Kelton, 2008), and *Campus* Second Life is available for educators (Childress & Braswell, 2006; Kelton, 2007). Second Life, which began in June 2003, experienced phenomenal growth in 2006, and currently has more than 300 colleges and universities engaged in virtual-based education (Bell, Peters & Pope, 2007; Meall, 2007). As of 2008 the number of virtual citizens in Second Life reached 14 million, although not all of these citizens are using the platform for educational purposes (Kelton). The average "citizen" in Second Life is 35 years old, and 40% of its "citizens" are female (Watson, Grant, Bello & Hoch, 2008). According to Hendaoui, Limayem and Thompson (2008) approximately half a million users visit Second Life daily. They state:

> Today's SVWs [social virtual worlds] are beginning to realize Stephenson's vision of the metaverse: a future massive network of interconnected digital worlds. Tens of millions of people already use these kinds of environments to communicate, collaborate, and do business. Big companies are also moving into these digital realms (p. 92).

Other virtual worlds include *There.com*, *Central Grid*, *Kaneva*, *Twinity*, *CyberNet Worlds*, *The Palace*, *Furcadia*, and *Project DarkStar* (Kelton). The Arts Metaverse (http://artsmetaverse.arts.ubc.ca/) developed by the University of British Columbia's Arts Instructional Support and Information Technology unit and based on the open-source *Croquet* platform is an immersive 3D virtual learning environment that provides a collaborative learning space for scholars, teachers, and students. Gartner, Inc. (2007) predicts that "by the end of 2011, 80 percent of active Internet users (including Fortune 500 enterprises) will have a "second life' in a virtual world" using these immersive virtual environments for education, training, business, and social networking.

Part II: Conceptual Framework and Learning Theories

3D Virtual worlds offer the potential for educators to design learning experiences that build upon adult learning theory, constructivism, experiential learning, situated learning, and andragogy and self-directed learning. Virtual worlds support formal and informal learning and foster self-directed learning in keeping with adult learning principles. They are rich experiential learning environments that support learning situated in a social context. They are constructivist environments with user created content. As collaborative, learner-centered environments, their design can support diverse learning styles. Experiential learning, situated

learning, and constructivist theories support the potential for learning in these multi-user, social virtual spaces.

Traditional theories of adult learning, andragogy and self-directed learning, focus on the characteristics that make adults unique as learners. According to Knowles, Holton, and Swanson (2005), technology presents new opportunities to provide a learning experience uniquely suited to the adult learner in the "andragogical tradition." For example, Macpherson, Elliot, Harris & Homan (2004) have noted that adult learning in a virtual environment provides the flexibility adults need to suit their individual capabilities, fostering lifelong learning. The enhanced social presence made possible by the virtual world platform fosters a "deliberative, reflective, and thoughtful exchange" between learners (McWhorter et al., 2008).

Conceptual Framework: Andragogy

Knowles' (1980) proposed the theory of andragogy as "the art and science of teaching adults" (Kiely, Sandmann & Truluck, 2004). Andragogy holds relevance for online and face-to-face learning and remains the best-known set of principles to guide adult learning practice, the six assumptions of adult learners. Andragogy considers the self-directed learning of adults and advocates a 'problem-based' approach with teaching techniques and strategies geared to adult learners (Darbyshire, 1993). Knowles believed adults are independent and more self-directed in their learning. Adults bring a wealth of experience to the learning environments, as they have a larger and more diverse set of experiences to draw from. Adults are goal oriented and have a readiness to learn. In addition, adults have a practical orientation to learning. Adults prefer a problem-centered orientation to learning and learn best when

knowledge is presented in real-life context. Adults are relevancy-oriented and have a need to know, and they bring to the learning experience their own intentions of what they would like to learn (Baumgartner, Lee, Birden & Flowers, 2003; Merriam & Caffarella, 1999; Rogers, 2001; 2002).

The humanistic view on learning, the tradition of andragogy "views learning as the active engagement of the learners with the world around them and with themselves" (p. 93, Rogers, 2002). Self-directed learning focuses on the process of learning, and makes the assumption that adult learners will assume primary responsibility for their own learning. The role of the adult educator is to facilitate or guide the learning process (Merriam, Caffarella & Baumgartner, 2007). Self-directed learning theory fits with virtual learning environments, as the environment is unbounded in time and space and requires learners to assume a higher level of autonomy and self-direction.

The andragogical model provides a framework specific to the needs of the adult learner and is a useful model for instructors teaching adults in 3D virtual worlds. Andragogy provides adult educators with a framework for understanding how adults learn. The six adult learner principles are detailed in Table 2.1. Knowles' principles of adult learning emphasize a self-directed, problem-solving, experiential approach to adult education.

Table 2.1: Andragogical Adult Learner Principles (Knowles, Holton & Swanson, 1998)

Adult Learning Principles
1. Learner's need to know: adults are "ready to learn" when they experience a need to know something or to change a life situation
2. Self-concept of the learner: as adults mature their self-concepts move from dependence towards self-directness; adults are autonomous and self-directing
3. Prior experience of the learner: adults enter educational activities with life experience which is a rich resource for learning
4. Readiness to learn: learning must be immediately relevant to adult learners: life related, developmental tasks; adults have a readiness to learn
5. Orientation to learning: adults are life-centered in their orientation to learning: problem-centered, contextual
6. Motivation to learn: adults are internally motivated to learn: intrinsic value, personal payoff

How Andragogy Informs Teaching Practice

Knowles' (1998) six core adult learning principles carry implications for the design and implementation of educational experiences that would meet the needs of adult learners. Andragogy makes the central claim that meaningful adult learning is associated with the everyday problems of adults in their social world (Merriam, 2001). The set of assumptions have practical implications for instruction, implying instructors need to know as much as possible about their adult learners' needs, prior experience, and knowledge. Adult educators

must find ways to build on that breadth and diversity of experience. They also need to anticipate obstacles to education and eliminate situational (cost, time, life situation), dispositional (beliefs, attitudes, confidence), and institutional barriers (support services, access) (Rogers, 2002).

Adults bring a rich background of life and work experiences to the learning environment. Most adults have typically held a variety of roles and have a more sophisticated accumulation of experience that results from these roles. Rogers (2001; 2002) explains this broad range of experience requires that adults receive application of concepts and a real-world perspective in the learning process. Adults have a need to recognize how the learning can be incorporated into practice outside the classroom. As Schon (1983) asserts, through reflective practice, adults can examine the knowledge they have accumulated through experience and reflect how this knowledge is used in their practice. Adult learners connect what they have learned from their past experience to their current situation and draw future implications. When learners incorporate new knowledge into the framework of their existing knowledge, they are more likely to retain and use the information.

Brookfield (1995) identified four major unique adult learning processes that build on the self-directed nature of adult learning. According to Brookfield, adults will establish their own learning goals, seek out appropriate resources, and evaluate their progress. Adults engage in critical reflection; thus, the learning environments should be based on adults' experiences, which is a valuable resource in learning. Knowles and Brookfield clearly have the adult learner at the center of the learning activity. Andragogy is relevant to learning in 3D virtual worlds because these virtual environments are supportive of a learner-directed

approach and include the ability to pace oneself, to individualize training, to include authentic activities in context, and to provide just-in-time learning.

A Critique of Andragogy

However, andragogy has been criticized on several fronts (Darbyshire, 1993; Hartree, 2004). The early debates focused on whether adults and children really learn differently (Davenport and Davenport, 1985) as cited in Sandlin (2005) and (Darbyshire, 1993). Recent critiques of andragogy are sociologically based and come from researchers with different theoretical orientations, including critical, feminist, and Africentric (Sandlin). St. Clair (2002) notes there are continual debates, as to whether andragogy is an adult learning theory, a teaching method, a philosophical statement, or all of the above and concludes that andragogy provides limited insight into learning other than offering a set of assumptions about adult learners. According to Sandlin, researchers raise five main issues in their critique of andragogy: (a) Andragogy assumes education is value neutral and fails to consider that education is political and value-laden and serves to socialize and shape behavior (Collins, 1995; Welton, 1995); (b) andragogy promotes a generic adult learner as universal with white, middle-class values and makes the assumption these ideals are valued universally and by all peoples and cultures (Collins, 1995; Flannery, 1994; Guy, 1996; Pratt, 1993); (c) andragogy "ignores other ways of knowing and silences other voices." andragogy does not consider other values systems and worldviews and does not allow for differences in learning preferences (Flannery, 1995; Welton, 1995); (d) andragogy "decontextualizes the learning process by not taking into account systems of privilege and oppression that influence

learning (Heaney, 1996; Tisdell, 1995); and (e) androgagy reproduces inequalities and supports the status quo (Colin & Preciphs, 1991; Flanner, 1994; 1995; Heaney, 1996).

Although andragogy has a long tradition in the field of adult education, Hartree (1984) questioned whether andragogy was a theory, suggesting instead the six assumptions are simply principles of good practice. Darbyshire's (1993) critique examined the role of andragogy in nursing education, which found that not all students are driven by a need to be self-directed and autonomous in their learning. Hanson (1996) challenged Knowles' views as not considering carefully enough the differences between adults and their contexts.

Darbyshire's Critique. According to Darbyshire (1993) andragogy's underlying assumptions are based on the fundamental notion that children's learning is different from adults' learning and therefore different educational theories, philosophies and teaching approaches are required. Darbyshire critiqued Knowles' for dichotomising child and adult learning, creating a barrier in the field of education rather than building a cohesive practice in education.

According to Darbyshire, Knowles made the assumption that pedagogy is synonymous with subject-centered learning and andragogy involves adults in problem-solving activities, since adults are goal-directed in their learning. Darbyshire states "it seems that Knowles has devised a dichotomy between children's and adults' learning which bears little resemblance to our knowledge of either current schooling practices or to present-day developments in higher and nursing education" (p. 330). Regarding Knowles' assumption of the value of the adult's prior experience in learning, Darbyshire found Knowles' assumption as 'andracentric'—stating we cannot unequivocally state that adult experiences are more

valuable than a child's experience in learning. Further, Darbyshire critiqued andragogy as "not a matter of educational theory but a misguided attempt to enhance the status of the field of adult education" (p. 332).

Hartee's Critique. Andragogy has been criticized on other fronts as well. Hartree's (2004) critique states andragogy has been debated as whether it is a theory of learning or a theory of teaching, with concern over Knowles' assumptions of adults having a self-directed orientation to learning, as not all adults are self-directed. Elias (1979) questioned Knowles' model and similarity to Dewey's progressive education, for children, stating that children also have developmental tasks that stress the importance of autonomy and problem-centeredness. Hartree points out Knowles' assumptions center on the learner rather than the learning process, making it difficult for the assumptions to present a unified model. According to Hartree, andragogy is at best a philosophical position, not a theory. As Cross (1981) suggests, Knowles' claim to provide a unified theory is at best "optimistic" (as cited in Hartree, p. 209).

Theories of Adult Learning Relevant to 3D Virtual Worlds

Experiential Learning

Adult education has as one of its primary principles that adults learn from their experiences and that adult educators should take into account the life experiences of adults as they design learning environments. David Kolb (1984) argued that learning must be experiential, proposing a four stage model of the learning process (a) a concrete experience (b) reflection on the experience, and (c) abstract generalization from the experience and the application of the concepts to another situation (Holmes & Gardner, 2007). Kolb stressed the importance of linking experience to learning, rooting experience in the first two of the four phases of learning.

Rogers (2002) states experience forms the basis for learning. As Rogers explains, experiential learning encompasses actively engaging with the context (learning by doing), using past experience to challenge the present, experiencing authentic activities in the context of learning, or reflecting critically on one's experience. Bersin (2004) asserts the highest level of mastery comes from experiential learning as this creates a high level of understanding, context, and retention. Feinstein, Mann & Corsun (2002) and Gredler (2004) note the role experiential learning plays in simulation-based environments.

Tennant and Pogson (1995), who have written extensively on how adults learn throughout the life cycle, affirm experience plays a central role in the practice of adult education. "Focusing on the learner's experience is an integral part of the tradition that places the learner at the center of the education process" (p. 149). The justification for placing experience at the center of learning is founded on Dewey's assertion that education rests

solidly on experience as a foundation for learning. Lindeman also tied the meaning of adult education to experience stating, "the resource of highest value in adult education is the learner's experience" (p. 6, 1926). Tennant and Pogson remark that:

> Learning is an active process in the sense that learners are continually trying to understand and make sense of their experiences. In effect, learners reconstruct their experiences to match more closely their existing rules and categories for understanding the world. These rules and categories may also change to accommodate new experiences. (p. 150)

The importance of experience is also noted in Brookfield (1995) and Miller (2000). Experiential learning is a well-established tradition in adult education (Fenwick, 2000).

However, learning from experience is a process that involves more than simply confirming the experience; it is an active, moving event. Tennant and Pogson (1995) explain experience has to be mediated and reconstructed (or transformed) by the student for learning to occur. Dewey states: "Every experience is a moving force. Its value can be judged only on the ground of what it moves toward and into" (1963, p. 35). Reflection "casts the individual as a central actor in a drama of personal meaning-making" as the learner "reflects on lived experience and then interprets and generalizes this experience to form mental structures" (Fenwick, 2000, p. 248). These mental structures are knowledge, stored in one's memory as concepts that can be represented, expressed and transferred to new situations. However, not all learning occurs in a continuous manner. Van Eck (2006) argued that discontinuity and disequilibrium, known as cognitive disequilibrium, are powerful forces for learning.

Reflection-in-action/Reflection-on-action

How do adults learn from experience? Experiential learning, according to Fenwick (2000) can be conceptualized as the "reflective construction of meaning" (p. 244) with particular emphasis on critical reflection and dialogue. Schon (1983) examined how adults learn from experience and explained this occurs through reflection-in-action and reflection-on-action. Schon states "85% of the problems a doctor sees in his office are not in the book" (p.16). Learning is a deliberate process of critical reflection that unfolds in different contexts to create knowledge. Schon describes the reflective process as enabling practitioners to glean new meaning from the uncertainty or uniqueness of a work situation through either one of two methods of reflective practice: reflection-in-action which occurs during the learning activity or reflection-on-action which takes place after a learning activity, or by interruption during the activity. "Reflection in action" is based on the central idea that learning occurs as professional practitioners engage in reflective activity in the context of their everyday work. Schon (1983) explains we are challenged in our day-to-day practice to engage in reflection-in-action, as our work lives are characterized by ambiguity and uncertainty. Reflection-in-action may manifest itself as "thinking on your feet." For example, in a virtual learning environment, the instructor enters into dialogue with the student, questioning the application, refining the instructional approach, and creating a new activity for the group to work on. This is an example of the professional becoming reflective in the context of practice, "freed from established theory and techniques and able to construct a new theory to fit the unique situation" (Schon).

Reflection-on-action occurs after the learning activity. This involves "recalling and analyzing lived experience to create mental knowledge structures" (Fenwick, 2000, p. 244). The practitioner reflects on his/her feelings, emotions, and sense of the experience and uses reflection as a basis on which to improve, grow, and develop his/her professional practice. Schon describes reflection-on-action as a purposeful, conscious and a public activity designed to improve future practice and develop one's self-knowledge. This is how we grow in our practice-- by analyzing, understanding, and reframing our experience to create new solutions and inform future practice (Coutts & McArdle, 2003). A particular strength of virtual learning environments is the ability for instructors and students to practice both "reflection in action" and "reflection on action" in a constructivist learning environment.

How 3D Virtual Worlds Facilitate Experiential Learning

Many of the technologies, and subsequent activities, afforded by 3D virtual worlds, such as simulations, experiential learning, and cognitive mentoring can facilitate reflection. According to Boulos et al. (2007), "the use of virtual learning environments has been shown to facilitate better reflection and the "trading of stories' between online learners, which can lead toward better building of communities of practice" (p. 240). Tools available in virtual learning environments that support the reflective process include chat and voice discussion with interaction taking place in synchronous real-time, and the visual immersion that provides users with a sense of immediacy and engagement (Boulos et al.). The changing of identities also provides a reflective use of this virtual online learning environment (Boulos et al.).

Reflection-in-action, and reflection-on-action, two key theories in the field of adult education, hold significant relevance to 3D multi-user virtual learning environments, for learning, and for instructional design. The learning process, which takes place in a social and contextually relevant environment, allows for reflection-in-action through dialogue and collaboration, and the constructivist design of learning activities, rooted in authenticity, provides opportunities for reflection socially situated within an authentic context. Reflective activities have the added benefit of bringing a sense of ownership to the learning experience. Reflection is an engaging process that facilitates the exploration of past experience and the discovery of new meaning and understanding (Boud, 2001). Experiential learning involves the reflective construction of meaning with emphasis on critical reflection and dialogue (Fenwick, 2000). According to Fenwick, a learner's reflection on lived experience, and the subsequent interpretation that forms mental structures or knowledge is constructivist in nature.

Situated Learning

Experiential learning and reflection-in-action/reflection-on-action focus on the adult's experience, within a social context. However, in the past decade, social learning theories, such as situated learning, which focus on the "context lens," are receiving increasing attention (Kiely et al., 2004). A central principal of situated learning theory is that context and social setting play an important role in the learning process. Situated learning theorists (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991) argue that learning should be located or situated in context. These theorists maintain that learning is rooted in the situation in which a person participates; learning takes place in authentic contextual environments

(Brown, Collins, & Duguid; Fenwick, 2000). The ability for 3D virtual worlds to evoke a strong sense of presence and psychological immersion makes the environment ideally suited for the situated learning model (Dede, 2004). Adult educators such as Fenwick (2000) and Wilson (1993) have suggested that situated learning theory builds on many of the principles and characteristics of how adults learn. The research demonstrates that situated learning theory supports learning in virtual learning environments (Gee, 2003; Hayes, 2006; Delwiche, 2006; Steinkuehler, 2004).

Wilson (1993) explains that situated learning implies that "learning is not just a psychological process that happens in splendid isolation from the world in which the learner lives, but that it is intimately related to the world and affected by it" (p. 74) and that context may be central to our understanding of adult cognition. Situated learning maintains that learning has a social dimension, and individuals learn with and from one other, in a community. Learning from one another is a form of shared learning called "distributed cognition" (Holmes & Gardner, 2006). Holmes and Gardner define distributed cognition as:

> Learning to learn in an expanded sense fundamentally involves learning to learn *from* others, learning to learn *with* others, learning to mediate others' learning not only for their own sake but for what that will teach oneself, and learning to contribute to the learning of a collective….one's contribution to the learning of the collective is likely to benefit the individual as well (p. 84).

The learning process and the context where learning occurs, is closely linked. Wilson (1992) notes adults do not learn from experience, they learn in it. Wilson states: "If we are to learn, we must become embedded in the culture in which the knowing and the learning have

meaning; conceptual frameworks cannot be meaningfully removed from their settings or practitioners" (p. 77, as cited in Fenwick, 2000).

Learning is Contextual

Lave & Wenger (1991) suggest learning is social in nature and knowledge should be presented in authentic contexts for learning to occur. Lave and Wenger maintain understanding is linked with interaction in a community of learners. Individuals learn through participation and interaction with the community, its history, assumptions and cultural values, rules, and patterns of relationship, the tools at hand, including objects, technology, languages, and images, and the activity of the moment, its purposes, norms, and practical challenges. Knowledge emerges as a result of these elements interacting. A primary tenet of situated learning theory is learning emerges from a world that is socially constructed. According to Lave and Wenger, meaning is contextual and learning takes place when individuals become increasingly involved as participants in social communities of practice.

Situated learning takes place with the potential direct application of the learning. Proponents of situated learning point to cognitive apprenticeship methods that acculturate students into authentic practices, such as architects and law clerks. Proponents state these are situationally located, tool dependent, and socially interactive (Wilson, 1993). Since learning occurs within the context of everyday life, situated learning is a key theory of adult learning and particularly relevant to the 3D virtual world platform, which lends itself to immersive learning experiences situated in an authentic context.

Prolonged Engagement

Prolonged engagement is an important component of situated learning theory. Prolonged engagement for successful task progression is facilitated through the design of authentic context and authentic activities, which fosters critical reflection, ideally suited to the learning environment of 3D virtual worlds. Designing tasks that have the learners take on multiple roles and perspectives, which can be fostered by the perspective taking of avatar representation can be applied in a variety of learning contexts such as case studies, role-plays, scenarios, and simulations (Herrington, Reeves, Oliver & Woo, 2004). According to Carter and Click (2006), these massive online environments are significant for teaching and learning because they are an important tool in reaching Net-Generation learners in interactive, creative ways who are accustomed to social learning environments and collaborative activities.

Learning is Social

Researchers such as Steinkuehler (2004, 2006) and Gee (2003) argue that learning is a social process and immersive learning environments are effective teaching and learning tools. Steinkuehler offers as one example how newcomers are introduced to these virtual worlds, through the assistance of other in-world residents. Information sharing and collaboration are facilitated in-world. Through active participation, in-world residents begin to understand the community practices/culture, gradually becomes a part of the community of practice, similar to Lave and Wenger's legitimate, peripheral participation (as cited in Delwiche, 2006). 3D virtual worlds provide students an opportunity to become fully immersed in a community of practice. Social construction of knowledge, and direct

application of knowledge are key tenets of this theory, and they are well suited for simulations and role-plays in-world. Steinkuehler (2004) points out "As these worlds mature, they have developed many characteristics of physical communities such as a specialized language, political structures, complex social rituals, and shared history" (p. 160). This is in keeping with situated learning theory, whose key tenets include social learning and a shared history.

How 3D Virtual Worlds Facilitate Situated Learning

Dede (2004) explains that virtual learning environments build on situated learning by "creating immersive, extended experiences with problems and contexts similar to the real world" that lead to the formation of problem-solving communities and to the transfer of knowledge (p. 13). Within the situated model, assessment is integrated throughout the learning process, rather than post learning, and often includes reflective activities. Situated learning requires access to expert performances, multiple roles and perspectives, and coaching and scaffolding. A situated learning environment provides for coaching and scaffolding—support in context, through feedback, reminders, supportive comments, and modeling and coaching (Herrington & Oliver, 2005).

Situated learning combines cognitive theories with situated activity, and has three common themes: cognition is situated in social context, cognition is distributed among a group, and learning takes place in a community (Swan & Shea, 2005). Situated learning has proven its effectiveness as an instructional design model for online learning in the literature, virtual worlds included, in several case studies (Dickey, 2005a; Herrington & Oliver, 2000). Characteristics of situated learning that facilitate effective teaching in social virtual worlds

include authentic context/tasks, access to an expert or master instructor, multiple roles and perspectives for viewing content, problem-solving activities, decision making opportunities, and scaffolding and mentoring (Dickey). For example, knowledge can be situated in a virtual context, such as a simulation, or anchored in multimedia, such as video or audio.

Dede (2004) notes this mediated immersion fosters communal learning involving "diverse, tacit, situated experience, with knowledge distributed across a community and a context as well as within an individual." 3D virtual learning environments strike a balance among experiential learning, guided mentoring, similar to apprenticeship, and collective reflection (Dede). A situated learning environment provides an authentic context that is reflective of how knowledge will be used in real-life settings (Herrington, Reeves, Oliver & Woo, 2004). Virtual learning environments can provide a solid level of realism and interactivity, fostering situated learning experiences. Foreman (2003, 2004), a leading scholar in the area of digital game based learning predicts that shared graphical worlds are the learning environments of the future; however, he questions whether these simulated environments can authentically replicate the situated learning experienced by students in the real world, citing more research is needed to show students can apply the knowledge learned in virtual worlds to the real world.

Situated Learning Model for Authentic Learning

Authentic learning is facilitated by the situated learning model, described by Herrington, Oliver, Herrington and Sparrow (2000) containing six principles important in the design of learning, all of which are a part of situated learning and learning in a social context. These principles include: apprenticeship, collaboration, reflection, coaching, multiple

perspectives, and articulation through rhetoric and dialogue. Specific principles for situated learning in online environments include presenting authentic tasks in context, with "ill-defined" problems (as cited in Herrington & Oliver, 2000). Herrington and Oliver propose that authentic activities be "ill-defined" –complex and uncertain, so learners can find, as well as solve the problem. This is suggestive of Van Eck's (2006) reference to the "cognitive disequilibrium" and resolution principle in game based learning, which can be applied to learning in 3D virtual worlds. An application of cognitive disequilibrium would be the design of learning activities to take into account real-world problem-solving steps, which are not neatly delineated in the real world. The design of authentic activities requires ill-structured complex goals designed so students can define the tasks and subtasks. These ill-structured tasks have to be engaging to sustain the student's interest, to encourage prolonged engagement with the task. Another component of authentic activity is the opportunity to collaborate with other learners, solving problems and negotiating solutions. The situated model minimizes independent work (Dede, 2004) and this is in contrast to the self-directed nature of adult learning.

There are several perspectives on situated learning theory and how it differs from andragogical theories of adult learning. With andragogy, the learning process is considered to be more of an individual and internal process. Knowledge is acquired and retained for future use. In contrast, situated learning theorists view learning as situated in context, focusing beyond the individual learner, viewing learning as a social process. In experiential learning, Schon's theories of reflection-in-action and reflection-on-action consider the important role context plays in reflecting upon, and on, experience and practice. Situated learning (and

constructivism, discussed shortly) focuses on "learners actively constructing knowledge in context of the culture and situations in which they are participating" (Kirkley & Kirkley, 2005, p. 43).

Constructivism

The research demonstrates that 3D virtual learning environments are an extension of constructivist learning theories (Carter & Click, 2006; Karagiorgi & Symeou, 2005). Numerous researchers have proposed that constructivist theories offer an approach to designing teaching in these virtual environments (Huang, 2002; Karagiorgi & Symeou, 2005; Jonassen, 2004, Kirkley & Kirkley, 2005; Martens, Bastiaens & Kirschner, 2007; Savery & Duffy, 1996; Woo, Herrington, Agostinho & Reeves, 2007). According to Dickey (2005), much of the existing research on the educational uses of 3D virtual learning environments is situated within a constructivist paradigm of learning. Technology-enhanced constructivist learning environments share several common characteristics and assumptions about learning. Constructivists believe the individual actively constructs knowledge. Constructivism is based on the assumption that learners construct meaning by interacting with, and upon the environment (Karagiorgi & Symeou, 2005). Karagiorgi and Symeou explain:

> A core notion of constructivism is that individuals live in the world of their own personal and subjective experience. It is the individual who imposes meaning on the world, rather than meaning being imposed on the individual (p. 18).

Constructivism maintains the process of knowledge construction takes place when learners are intellectually engaged in personally meaningful tasks (Chittaro & Ranon, 2007). Woo et al. (2007) believe that collaborative learning, peer interaction, and authentic tasks within a

social constructivist framework improves both the quality of student interactions and provides for a more satisfying learning experience. Constructivism maintains that learning is a process of constructing meaning; it is how people make sense of their experience.

From a constructivist perspective, learning is a process of making sense of the world and negotiating meaning with others, and is linked to users' abilities to build, alter and view their surroundings from multiple perspectives, an affordance of avatar representation in virtual worlds (Dickey, 2005b; Kirkley & Kirkley, 2005). For example, Second Life, as a multi-user, visually enhanced, interactive virtual environment built almost entirely by its "residents" (visually represented as avatars) offers a virtual platform for learning used by many educational institutions as a way to engage students in immersive educational experiences, where they can own virtual property, build and construct objects, and interact with their classmates.

3D virtual worlds are well suited to constructivist design because they provide first person interaction with the environment, and a "first-person experience allowing for spontaneous knowledge acquisition" (Chittaro & Ranon, 2007). Constructivists claim that individuals learn through a process of knowledge construction that takes place when learners are intellectually engaged in "personally meaningful tasks" (Chittaro & Ranon). Constructivists such as Dewey (1916), Piaget (1973), Vygotsky (1978) and Bruner (1996) each proposed that learners could learn actively and construct new knowledge based on their prior knowledge. According to Dewey (1916), knowledge is based on active experience with the learner's interaction with his environment.

Constructivism has three main tenets (a) understanding comes from interactions with the environment, (b) cognitive conflict is the stimulus for learning and determines the organization and nature of what is learned, and (c) knowledge evolves through social negotiation with the social environment, providing alternative views to test the learner's understanding of the knowledge construct. Constructivist theorists (Jonassen, 1991; Savery & Duffy, 1996) believe learners construct their own reality and form their own interpretations based upon their perceptions of experiences. Jonassen explains that one's knowledge is grounded in the perception of the physical and social experiences they understand to have occurred. However, constructivist theorists differ as to whether the process of meaning making is primarily individual or social.

Personal, Social, and Communal Constructivism

Constructivism has been framed in the context of personal, social, and communal. Driver et al. (1994) believes constructivist learning is a personal, meaning-making activity. Meaning is made by the individual and is dependent on the individual's previous and current knowledge structure. Learning is an internal, cognitive activity that is fostered by cognitive conflict. Social constructivists, such as (Vygotsky, 1978), believe learners construct knowledge through social interaction with others. Social constructivism maintains that collaboration and communication are important components for learning, placing an emphasis on the social context of learning. Thus, the socio-cultural context in which learning takes place and the context in which learning takes place impact the learning process (Huang, 2002). Social constructivism underpins our understandings of how individuals learn in a

social context and extends the learning process to include a collective reflection and sharing of experience.

Educational technologies such as 3D virtual worlds are well suited to social constructivist theories of learning because they enable the development of formal and informal communities, and facilitate a community of learners (Holmes & Gardner, 2006). As such, these virtual worlds foster learning in an environment that builds upon the tenets of communal constructivism. Communal constructivism is the shared learning experience that occurs in a community of learners. Holmes and Gardner explain that communal constructivism is a "reinvestment in the learning environment"--the process in which learners place their learning back into the community to benefit others. Communal constructivism promotes learning as an evolutionary process and knowledge as a shared resource. Holmes and Gardner explain:

> Enriching and expanding the available learning opportunities will be important as everyone is constantly called upon to learn and create new knowledge, to learn new ways of doing things and, at a deeper level, a new way of learning itself (p. 17).

Summary of Constructivism

Research demonstrates that learner participation in a 3D virtual learning environment supports the constructivist model of instruction (Annetta & Holmes, 2006). Constructivism theory points out that learning is an activity that is enhanced by shared inquiry. Each individual creates his/her own interpretation of knowledge-building experiences. Shared inquiry implies a collaborative learning process. Collaborative learning is a learner-centered approach. Constructivists maintain that learners construct knowledge through relationships,

rather than acquire knowledge through the transmission of information (Dickey, 1999). Knowledge is dynamic and built around the process of discovery (Huang, 2002). As Savery and Duffy (1996) explain: "what we understand is a function of the content, the context, the activity of the learner and, perhaps more importantly, the goals of the learner" (p. 136). Virtual worlds are well suited to the essential design principles in the constructivist framework, including collaborative and interactive learner-centered activities, as those activities involve negotiation with the environment and other learners.

Virtual projects that emphasize real-world tasks designed according to the principles of authenticity facilitate learning (Karagiorgi & Symeou, 2005; Savery & Duffy, 1996). Ill-defined tasks further constructivist learning for adult learners, because of their inherent problem-centered approach. Brown (2004) explains that a constructivist approach utilizing problem-based learning, experiential learning, authentic simulations, and role-play that simulate real life occurrences with "ill-structured" problems, all which fosters deep learning. Simulations, role-playing games, and virtual case studies are all potential tools to facilitate the construction of knowledge in virtual learning environments. Simulations and role-playing activities in particular facilitate multiple perspectives, allowing users to shift from first, to third person perspective, enhancing the degree of learner embodiment in the 3D environment (Dickey, 2005; Karagiorgi & Symeou). The ability to change perspectives while engaged in problem-solving activities is a significant benefit offered by these virtual worlds. 3D Virtual worlds used for educational purposes contain many of the key elements in constructivist e-learning design including: authentic context/tasks, active learning, collaborative learning,

learner-centered/controlled, self-assessment, and coaching (Martens, Bastiaens & Kirschner, 2007).

A central tenet of constructivism is every learner has a unique way of viewing the world. Constructivist design is based on the assumption every learner brings a unique perspective to the learning situation, thus, the center of instruction is the learner, and "prespecified content and objectives are not congruent with the constructivist view" (Karagiorgi & Symeou, 2005, p. 19). Virtual world platforms address key elements of constructivist design principles: "Cognitive authenticity" (experimentation and engagement) and "contextual authenticity" (tasks related to the real world). Case-based participatory simulations are examples of cognitive and contextual authentic activies (Dede, 2004). Constructivist models are learner-centered and build upon the learners' prior knowledge, aligning with the principles of adult learning (Huang, 2002), experiential learning, and reflective thinking. A constructivist learning approach results in a learning product that is more facilitative, than prescriptive. Central to constructivist design is giving the learner an opportunity to defend and justify their approach. Self-assessment, learner portfolios, and journaling are strategies for students to assess their own learning, and these are all methods well suited to the adult learner population.

Summary of Adult Learning Theories

Experiential, situated, and constructivists learning theories presented in this literature review are relevant theories for adults engaged in instruction in 3D virtual worlds. Experiential, situated learning and constructivism adult learning theories include and address key principles of adult learning theory presented in Knowles' andragogy framework.

Constructivism offers great potential for teaching and learning in these virtual environments, as does situated learning (Bartle, 2007; Dickey, 2005; Delwiche, 2006; Hayes, 2006; Steinkuehler, 2006; Yee, 2006; Van Eck, 2006). Research indicates that three-dimensional multi-user virtual learning environments have the potential to enhance teaching and learning, offering many educational benefits to students and instructors (Van Eck). For example, 3D virtual worlds provide learners experiential learning spaces with the opportunity to replicate experiences and reinforce learning, in a collaborative setting. Virtual learning environments foster community building in unique ways. For one, they are immersive environments, allowing users to experience prolonged engagement, to construct their own knowledge, and to learn from one another. For adult learners, the potential for these environments to foster self-directed learning, experiential learning, problem-solving, and to embody many of the principles that are foundational in the adult learning literature.

However, it appears a large amount of research focuses on the constructivist nature of these learning spaces, and is supported by empirical research. Dickey (2005) argues 3D learning spaces cultivate constructivist learning environments, pointing to earlier research conducted by Bruckman (1997) and Dede (1995). Current research indicates 3D virtual learning environments support constructivist based learning activities by allowing learners to interact directly with information, from a first-person perspective.

Huang (2002) explains that constructivist design for online learning environments is within the tenets of the principles of adult learning. Adults value interactive learning, a safe, facilitated learning environment, experiential learning, reflection and a learner-centered design. Immersive learning environments, such as Second Life and Active Worlds, are

examples of the interaction of four core learning elements that are manifested in a well designed constructivist environment: immersion, engagement, agency, and risk/creativity (Blashki, Nichol, Jia, & Prompramote, 2007). Recent case study research on several popular 3D virtual worlds (Active Worlds) suggest these learning spaces support constructivist learning by allowing the emergence of knowledge-building communities that facilitate role-playing, collaborative learning, first-person interaction with content, and meaningful engagement (Dickey, 2005).

Part III: Barriers and Potential Educational Benefits

Virtual Worlds in Adult Education and Training

Adult educators and adult learners are increasingly turning to virtual worlds for the delivery of instruction (Skiba, 2007). Virtual worlds offer learning experiences not possible in other distance delivery modalities that are two-dimensional and asynchronous. With 3D virtual worlds students can immerse themselves in a synchronous learning experience and feel a sense of presence in real-time. Two popular virtual worlds, Second Life and Active Worlds, allow users in the form of avatars, their virtual selves, to create and build a virtual reality and engage in synchronous learning activities. For example, in Second Life, avatars conduct business, they socialize and network with each other, they attend training and education events, and they actively engage in experiential, problem-based learning in a social setting (Boulos, Hetherington & Wheelert, 2007; Cross et al., 2007; Delwiche, 2006; Ju, 2007). Many higher education institutions, professional associations, and consortia such as the Alliance Second Life Library project and the New Media Consortium offer seminars, forums, and social events in virtual worlds (Bell et al., 2007; Foster, 2007a; Johnson, 2007).

Virtual classrooms such as Harvard University's "CyberOne: Law in the Court of Public Opinion" are held in Second Life (Lamb, 2006). Other universities using Second Life include Ball State and Central Missouri State universities for teaching English composition, and Pepperdine University for teaching an education course. The National Oceanic and Atmospheric Administration provide simulations in Second Life geared to inform the public about tsunamis and other phenomena (Ibid). Active Worlds has its own educational community, the Active Worlds Educational Universe (AWEDU) and makes its technology available to educators.

Virtual worlds have tremendous potential for corporate learning. IBM has pioneered their use in areas such as recruiting, and internal and external meeting and mentoring (Leveckis and DiRomualdo, 2008). Sun Microsystems uses Second Life for product launches, community building, and training (Willyerd, 2008). GAX technologies holds annual European job fairs on the Working Worlds Island in Second Life (http://www.working-worlds.com/web/en/html/). The U.S. Army contracted with corporate owners of a high-profile virtual world to create a military training environment. Texas A&M medical faculty are collaborating with a commercial game company to develop a social virtual world to train health care professionals (Hayes, 2006). Kelton (2008) states over 1 billion (U.S.) dollars were invested in virtual companies in 2007 and over 184 million U.S. dollars were invested in the first quarter of 2008 alone.

Virtual Worlds and the Adult Learner

As an instructional space virtual worlds offer new opportunities for teaching the adult learner. Virtual worlds have found their place in education and training because the learning

experiences they afford build upon sound adult learning theories: constructivism, experiential learning, situated learning, andragogy and self-directed learning. In addition, 3D virtual worlds share many of the learning principles found effective in game-based learning, such as learning by doing, just-in-time learning, enhanced motivation to learn, problem-based learning, collaboration, team-work, and distributed knowledge creation (Gee, 2003). Virtual learning environments can be effective instructional spaces as they offer opportunities for both formal and informal learning, flexible access, and the ability to accommodate diverse learning styles. Hayes (2006) reports 3D virtual learning environments benefit adult learners by building on the principles unique to adult learners, specifically, self-directed and experiential learning fostered in a socially situated context.

Clearly, adult learners have many opportunities, personal, professional, and academic, to use virtual worlds for formal and informal learning. In addition, virtual worlds are potentially suited to address changing adult learner demographics and learning behaviors shaped by exposure to a media-rich digital culture. Net Generation learners, born 1982-1991, have never known life without the Internet. Oblinger (2004) reports:

> Today's students are digitally literate. Whether 18 or 48, virtually all learners are accustomed to operating in a digital environment for communication, information gathering and analysis. Students also tend to be "always on." They are in communication with friends and peers constantly through a mixture of cell phones, instant messaging (IM) and email. Mobility is another characteristic - students are constantly on the move, between classes, at work or socializing. (p. 2)

According to Van Eck (2006), today's students exhibit the learning preferences of a digital culture, as they require "multiple streams of information, prefer inductive reasoning, want frequent and quick interactions with content, and have exceptional visual literacy skills" (p. 1). Students entering higher education are fluent in using a variety of digital media and they enjoy collaborative, team-based learning, as many students are comfortable learning in and navigating virtual environments. 3D virtual worlds offer an immersive social context for learning, incorporating many of the Web 2.0 technologies adult learners have grown accustomed to using (Dede, 2005; Oblinger, 2004). Net Generation learners enjoy working collaboratively in teams and prefer to have communities and social networks as part of their learning environment. Oblinger and Oblinger (2005) explain:

> Learning is participatory; knowing depends on practice and participation. Digital resources enable experiential learning—something in tune with Net Gen preferences. Rather than being told, Net Geners would rather construct their own learning, assembling information, tools, and frameworks from a variety of sources. (p. 212)

Net generation learners possess a sophisticated facility with technology, the ability to seamlessly incorporate multi-tasking into their daily academic activities, a preference for experiential learning, and facility using a variety of virtual spaces, including 3D gaming environments and 3D virtual worlds (Oblinger & Oblinger). In fact, research shows Net Generation learners are detaching themselves from the "intellectual enterprise" as learning becomes more of a collaborative, shared experience (Foreman, 2004).

Dickey (2005a) suggests virtual worlds "have also challenged and expanded our ideas of what constitutes a learning environment" (p. 439). Virtual worlds, as learning spaces,

provide adult learners opportunities for an immersive, participatory, and collaborative learning experience, which enhances learning (Dede, 2005). Assessment and evaluation of learning also take new forms within these virtual worlds. Calongne (2008) explains: "Exams or assessments of competency shift to projects and solutions to problems that are expressed in context, offering new ways to visualize, experience, and assess the solutions. This method does not replace traditional methods of evaluation, but it does offer additional ways of assessing what students know and can apply" (p. 42).

By all accounts, virtual worlds will continue to grow and play a major role in the future of education as they provide a compelling approach to learning, collaborating, and creating new knowledge (Chapman, 2008; Dickey, 2005; Hayes, 2006; Johnson, 2007; Meall, 2007). Hendaoui, Limayem, and Thompson (2008) state: "Similar to how the Internet expanded, we can expect SVWs to grow further, becoming a huge network of interconnected virtual worlds. It is predicted the emerging metaverse market could reach billions of dollars in the upcoming years" (p. 88-89).

In terms of teaching appeal 3D virtual worlds offer instructors the ability to construct an immersive learning experience in an authentic, socially situated context, which combines Web 2.0 tools and the learning principles found effective in game-based learning. Alvarado (2008), writing on the effective use of games in teaching and learning makes a significant point that is applicable to the appeal of 3D virtual worlds. Alvarado states: "Although digital storytelling, podcasting, blogging, and collaborative writing with wikis are each revolutionary in their own ways, they rely heavily on traditional oral, written, or cinematic forms already familiar to academics" (p. 4).

Barriers to Use and Implementation

Although there are many benefits delivering learning experiences in a virtual world, these spaces do present significant considerations and challenges for teaching adult learners, ranging from usability issues, difficulty in navigation and using the 3D interface, technical issues and use and implementation (Boulos et al., 2007; Gronstedt, 2007; Johnson, 2007). Boulos et al. capture the essence of these considerations by stating: "3-D virtual worlds then appear to have much creative collateral to offer to education as social spaces for learning, but, as with all media and applications, there are caveats" (p. 241). There are issues in the areas of usability, technical usage and implementation, integration (seamless integration into existing online learning environment), disciplinary issues (inappropriate use/plagiarism/griefing), trust, identity and privacy, copyright, and content development in this virtual space (Boulos et al.). Hayes (2006) states: "leveraging user-creation for learning requires far more than simply providing users with the correct tools. Participation in user-creation depends on a complex set of social, economic and legal conditions that the world's designers can only partially control" (p. 158). In addition, instructors are challenged to develop new and effective ways of teaching and learning in virtual worlds, as opposed to simply replicating existing teaching efforts. Boulos et al. point out there are new sets of competencies and skills educators must master to make 3D virtual worlds effective and efficient for teaching and learning. Taylor and Chyung (2008) state: "Despite SL's potential for simulated training and education, SL has limited features necessary to be an effective medium for instruction and content management" (p. 17). For example, Second Life is limited on document storage and grade book functions, has a limited utility for instruction,

and poor security features, as noted by Taylor and Chyung, who conducted a survey of university instructors using or planning to use Second Life.

Boulos et al. (2007) do a thorough job documenting the benefits, and challenges, of using and implementing 3D virtual worlds to teach adult learners in a hybrid review-case study that discussed the educational potential of this learning environment and the challenges ahead for educators. Although the study explored an immersive experience using Second Life for health education, the issues presented are relevant to adult learners and can be applied to other academic discipline areas. The framework is important because it focuses on areas that would concern educators seeking to implement learning experiences that meet the needs of the adult learner. The issues and challenges are noted in Table 2.2

TABLE 2:2 Categories of Barriers: 3D Virtual World Implementations

BARRIER	**REFERENCE**
ASSESSMENT -Institution's return on investment	Johnson (2008)
ACCOUNTABILITY -Data collection in a virtual world -Security and reliability of student data	Johnson (2008)
LEARNING ENVIRONMENT -Harassment -Cyber shootings/ -Immoral behavior	Bugeja (2007)

Table 2.2 Continued

BARRIER	REFERENCE
CONTENT -Transferability -Reuse -Ownership -Content protection -Evidence based content development -Quality standards	Kharif (2007) Boulos et al. (2007)
COPYRIGHT/INTELLECTUAL PROPERTY RIGHTS -Institutional terms of service vs. faculty member rights	Johnson (2008)
DISCIPLINARY -Inappropriate use -Griefing -Plagarism	Bugeja (2007) Boulos et al. (2007)
FUNDING -Development of virtual world project -Sustainability	Bugeja (2007)
POLICY -Student privacy -Intellectual property ownership	Bugeja (2007)

Table 2.2 Continued

BARRIER	REFERENCE
PRIVACY -FERPA -COPA (Child Online Protection Act for under 18 yrs of age students) -A multi-age environment presents safety concerns for under 18 years of age students	Johnson (2008)
SKILLS MASTERY/COMPETENCIES -Resident -Learner -Educator -Developer/builder	Boulos et al. (2007)
STANDARDS FOR USE -Standard virtual world for instructional purposes not identified at most institutions -Institutional policies and guidelines for use -Standards for interoperability	Johnson (2008)
TEACHING FUNCTIONALITY -Grade book -Document storage	Kluge & Riley (2008) Taylor & Chyung (2008)

Table 2:2 Continued

BARRIER	REFERENCE
TECHNICAL -Processing speed -Graphics -Bandwidth -Server site shutdown -Firewall issues -Integration issues	Book (2004) Boulos et al. (2007) Conklin (2007) Skiba (2007) Taylor & Chyung (2008)
TRAINING -Learning curve -Faculty development	Boulos et al. (2007)
USABILITY -Navigation -Accessibility -Adaptive technology	Boulos et al. (2007)

There is a learning curve to participation in virtual worlds, and it is a steep learning curve (Kharif, 2007). Kharif notes there is an even greater learning curve for those who wish to develop objects and build within the environment. In addition, instructors must prepare student orientations and take a good amount of time and effort to learn the platform, and then prepare instructional materials for their students. The steep learning curve for new users is a

program constraint (Taylor & Chyung, 2008). Technical issues pose significant barriers for educators and students, as the physical requirements of a PC running a virtual world such as Second Life are a significant consideration when planning a virtual classroom, since sufficient graphics cards, memory, and bandwidth is required (Conklin, 2007; Skiba, 2007). Taylor and Chyung point out the graphics intensive appearance of avatars can create a network lag in the learning environment. For learners, building in the virtual world and creating user-generated content may entail a steep learning curve, depending on the user's technical background (Johnson, 2007). Another limitation, according to Mitchell (2003), concerns the potential for the learner's loss of individual privacy and individual identity, and its impact on the learner:

> [T]ribal lifestyles distributed across dispersed, fragmented, fluctuating habitats: electronic nomads wandering among virtual campfires. People's senses and physical agency are extended outward and into the intangible, at considerable cost to individual privacy. Individual identity is continuously reformed via an ever-shifting series of networking with others and with tools. (p. 23, as cited in Dede, 2004)

Finally, virtual worlds pose inherent ethical issues such as hidden values, assumptions, and agendas embedded in the technology. Dickey (1999) explains: "Three-dimensional worlds are for the most part pre-constructed environments. Parameters for both personal and social construction are to some degree pre-determined by the values and assumptions embedded in the design" (p. 45).

According to Book (2004), these 3D virtual worlds offer a "glimpse of the future of the Internet—Web 3.0" but their processing, graphics, and bandwidth requirements can be

prohibitive for some (Leveckis & DiRomualdo, 2008). Server sites close for maintenance without much advanced notice. Corporate and university firewalls may not work well with the virtual world platform as applications reside on outside servers in the case of some virtual worlds. The applications also require fairly high-speed Internet connections (Gronstedt, 2007). The transferability and reuse of content are concerns for instructors teaching in virtual worlds. In Second Life for example, all content (structures, information, buildings, etc.) must be created within the virtual world and cannot be moved to other platforms (Kharif, 2007).

The learning climate poses challenges as well, as disruptive players "griefers" are present in-world (Chittaro & Ranon, 2007; Foster, 2007). These griefers disrupt the learning environment in a number of ways, ranging from vulgarities and obscene language to serious assault on one's avatar (Taylor and Chyung). Virtual worlds are a virtual representation of our society (both the good and the bad), users may encounter places, avatars, and language that are disagreeable or offensive. The implementation of virtual worlds raises a host of policy issues in educational organizations, in universities and in corporate training, and an awareness of these issues is particularly relevant to instructors who are considering using virtual worlds for educational purposes. Virtual university campuses have had incidents of "griefing" "cyber-shootings" harassment and immoral behaviors (Bugeja, 2007). Student privacy, intellectual property ownership, student services infrastructure, and accessibility issues are important considerations. For instructors, additional administrative policy issues concern funding the development and sustainability of the virtual world project, intellectual

property ownership, access to content, and the implications of purchasing virtual land to teach in this environment (Bugeja).

As noted, these learning spaces have significant hardware requirements, in addition to a steep learning curve. In order for this technology to be adopted and integrated, Dickey states it must accessible, in terms of cost and technical skills (Dickey, 2005). Clearly, in light of the barriers noted in the research, as adult educators we must guard ourselves against "pro-innovation bias," which refers to the notion that adopting the innovation will be beneficial to all potential adopters (Carr, 2007). In the case of virtual worlds, guarding against bias implies consideration of the potential benefits of this emerging technology and its impact on key stakeholders -- the students (our adult learners), the instructor, and the administration. For example, the innovation can come at a significant cost to instructors in terms of course planning, design, and development costs. The innovation may be resource intensive and not necessarily cost effective in all discipline areas. Also, an innovation needs to be considered within a framework of sustained costs, in terms of time, personnel (instruction and technical support) and financial resources. Furthermore, technological innovations bring new concerns in terms of intellectual property rights, faculty reward systems, and funding (Skiba, 2007).

Adult learning occurs throughout the lifespan (Tennant & Pogson, 1995), and for a wide variety of reasons: work-related, personal, social, and emancipatory. 3D virtual worlds may not be suited for a number of adult learning pursuits, and may leave a large group of adults disenfranchised (Kelton, 2007). In addition, 3D virtual world environments can further the digital divide, in terms of access, usability, and as socio-cultural barriers. Will older adult learners, the (non-Neomillenials) avail themselves of this technology? Holmes and Gardner

(2006) caution that many adult learners will be left behind, for example, those who are socio-economically disadvantaged. Diversity and inclusion are two areas of weakness in 3D virtual learning environments. 3D virtual worlds may perpetuate the commercialization of education. Adult educators must question how these emerging learning environments stand up against the ideals and principles of adult education.

Potential Educational Benefits

Educators are beginning to see the potential of 3D virtual worlds to enhance their students' learning experiences, with the virtual world becoming "a great leveler,..a very popular and equitable method of interaction" (Boulos et al., 2007). 3D virtual worlds have potential benefits for teaching adults, as they build upon adult learning and motivation principles. For example, they support formal and informal learning, and foster self-directed learning. Virtual worlds are experiential learning environments that support situated learning, with learning situated in a social context. They are constructivist environments, as users can view content through multiple perspectives via role-play with their avatars (Chapman, 2008). As collaborative, learner-centered environments, their design can support diverse learning styles and can help meet the learning needs of today's digital learner (Net Gen). 3D virtual worlds are not only suited to changing adult learning styles, but have an immersive presence that enhances learning (Dede, 2004a).

As an instructional space, virtual worlds offer exciting opportunities for teaching adult learners, with authentic educational experiences, immersive learning, collaboration, user-creation of learning objects, and authenticity in the learning environment. Watson et al. (2008) presented a framework illustrating how Second Life allows patients to interact in a 3D

environment with peers and healthcare workers. Second Life has been found to be useful in diabetic education as it can foster a community of support (social support) with experiential learning activities, and may prove to be more engaging for patient education. Collins (2008) sees great educational potential for 3D virtual worlds as a learning space. She states:

> In this emerging ecosystem of digital tools, spaces, and networks that exist "online," virtual worlds represent a convergence of several technology trends that, if realized, would place us on the cusp of an even deeper change that could profoundly influence our daily interactions in and perceptions of both worlds—physical and virtual. (p. 52)

The strengths of 3D virtual worlds lie in the variety of instructional tools, including the Web 2.0 social tools, wikis, blogs, instant messaging, and text chat that are available in this learning space.

Authentic Learning

3D virtual worlds have an immersive presence and can provide authentic learning opportunities rooted in context (Dodds, 2007). 3D virtual worlds give adult educators a space to deliver authentic and immersive learning experiences. Authentic learning is a defining characteristic of these spaces. According to Lombardi (2007):

> Authentic learning typically focuses on real-world, complex problems and their solutions, using role-playing exercises, problem-based activities, case studies, and participation in virtual communities of practice. The learning environments are inherently multidisciplinary, and similar to a 'real world' application or discipline. Authentic learning goes beyond content, intentionally bringing into play multiple

disciplines, multiple perspectives, ways of working, habits of mind, and community. (p. 2-3)

In fact, it is community participation, according to Lombardi, that is central to authentic learning, as is the collaborative completion of tasks. Oliver, Herrington, and Reeves (2006) report virtual worlds offer a learning environment that facilitates the use of authentic activities as anchoring tasks. They state: "There is increasing evidence that in order to fully engage with an authentic task or problem-based scenario, students need to engage with a process that is called the *suspension of disbelief"* (p. 503). They identified the critical characteristics of authentic activities needed to support learners' suspension of disbelief and their acceptance of the activity as real, based on the research on situated learning, anchored instruction, and problem-based learning, noted in Table 2.3 (Herrington, Reeves & Oliver, 2007).

Table 2.3: Characteristics of Authentic Activities

Authenticity Indicator	Characteristics/Description
Real–world relevance	Authentic activities have real-world relevance.
Ill-defined problems	Authentic activities are Ill-defined, and problems are open to multiple interpretations, requiring learners to identify for themselves the tasks and subtasks needed to complete the major task.
Sustained, complex tasks	Authentic activities comprise complex tasks that require sustained investigation over a period of time, requiring significant investment of time and intellectual resources.

Table 2.3 Continued

Authenticity Indicator	Characteristics/Description
Multiple perspectives	Authentic activities provide opportunities for students to examine the task from multiple sources and perspectives, using a variety of resources requiring students to distinguish relevant from irrelevant information.
Collaboration	Authentic activities provide opportunity for collaboration making collaboration integral to the task.
Reflection	Authentic activities provide opportunities for reflection (metacognition): Authentic activities enable learners to make choices and reflect on their learning, both individually and as a team or community.
Interdisciplinary	Authentic activities can be applied across different subject areas and have an interdisciplinary perspective.
Assessment	Authentic activities offer integrated assessment: Assessment is not merely summative in authentic activities but is woven into the major task in a way that reflects real-world evaluation processes.
Product	Authentic activities create polished products valuable in their own right.
Interpretation	Authentic activities allow competing solutions and multiple interpretations and outcomes.

Problem-Centered Learning as Authentic Learning. Problem-centered learning is promoted when learners are engaged in solving real-world problems. The cognitive apprenticeship model is a form of problem-centered learning (Merrill, 2002). Cognitive apprenticeship can be designed in social virtual worlds through simulated apprenticeships and observation of experts. Problems and tasks however, must be designed to foster prolonged engagement to move the learner beyond the operation or action level to progression in problem-solving (Merrill). From a design perspective, effective problem-centered learning environments should engage the student in four levels of task progression (1) the problem (2) the tasks required to solve the problem (3) the operations for each tasks, and (4) the actions for each operation (Merrill).

Adult learning in virtual worlds is ideally suited for problem-centered learning, a component of social learning theories. Many of us learn from example, in fact, the apprenticeship model of learning (i.e. internships) has been recognized as an effective way to learn in authentic situations and is practiced in professions such as teaching, healthcare, and law. Modeling and learning from others is a strong point of 3D virtual worlds. For example, authentic learning tasks and problem-solving dilemmas that one would encounter in practice can be designed in 3D virtual worlds using the instructional design model of cognitive apprenticeship. Cognitive apprenticeship is a method designed to "enculturate students into authentic practices through activity and social interaction" (Herrington & Oliver, 2005). Cognitive apprenticeship entails the learner moving from the role of observer to a fully functioning member of a community of practice (Lave and Wenger, 1991). The four processes of cognitive apprenticeship (a) modeling (expert demonstrates an activity and

provides hints and feedback to apprentice) (b) scaffolding, a process in which learners are assisted to reach new levels of knowledge, skill, or understanding via a support structure, or scaffold, and the expert reaches out to help just when they need help, refers to Vygotsky's "zone of proximal development" (c) fading, as the apprentice becomes more skilled at the task, the expert begins to transfer responsibility to them by "fading" into the background, and (d) coaching, the expert continually prompts the apprentice by choosing tasks, providing hints, and scaffolding. Many projects in Second Life begin by having students orient themselves to the interface, the virtual classroom, and the environment, either by mentoring or by attending specific orientation programs in-world. 3D virtual worlds facilitate problem-based learning and provide the opportunity for placing the problem or situation in a new context or framework. Learners have the ability to examine and explore problems and scenarios from multiple roles and perspectives depending on the avatar that is created (Annetta & Park, 2006). Authentic activities are a key component of problem-based learning.

Immersion and Presence

Holmes and Gardner (2006) describe the educational potential and strengths of 3D virtual worlds as spaces for learning. They believe that visually, the 3D graphics and immersive aspect of these learning spaces are very compelling, as they provide learners with a realistic representation of the overall context. In addition, virtual worlds offer learners the capability to analyze phenomenon from multiple perspectives, through their avatar, the virtual self, and this perspective-taking offers a significant benefit in problem-based learning. The immersive quality of virtual worlds facilitates collaborative learning, social presence, and experiential learning. Swan & Shea (2005) have commented on the enhanced affect in

learning that virtual worlds make possible due to enhanced social and instructor presence. Indeed, as learning spaces, virtual worlds evoke a strong sense of presence through sensory and psychological immersion, and through the visual representation of avatars (Dede, 2004). The immersion provided in virtual worlds builds and facilitates social presence, thus enhancing students' learning experience. Becoming a learning community in online educational environments and developing effective social relationships is important, and can be facilitated through social theories of learning (social presence), which are facilitated by the immersive nature of 3D virtual worlds. Swan and Shea (2005) have found a strong relationship between the technological affordances of online environments for developing virtual learning communities and for the social construction of knowledge. Online/social presence has been found to increase satisfaction with learning experiences and enhance student learning (Richardson & Swan, 2003).

Accommodates Digitally Fluent Adult Learners

Net Gen students (Oblinger, 2004) alternately called "Neomillenial students" (Dede, 2004a) are adult learners with a wide variety of digital media fluencies. These adult learners, born between born 1982-1991 are fluent in multiple media and participate in collective knowledge building--knowledge distributed across a community context (social networking for example). Media-rich environments have shaped students' attitudes and aptitudes. 3D virtual worlds accommodate the learning styles of the Internet-generation learners because they foster shared learning in a social context, similar to the information seeking behavior of the Internet generation. Net Gen learners are accustomed to assimilating and compiling knowledge, forming "virtual think tanks" of collaborative workgroups. In addition, learners

are becoming more experiential in their learning activities, with preferences towards teamwork, experiential activities, multi-tasking, and collaborative work groups (Dede, 2005; Oblinger 2004).

Learner-centered Constructivist Approach to Learning

A basic tenant of adult learning is adults are self-directed, goal oriented learners. Thus, adults have a need to feel in control over their own learning (Rogers, 2001). Case studies, role-play, simulations, and games are effective strategies for teaching adults facilitated by these emerging learning spaces. 3D virtual world learning experiences can be designed to allow learners flexibility, exploration, the ability to repeat tasks in a safe environment, and self-paced learning through a learner centered, constructivist approach (Huang, 2002). In addition, the ability to generate user created content gives adult learners the flexibility to create their own visually compelling learning environments (Chittaro & Ranon, 2007; Kelton, 2007).

Problem-centered Approach to Learning

Adults are relevancy-oriented in their learning, they prefer a problem-centered orientation to learning, and they learn best when knowledge is presented in real-life context (Huang, 2002). Bersin (2004) maintains the highest level of mastery comes from experiential learning, learning by doing. "These are learning activities that create high levels of understanding, context, and retention. They are similar to simulations that immerse the learner in a real-world situation" (p. 34, Bersin). Learners can immerse themselves in the learning environment by acting out the role of a character through their avatars in a simulated setting. This creates an effective learning environment that allows learners to explore and

learn independently (Feinstein, Mann & Corsun, 2002). Adults are motivated to learn in learning environments that are compatible with their proactive, self-directed tendencies.

Enhancing Motivation to Learn

Motivation is an important principle in how adults learn, and virtual worlds can have unique characteristics that can enhance adult motivation to learn. Adults learn best in a psychological climate that is non-threatening and nonjudgmental (Wlodkowski, 1999). Wlodkowski asserts that motivation provides the drive that sustains the efforts required for learning and motivation is enhanced in an inclusive learning climate. Merriam and Brockett (1997) have observed that the physical, psychological, and social environment plays an important role in successful learning. Wlodkowski (1999) has called the instructor's role the "architect of motivation." In a virtual world, the climate can be enhanced by a high degree of teaching and social presence, manifested by high teaching immediacy behaviors, through dialogue and instructor feedback (Swan & Shea, 2005). 3D virtual worlds support instructor presence and social presence through the use of avatars and real-time chat, fostering inclusion. Carter and Click (2006) assert that 3D virtual worlds engage learners in a safe climate, and have a motivational and instructional power that foster engagement through immersion, while lowering the threat of failure. Climate setting in virtual carries special implications given the social learning and constructivist framework of these worlds. Climate setting is important in 3D virtual worlds, as the literature indicates that deviant behavior does occur ("griefing") and some places are simply unsafe virtual settings where avatars can be harmed, physically and psychologically (Conklin, 2007).

Research indicates these immersive learning spaces have the potential to enhance teaching and learning, offering many educational benefits to students and instructors (Van Eck, 2006). The ability for instructors and learners to construct their own 3D immersive learning environment through "user-extensible" options (i.e. Second Life has a "sandbox" area to experiment with creating and building digital artifacts), and to interact with content in an authentic way, provides opportunities for constructivist, experiential, and situated learning (Chittaro & Ranon, 2007; Dede, 2004; Delwiche, 2006; Dickey, 2005; Gee, 2003; Hayes, 2006; Karagiorgi & Symeou, 2005; Steinkuehler, 2006). For example, 3D virtual worlds are well suited to constructivist design because they provide first person interaction with the environment, and a "first-person experience allowing for spontaneous knowledge acquisition" (Chittaro & Ranon). 3D virtual worlds provide enhanced social presence through avatars and voice chat, they facilitate collaborative learning and the co-creation of knoweldge, and they foster situated learning because the learning is social and embedded in context. They offer fascinating opportunities for critical reflection during the learning process, and complement the theory of experiential learning, which involves the reflective construction of meaning through critical reflection and dialogue (Appelman, 2004). Adult learners bring a vast amount of experience to the learning experience, and 3D virtual worlds build upon that experience by supporting adult learning theories that foster critical reflection, as well as learning in context.

Summary

According to Gee (2003), virtual learning spaces can be effective learning environments for adult learners, as they offer opportunities for both formal and informal

learning, flexible access, and the ability to accommodate diverse learning styles. Hayes (2006) has stated a 3D virtual learning environment benefits adult learners by building on the principles unique to adult learners, specifically, the self-directed and experiential learning fostered in a socially situated context. Adult learners value a collaborative working environment, and virtual learning spaces, well suited to social learning theories, and constructivist ways of knowing, can positively impact adult learning and meet the unique needs of this demographic group. For example, Second Life fosters a culture of collaborative learning and peer-to-peer creation, providing learners with an opportunity to apply existing knowledge and succeed in successive steps (Carter & Click, 2006; Cross et al., 2007). Experiential learning, situated learning, and constructivist theories support the potential for learning in these multi-user, social virtual spaces. Boulos et al. (2007) commented on the benefits of virtual worlds as learning spaces that provide students with a "psychologically safe environment within which they can participate in experiential learning, practice skills, try out "what if" hypothetical scenarios, and make mistakes without serious repercussions" (p. 240). In addition, research has focused on the many facets of 3D virtual worlds that are suited to the characteristics that make adults unique as learners (Boulos et al., 2007; Dede, 2004a; Gee, 2003; Hayes, 2006).

Presence takes on new meaning in social virtual worlds such as Second Life, with one's avatar's body communication contributing to the experience. The virtual worlds add new dimensions of communication through the visualization of non-verbal communication, the customization of one's avatar, and the ability of avatars to take on a variety of representations of the self. Carter and Click (2006) explain that how close avatars stand to

one another, the direction they face when chatting, and even where their eyes are focused all contribute to the communication experience. Communication and presence can be enhanced by activating gestures, animations and poses. Carter and Click state: “These visual cues provide a much different dimension of social interaction capabilities in comparison to text-based or even audio-based communication tools, which can greatly increase the quality of community among online students” (p. 2) Avatars, which Boulas et al. (2007) refer to as digital “alter egos” allows students and instructors to use these digital representations of themselves to interact as they navigate the learning spaces by teleporting and flying, making the learning experiences “more synchronous and more rapid” (p. 240). These virtual spaces enhance student participation, as Boulas et al. (2007) have found that levels of student engagement are enhanced and better participation can be encouraged through these authentic learning environments.

Chapter Summary

The literature review in chapter two covered the history of virtual worlds, the instructional tools that are a part of this learning space, and the adult learning theories, experiential, situated learning, and constructivism, that facilitate learning in this environment. The barriers and challenges to implementation, and the potential educational benefits virtual worlds afford adult learners were discussed within the framework of Knowles’ adult learning principles. The following chapter will describe the case study approach methodology undertaken in this study to explore the strengths and limitations of 3D virtual worlds as instructional spaces for teaching adult learners.

CHAPTER 3: METHODOLOGY

This dissertation research study examined instructors' perceptions of 3D virtual worlds as instructional spaces for teaching adult learners. The purpose of this case study was to explore the educational application of 3D virtual worlds in a variety of academic discipline areas and to critically assess the strengths and limitations this virtual learning environment presents for teaching adult learners. The guiding research question for this dissertation study was: *What are instructors' perceptions of the strengths and limitations of three-dimensional virtual worlds as learning spaces for teaching adult learners?* The following four questions supported this research:

1. How do instructors implement educational experiences in 3D virtual worlds for adult learners?
2. How do instructors facilitate adult learning in 3D virtual worlds across disciplines?
3. What insights do instructors describe about the adult learners' needs in this virtual environment?
4. How do instructors describe a successful immersive learning experience implemented in a 3D virtual world?

By interviewing instructors who taught in a virtual world, I was able to understand their perceptions of the barriers and challenge virtual learning environments present for teaching adult learners. Instructors were asked to reflect on their experiences teaching in a virtual world, and to describe their perceptions of characteristics of a successful virtual world implementation.

Chapter Three describes the research design for this dissertation study. The discussion begins with a description of the qualitative paradigm approach with an explanation of the rationale for a heuristic multiple case study approach. A discussion follows on data collection methods, data analysis methods, ethical considerations, limitations, and strategies for validating trustworthiness, validity, and reliability.

Research Design

The strategy of inquiry for this dissertation study was a heuristic multiple case study approach. The multiple case study approach included interviewing instructors teaching in six different universities in the southeastern United States. These instructors taught in a variety of academic disciplines, including the sciences, education, health sciences, communication, and business management. The design of this heuristic multiple case study included a within case analysis and a cross case analysis. The heuristic quality of the case, interviewing multiple participants, selecting a variety of academic disciplines, and exploring several virtual world platforms strengthened the findings and illuminated my understanding of the virtual world implementations.

Heuristic case studies bring about the discovery of new meaning and extend the reader's experience or confirm what is known. Merriam (1998, p. 30) has stated: "Heuristic means that case studies illuminate the readers' understanding of the phenomenon under study." According to Merriam, the heuristic quality of a case suggests it can "explain why an innovation worked or failed to work" and "discuss and evaluate alternatives not chosen" and "evaluate, summarize, and conclude, thus increasing its potential applicability" (p. 31). A heuristic case study was fitting for the purpose of this research, as I explored the innovative

application of 3D virtual worlds across disciplines, and the strengths and limitations this virtual learning environment presented for teaching adult learners. The successful educational application of an innovative technology was explored in depth. Instructors described the assessment methods they used to determine successful application of this innovation.

Qualitative Paradigm

Framing this dissertation research study as a qualitative case study is fitting given the purpose of the study and the exploratory nature of the research questions. According to Marshall and Rossman (2006), qualitative research offers the researcher the opportunity to explore participants' values, beliefs, and perspectives from the participant's vantage point. The research questions placed the participants, the instructors, at the center of this research as I inquired about their teaching practice, gathering their insights, perceptions, and reflections on their teaching experiences in the virtual world. In qualitative research the researcher collects open-ended, emerging data with the primary intent to develop themes from the data collected (Creswell, 1998). The data was part of a cross-case analysis discussed further in this chapter, which is heavily dependent on emerging themes from each case.

A key philosophical assumption of qualitative research is "reality is constructed by individuals interacting with their social worlds" (Merriam, 1998, p. 6). Merriam has explained that qualitative researchers are interested in understanding the meaning individuals construct about their world, how they make sense of their world and their experiences. As Merriam has suggested, the qualitative paradigm approach makes the assumption that meaning is embedded in individual experiences. The semi-structured interviews and virtual

observations allowed me to gather the instructors' perceptions of their experiences teaching in a virtual world.

The interpretive nature of qualitative research "not only engenders new concepts but also elaborates existing ones" (Peshkin, 1993, p. 26). Peshkin has framed the benefits of qualitative research in terms of its outcomes. Outcomes include description, interpretation, theory development, and evaluation, specifically in the area of policies, practices and innovations. Thus, a qualitative case study is fitting to examine virtual world innovations as an inquiry into implementation, processes and impact for teaching and learning. The outcomes of qualitative research point to its immense "generative potential" reminding researchers the search is for understanding, not for truth (Ibid).

The qualitative paradigm approach with case study methodology offers flexibility and spontaneity in data collection and data analysis. The flexibility in the research design is in keeping with a goal of qualitative research, to generate explanatory theory and to create understanding. The research process facilitates the emergence of relational concepts and patterns, so the process is both interpretative as well as inductive (Bogdan & Biklen, 2003). According to Tellis (1997), the "quintessential characteristic of case studies is they strive towards a holistic understanding of cultural systems of action" (p. 5) within their bounded system.

Case Study Approach

Case study research facilitates interpretation in context and satisfies the three tenets of the qualitative method: describing, understanding, and explaining (Tellis, 1997). A case study is an intensive examination of a specific phenomenon or social unit (Bogdan & Biklen,

2003). This case study is an intensive examination of how and why instructors implement 3D virtual worlds in their teaching. A case study is a bounded study, bounded by place, time, or unit (Yin, 2003). In this qualitative case study, the bounded system is the unit of analysis, the participants, instructors who are implementing 3D virtual world learning experiences in their teaching practice**.** Creswell (1998) explained a case study is an exploration of a "bounded system" or a case, or multiple cases, over time through detailed, in-depth data collection involving multiple sources of information rich in context. "The bounded system is bounded by time and place, and it is the case being studied—a program, an event, an activity, or individuals" (p. 61). This case study explored how instructors located in multiple institutions in the Southeastern United States applied 3D virtual worlds in their teaching, across a variety of academic disciplines. Merriam (1998) noted a qualitative case study is an appropriate design for research studies that undertake understanding and interpreting observations of educational phenomena.

Yin (2003) explained a case study as an empirical inquiry that "investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (p. 13). This multiple case study investigated the phenomenon of 3D virtual learning experiences. Merriam (1998) stated case studies are differentiated from other types of qualitative research because they are intensive descriptions and analysis of a single unit or a bounded system.

Yin (2003) has suggested for "how" and "why" questions the case study has a distinct advantage. Case study is an appropriate methodology "when a "how" or "why" question is being asked about a contemporary set of events, over which the investigator has little or no

control" (p. 9). The case study approach is fitting for the guiding research question in this dissertation study, which seeks to understand how instructors implement 3D virtual worlds in their teaching, and why they select this innovative virtual learning environment as an instructional space within the context of their discipline area.

Merriam (1998) has stated case study is a particularly suitable design if the focus of the study is on process. "Case studies help us to understand processes of events, projects, and programs and to discover context characteristics that will shed light on an issue or object" (Sanders, 1981, p. 44 as cited in Merriam). Case study, defined in terms of the research process, facilitates investigation of a phenomenon within its real-life context. Currently 3D virtual world learning environments are explored at the grass roots level at the universities identified for this dissertation research study. Instructors implementing 3D virtual worlds are the early adopters, the innovative thinkers who are currently exploring this technology and its potential application to enhance teaching, making this study highly suitable for case study design. Since the focus of this study was on the instructors' perceptions of the effectiveness of their own implementations, a case study design allows the researcher to explore the educational application from a process focus. Merriam has explained the decision to focus on a qualitative case study arises because the researcher is interested in insight, discovery, and interpretation rather than hypothesis testing. Merriam has stated case studies can and do accommodate a variety of disciplinary perspectives. Since this dissertation study involved an investigation of virtual world implementation across a variety of academic disciplines, and sought to understand the nature of this innovation, the case study methodology was appropriate for the purpose of the research.

Multiple Case Approach

The multiple case approach includes two or more cases within the same study (Yin, 2003). This case study design took the form of a multiple case approach, with six cases selected from various disciplines and universities, both public and private, in the southeastern United States. The case was comprised of participants that taught adult learners in a 3D virtual world. Each instructor and accompanying technology staff member that was included in the interview, such as instructional designer or programmer constituted an individual case. This addressed the multi-perspective analysis characteristic of case studies.

As Tellis (1997) has noted, a frequent criticism of case study methodology is its dependence on a single case makes it difficult to provide apparent applicability or a conclusion. Selecting six cases from a variety of discipline areas and from several institutions, both public and private, allowed the researcher to develop a greater thematic awareness of the issue, from multiple instructor perspectives. Selecting participants from a variety of disciplines was an important facet of this dissertation study, as this enriched my interpretation of virtual world implementations across different context and discipline areas. Merriam (1998) has stated the more cases included in a study and the greater the variation across the cases, the more compelling an interpretation will be.

Stake (1995) explained: "In qualitative case study, we seek greater understanding of the case. We want to appreciate the uniqueness and complexity of the case, its embeddedness and interaction with its contexts" (p. 16). An additional reason for using a multiple case approach was to design a more rigorous and a more robust study. According to Yin (2003), the evidence gathered from a multiple case design is considered more robust and "more

compelling" and strengthens the overall study. In addition, Merriam (1998) maintained the inclusion of multiple cases is one strategy for enhancing the external validity or generalizability of the findings.

Study Setting and Participants

The Setting

The selection of the setting for the case study research is a significant consideration. According to Peshkin (1993), "all situations occur in a setting of particular characteristics, and there is no setting of any interest to social researchers unless there is something we can call a situation" (p. 25). To gain an in-depth understanding of the characteristics of each case I gathered background information on each selected site prior to conducting interviews. I gathered and reviewed print and web-based information on the university, the program, and the academic discipline. I also reviewed any web-based program information about the instructor and the course. In addition, I had several informal discussions via telephone and email about the virtual world implementation to ensure the instructor's profile fit the selection criteria.

Marshall and Rossman (1995) have suggested the researcher consider the rational of why a specific setting is appropriate for the conduct of the study, and how the characteristics of the chosen site will inform the study. According to Miles and Huberman (1994), the strength of qualitative data is from its "local groundedness—the fact that the data were collected in close proximity to a specific situation" (p. 10). Where possible, participants were interviewed in their work setting. The groundedness of qualitative research requires participants be interviewed at their work setting where possible so they could reference work

related resources used in practice throughout the interview. By interviewing participants at their work setting, I was able to situate the study in the context of their professional work lives, embedded within their organizational context. This practice is in keeping with the tenants of qualitative research, which states qualitative research is naturalistic and should be conducted in the participants' environment.

In addition, this dissertation research study required gathering data in a virtual space, the instructor's virtual classroom. Observations and some follow-up interviews were conducted in the virtual world. Since the study participants teach in a virtual environment, it was necessary for me to gather data as a participant observer in the virtual world. The benefits of using a virtual world as the research site in qualitative methodology has been noted by Bainbridge (2007), Boulos et al. (2007), and Dickey (2003). Dickey (2003) conducted an examplar case study on the pedagogical affordances of 3D virtual worlds using the virtual world Active Worlds as the context and setting for the case study. Boulos et al. conducted a landmark case study on the educational potential of Second Life for health education using many locations within Second Life for their case study review.

Participants and Purposeful Sampling

Merriam (1998) defined the unit of analysis as the sample. In this dissertation study, the unit of analysis is the instructor teaching in a virtual world. The study participants were instructors in a southeastern state in institutions of higher education who teach adult learners in a variety of academic disciplines. The instructors' names and identifying information remained anonymous. Instructors were selected as the participants because they are at the forefront of this innovation. In academic institutions, the impetus for a technological

innovation is typically a grass roots effort, and it is the early adopters, the instructors, who often initiate implementation of emerging instructional technologies. As communication and influence moves laterally through their professional community of practice, a community of innovators takes shape (Dodds, 2007).

According to Merriam (1998) there are different types of purposeful sampling: typical, unique, maximum variation, convenience, snowball, chain and network sample. "Purposeful sampling is based on the assumption that the investigator wants to discover, understand, and gain insight and therefore must select a sample from which the most can be learned" (p. 61). Purposive sampling criteria was followed which keeps researcher bias in check (Miles & Huberman, 1994). Creswell (1998) suggested purposeful sampling allows one to select cases that show a varied perspective on the problem, process, or event but the researcher can also select ordinary cases, accessible cases, or unusual cases. Selected participants represented a diverse group of academic discipline areas. Flyvbjerg (2006) explained cases can be selected "on the basis of expectation about their information content" as this leads to selecting cases for their validity (p. 230). An exemplar case or the "paradigmatic case" will strengthen the validity of the case study (Flyvbjerg).

According to Merriam (1998), to begin purposive sampling, selection criteria must be established prior to selecting study participants. Selection criteria were established early in the research design and the following criteria guided case selection:

1. A variety of academic disciplines were represented.
2. Instructor has implemented or is currently implementing an educational experience within a 3D virtual world.

3. Virtual world implementation is targeted to an adult learner student population.
4. The instructor is willing to participate in a two-hour interview.
5. The instructor is willing to allow a virtual observation of the 3D virtual space.
6. The instructor is willing to grant researcher access to the virtual world site and will allow examination of digital teaching and learning artifacts created in the virtual world.
7. The instructor teaches in Second Life or Active Worlds, although teaching in other virtual worlds will be considered, as this serves to enrich the study.

All participants selected met the sampling criteria.

The type of purposeful sampling appropriate for this case study approach was convenience sampling. After ensuring selected participants met the sampling criteria, I considered location, time, and availability of sites and respondents. I gained access to participant names through three regional conferences.

The selected participants were instructors who held teaching appointments in the southeastern United States, in public and private institutions of higher education. The instructors taught in a variety of discipline areas, sciences, education, healthcare, mass communication, and business management. By interviewing instructors who taught in various academic disciplines, I was able to gain a deeper understanding of the types of learning experiences possible in a virtual world learning environment. With a focus on the learning experience, I could closely examine the teaching artifacts, instructional strategies and methods, and assessment measures for each implementation. In addition, this dissertation case study was not limited to a specific virtual world platform. Exploring virtual world

implementations from various contexts and several technology platforms focused the study on the learning experience, and the educational application of the technology to achieve learning outcomes.

Prior to beginning the interviews I asked a series of background questions to learn more about each participants' experience with technology, experience teaching online, and experience using virtual worlds. I felt it was important to understand how instructors prepared to use this technology in their teaching, and what type of prior online teaching experience they had. Through pre-interview discussions with instructors, on-site visits, and extensive web and document review, I gained an overview of the discipline and understood the purpose, goal, and outcome of the learning experiences in these various discipline areas. Through extensive interviews, document analysis, and virtual world observations, I learned about the instructors' use and implementation of virtual worlds as an instructional tool, the types of educational experiences they delivered in the virtual world, and the strengths and limitations these virtual spaces presented for teaching adult learners.

Participants' Background

All participants had substantial experience teaching with technology, and a few were advanced users, two with programming experience. All but one of the instructors interviewed had prior online teaching experience, ranging from several years' experience to more than 12 years' experience. The instructor who did not have online teaching experience was still highly technically proficient, with prior programming knowledge. This instructor taught at a university with limited online offerings. Four of the instructors had previous experience teaching in a virtual world in the past two years. These virtual worlds were Second Life and

Active Worlds. By far, these were the two virtual worlds most participants had considered for their implementations.

Five of the instructors interviewed had experience delivering instruction in fully online courses, either currently or in the past, and several had significant online teaching experience, as the degree programs they teach in are fully online. This background information was necessary because it gave me an overview of each participant's online teaching experience and their familiarity with technology. In addition, knowing this background information enhanced the trustworthiness of their credibility as participants. Overall, all instructors were knowledgeable about technology, several had substantial online teaching experience, and many were familiar with a variety of virtual world platforms. This demographic information is illustrated in Table 3.1: Participant Background, Part I, and Table 3.2: Participant Background, Part II.

Table 3.1: Participant Background, Part I

Case	Discipline	Students	Course Delivery Distance Education (DE) or F2F (face to face)	Virtual World/ Supplement or full course delivery
001	Sciences	Undergraduate (juniors and seniors)	DE and F2F	Flash-based game [Supplement]
002	Health Sciences	Graduate students	DE course in a DE program	Second Life [Supplement]
003	Comm.	Undergraduate capstone	F2F	Second Life [Supplement]
004	Sciences	Undergraduate (freshmen – juniors)	F2F	Second Life [Full course delivery]
005	Business Mgmt.	Graduate	DE course in DE degree program	Second Life [Full course delivery]
006	Education	Graduate	DE course in DE degree program	Active Worlds [3D virtual world education system]

TABLE 3.2: Participant Background: Part II

Case	Online teaching experience	Virtual world experience	Time to learn virtual world	Development Team
001	more than 10	Less than 2	1 year	Campus technology team, programmer
002	not reported	Less than 2	2 years, immersion in culture	Second Life programmer
003	more than 10	3 years	2.5 years, immersion in culture	Instructor was also developer
004	not reported	4 years	immersed in culture and building for 3 years	Instructor was also developer
005	12 years	3 years	6 months	Campus technology team
006	More than 10	4 years+	Self taught, including building in the virtual world	Instructor and colleagues

Data Collection Methods

In case study research data collection is about "asking, watching, reviewing" (Merriam, 1998, p. 69). According to Creswell (2003), "The researcher collects open-ended, emerging data with the primary intent of developing themes from the data" (p. 18). Creswell (1998) has noted there are multiple sources of information for a case study, including interviews, analysis of relevant digital documents, and observation. The case study approach cannot rely on a single method of data collection and requires the use of multiple sources of evidence (Yin, 2003).This dissertation case study included face-to-face interviews, observations in the virtual world via my own avatar, and document review of teaching artifacts, including print, web-based, and digital media. These various inquiry methods facilitated naturalistic observation, which is a key component of case study research (Stake, 1995).

The data collection process for this study included the following: (a) semi-structured, in-depth interviews with each participant, spending approximately three - four hours for each interview, including follow up interviews after the virtual world observation, (b) direct observation in the 3D virtual world and an in-depth participant observation in the virtual world in the instructor's 3D virtual classroom, (d) follow-up interviews with each participant via telephone after the interview, (e) extensive field notes and journaling before and immediately after the interviews and virtual observations, and (f) extensive field work during the virtual world observations, journaling my observations and capturing screenshots of digital teaching and learning artifacts. For a complete list of items reviewed see Table 3.3: Case Study Data Collection Plan.

Interviews

According to Robson (2002), as qualitative researchers, the researcher is able to collect data using a semi-structured interview, with predetermined questions yet with "an openness to changes of sequence and forms of questions in order to follow up the answers given and the stories told" (Kvale, 1996, p. 124). Since I was seeking to understand the problem from the instructor's perspective, conducting in-depth, semi-structured, face-to-face interviews gave me the flexibility with the interview format to gather data and interpret major thematic areas. According to Yin (2003), the interview is one of the most important sources of information in case study research.

With consent, interviews were hand-recorded and audio recorded. One of the interviews was conducted on the telephone and within Second Life, using text chat and hand-recorded notes, and the remaining five interviews were conducted face-to-face. Interviews were immediately transcribed by the researcher. The quotes and interview notes were sent back to the interviewee for member checking to confirm trustworthiness (Robson, 2002). Follow-up interviews with each participant were conducted after the virtual world observations. Participants were interviewed twice. A series of follow-up interviews were conducted, via telephone or face-to-face. The interview guide is provided in Appendices A and B and includes the full set of questions for each case participant.

Observations

Observations are a part of the data collection plan. Merriam (1998) described two distinguishing characteristics of observations: (a) they take place in the natural field setting, in this case, face- to-face and virtual, and (b) they represent a first hand encounter with the

phenomenon of interest. Direct and participant observation in the virtual world allowed me to explore the virtual world implementation, and to participate in the virtual setting. I was able to view the implementation from both perspectives as an avatar. There were no specific protocols for the observations as I was guided by the instructor's avatar. For the virtual world observations, I downloaded copies of text chat files and recorded voice chat, and I took extensive screen shots of the virtual world classroom. I recorded the observations in my field notes. I downloaded snapshots; I saved notecards in Second Life and text chats in Active Worlds. I saved digital artifacts in "my inventory" in Second Life as I had an active account linked to my own avatar. For Active Worlds I had a guest avatar and I downloaded all artifacts and saved them to a word document and to a PowerPoint file. I saved all Second Life snapshots in PowerPoint files, as that was the simplest way to document my field notes. During each virtual observation I took digital photographs to capture displays of user or co-created objects. I also captured snapshots of the virtual class layout and instructional tools that were used, such as visual tools and any social media tools. For the 3D virtual lab observation, I was given guest access to the lab.

Document Review

Prior to and during each interview I asked participants if they could share any artifacts, such as course syllabus, press releases, and other documents describing their virtual world implementation. I researched additional press releases on the Internet on my own about the virtual world implementation. I researched the instructor's background, gathering relevant documentation on teaching, background, and publications. The protocol for

document analysis included a document summary sheet (Miles and Huberman, 1994). For a copy, see Appendix C.

Overview of Combined Data Sources

The protocols followed for this research dissertation are outlined in Yin (2003). According to Yin, there are six sources of evidence to consider in a data collection plan (a) documents (b) archival records (c) interviews (d) direct observation (e) participant-observation, and (f) physical artifacts. The evidence, and supporting documentation that pertains to this case study are outlined in Table 3.3.

Table 3.3: Case Study Data Collection Plan

Data Source	Evidence
Documents	Course syllabus, agendas, emails, course web site, written reports of events; news and media reports about the virtual world implementation
Archival records	Organizational records, survey data, virtual world chat logs
Interviews	Audio recordings, web conferencing recordings, text chat files
Direct observation	Digital snapshots of teaching and learning artifacts, digital postcards, text and instant message transcripts
Participant observation	Digital snapshots, digital postcards, text and instant message transcripts
Physical artifacts	Digital Notecards in Second Life, podcasts in Second Life, streaming video in Second Life and Active Worlds, text chat and instant message logs, emails, digital artifacts (PowerPoint files, video, and digital images), message board, whiteboard, web site links, machinimas, sound, animation, video clips and build objects

To discover the meaning embedded in each instructor's teaching experience this dissertation research involved extensive fieldwork, through interviews, participant observations in the virtual world, document analysis, and digital artifact analysis, conducted in the natural setting where the phenomenon occurred. Conducting qualitative research in the virtual world, via participant observation, enabled me to understand from the instructor's perspective the challenges, issues, and implications to designing and delivering these immersive educational experiences. To summarize, data sources included the following:

- Instructor interviews
- Direct and participant observation
- Digital artifacts in the virtual world
- Archival records within the virtual world
- Document review

The three principles of data collection outlined by Yin (2003) were followed in the data collection plan. These included triangulating from multiple sources of evidence. According to Yin, the most important advantage presented by using multiple sources of evidence is the development of "converging lines of inquiry" a "process of triangulation and corroboration" which makes the case study findings more convincing if based on several different sources of information. Triangulating the data addresses any potential problems of construct validity. In addition, I created a case study database, which increased the reliability of the entire case study. The case study database consisted of notes, from interviews, observations, and document analysis, documents, press releases, syllabi, and emails, and case study narrative. Documents relevant to specific interviews were cross-referenced by the interview notes

citing the documents in the "comment field." The case study narrative included my initial written responses to the research questions, based on citing relevant evidence from interviews, documents, observations, and archival evidence. The purpose of the case study narrative was to document a connection between specific pieces of evidence and issues in the case study. This provided a chain of evidence, which increases the reliability of the case study data (Yin).

Data Analysis

According to Merriam (1998), the goal of data analysis in case study research is to communicate understanding. This goal is linked to the fact data have usually been derived from interviews, field observations, and documents. The data analysis process for this case study sought to develop a deeper understanding of each case and the coding process facilitated the development of a thematic understanding across all six cases. Stake (1995, p. 78) stated: "Keeping in mind that it is the *case* we are trying to understand we analyze episodes or text materials with a sense of correspondence. We are trying to understand behavior, issues, and contexts with regard to our particular case."

Overview of the Data Analysis Process

The data analysis process in Miles and Huberman (1994) served as the guiding framework for this study, with analysis consisting of three activities: data reduction, data display, and conclusion verification. The initial analytic methods described by Miles and Huberman were followed. Data analysis began as soon as data collection was underway. First, beginning with completing contact and document summary sheets, then proceeding to first-level coding, a literature based start codes master list (see Appendix H), then second-

level pattern coding, and finally deriving general themes through memoing. Data analysis for each case was followed with an interim case summary report.

The contact summary and data summary sheets were completed during the entire data collection process and facilitated initial data reduction. These forms were completed immediately after the contact or document review took place, according to the procedures set forth by Miles and Huberman (1994), who stated: "At that point you have a perspective that combines immediacy with a reflective overview of what went on in the contact" (p. 52). These forms were used to guide planning for the next contact, to explain a document's significance, to suggest new or revised codes for the master code list, and to facilitate further data analysis. The document summary sheets were also coded and summarized. Data analysis included: (a) assigning codes to field notes drawn from virtual observations and interviews; (b) noting reflections in the margins on both interview transcripts and observation field notes; (c) identifying similar phrases, relationships, patterns, themes and common sequences in the documents and interviews; and (d) memoing themes across the cases.

Overview of the Coding Process

According to Maxwell (2005) the primary goal of coding is "not to count things, but to "fracture" (Strauss, 1987, p. 29) the data and rearrange them into categories that facilitate comparison between things in the same category and that aid in the development of theoretical concepts" (p. 96). The procedures followed for data analysis are based on Miles and Huberman's (1994) framework for coding. Early steps in the data analysis process utilized document summary sheets (see Appendix C) and contact summary sheets (see Appendix D). The document summary sheet was useful as it helped to clarify and summarize

the main documents, and I attached a form to each document artifact I reviewed, including my reflective commentary. After a field contact took place, either by interview or virtual observation, I immediately reflected on the main concepts, themes, issues and questions, and noted those in the contact summary sheet.

Data was hand-coded. The first step for coding involved transcribing the interview tapes and coding from the Start Codes Master List (noted in Appendix H). I created descriptive codes, which I developed from a preliminary code list based on the research questions and the conceptual framework. Miles and Huberman (1994) refer to this as a provisional "start list" of codes prior to fieldwork. See Appendix H for a complete description of the Start Codes Master List. The codes were attached to "chunks" of data of varying size sentences or phrases, identified as the response, by question. When a question response consisted of more than a paragraph, paragraphs were coded individually. Thus, the codes consisted of straightforward category label codes, initiated from the start codes master list. The transcripts were re-read and coded for benefits and barriers, with initial codes derived from the literature. As an example, the barriers coding scheme is included below in Table 3.4: Preliminary Barriers with Assigned Codes. There was a similar coding scheme for educational benefits. This list was applied to the first set of field notes, examined for fit and power (Miles and Huberman, 1994), and then hand coded in the margins. This list was then applied to Level 1 coding tables, by case number document.

Table 3.4: Preliminary Barriers with Assigned Codes

Barriers	**Assigned Code**
ASSESSMENT -Institution's return on investment	ASSMT
ACCOUNTABILITY -Data collection in a virtual world -Security and reliability of student data	ACCT
LEARNING ENVIRONMENT -Harassment -Cyber shootings -Immoral behavior	ENV
CONTENT -Transferability -Reuse/-Ownership -Content protection -Evidence based content development/ -Quality standards	CONT
COPYRIGHT AND INTELLECTUAL PROPERTY RIGHTS -Institutional terms of service vs. faculty member rights	PROP
DISCIPLINARY -Inappropriate use -Griefing -Plagarism	DISC

Table 3.4 Continued

Barriers	**Assigned Code**
FUNDING -Development of virtual world project -Sustainability	FUND
POLICY -Student privacy -Intellectual property ownership -Student services infrastructure	POL
PRIVACY -FERPA COPA (Child Online Protection Act for under 18 yrs of age) -Multi-age environment presents safety concerns for under 18 – years of age students	PRIV
SKILLS MASTERY AND COMPETENCIES -Resident/Learner/Educator/Developer	COMP
STANDARDS FOR USE -Standard virtual world for instructional purposes not identified at most institutions -Institutional policies and guidelines for use -Standards for interoperability	STAND

Table 3.4 Continued

Barriers	**Assigned Code**
TEACHING FUNCTIONALITY -Grade book -Document storage -Security features	FUNCT
TECHNICAL -Processing speed -Graphics -Bandwidth -Server site shutdown -Firewall issues -Integration issues	TECH
TRAINING (faculty development) -Learning curve	TRN
USABILITY -Navigation -Accessibility -Adaptive technology	USABIL

The second level of coding required a re-reading the transcripts. This coding process was an inductive one that involved assigning interpretive codes. The second level of coding

considered the lens of Knowles' (1998) core adult learning principles, teaching techniques and strategies, instructional tools, and authenticity characteristics of the learning experience.

In summary, the coding process moved from the descriptive to the inferential. I developed a set of theoretical codes from the literature, assigning those descriptive codes to the data following the procedures set forth by Miles & Huberman (1994). I created meaningful categories of data, within the conceptual framework of adult learning theory and the barriers and benefits identified in the two exemplary studies (Dickey, 2003 and Boulos et al., 2007). I assigned descriptive codes with a summarizing notation to the data in the transcript and identified emergent themes and patterns. A sample matrix for the coding process included a code abbreviation, the actual code, a definition of the code and why the code was selected, all displayed in table format with relevant quotations with assigned page numbers for later reference.

Using the process of "discriminant sampling" codes were written in the form of a memo. As pattern coding included memoing, this required an additional re-reading of the transcripts. The memos were dated and linked to particular places in the field notes, to previous case analysis discussions, and to case summaries. The memoing process was inductive. This process facilitated cross case analysis. To ensure inter-rater reliability, at each reading I made reflective notes, I identified emerging themes, and I crosschecked with members of my dissertation support group.

Cross-case analysis and within-case analysis

Since this study was a multiple case study, data analysis included the within-case analysis and the cross-case analysis. For the within-case analysis each record was first treated

as a comprehensive case in and of itself, and the data analyzed by providing a detailed description of each case and the themes within each case. Cross-case analysis allowed me to develop a thematic framework across cases of the emergent themes (Merriam, 1998). I followed Miles and Huberman's (1994) description of the cross-case analysis for the data analysis display.

Themes

Themes were organized in a matrix using Miles and Huberman's (1994) example of a thematic conceptual matrix, displayed by Case ID number. For a case-oriented analysis, the procedure included first completing a thorough analysis of each individual case and displaying this in matrix form. For example, an initial analysis by case considered the virtual world implementation, a description of the instructional strategies and tools used, characteristics of successful implementation, and authenticity indicators. The codes selected were significant because they comprised a list of the most cited barriers to implementation in the research. Matrix displays included codes associated with adult learning principles, adult learning theories, and barriers and benefits, drawn from the conceptual framework literature and the two examplar studies (Dickey, 2003 and Boulos et al., 2007).

The final cross-case display matrix referenced codes in the columns. By coding and displaying the data in this format, thematic elements emerged that appeared consistent across disciplines and learning experience. Finally, to compile the cross-case analysis matrix, I followed Yin's (2003) replication strategy for case-oriented research. This strategy required studying one case in depth according to the theoretical framework (andragogy and adult learning theories) and examining successive cases to see whether a pattern found matched

those in previous cases. With this strategy, a theoretical framework was used to study one case in depth, and then successive cases were examined to see whether the pattern found matches those in previous cases. As patterns emerged, they were coded and compiled in a table.

Ethical Considerations

Ethical considerations were addressed by conducting a pilot study with a purpose to "specifically test your ideas or methods and explore their implications" (Maxwell, 2005) and to help the researcher test the interview questions and procedures for the full study. According to Maxwell, "One important use that pilot studies have in qualitative research is to develop an understanding of the concepts and theories held by the people you're studying—what is often called "interpretation" (p. 58), providing the researcher with an understanding of the meaning of the phenomena under study. A pilot study of three instructors at an area university was conducted in November 2008. Pilot study participants were not included in the full study to avoid biasing the data collection process. The pilot case study served as the final preparation for data collection and allowed me to test procedures for the full dissertation study (Yin, 2003).

Ethical concerns regarding working with human subjects have been addressed by following the university IRB protocol (see Appendix E). Prior to the beginning of each interview, the researcher provided each participant a copy of the informed consent form (see Appendices F and G). Each participant was mailed a copy of the informed consent form and the original forms were kept separate from the transcript so no link can be made between the informed consent form and the typed interview transcript. Ethical concerns regarding the

validity of data collection are addressed by case study research protocols, which call for triangulation of data to confirm the validity of the data collection processes (Tellis, 1997). This was accomplished by using multiple sources of data collection, as evidenced in the data collection plan (Ibid). To guard against my own biases I used inter-rater reliability to check for coding. I also used journaling, took field notes during the virtual world observations, and I kept an audit trail as my chain of evidence.

Participant observation in virtual worlds via one's own avatar raised special considerations in terms of representation, identity, integrity, and anonymity. Williams (2007), in his detailed study on avatar representation profiles discussed many of the methodological issues that may arise in this virtual space, including identity of research participant, visual representation, distinction between public and private spaces, and authenticity. Identity of research participant in the form of the instructor's own avatar has been kept confidential with no link from the instructor's avatar to the findings reported in this study. In addition, screen shots that carried any visual representation of the instructor's avatar have been kept confidential. Virtual observations were conducted within the instructor's own teaching space, so no public spaces were included in the observations. Authenticity of the instructor's avatar was addressed by triangulating the data.

Limitations

This study relied on data collection by interviews and virtual observation, which carry several limitations. Tellis (1997) has commented on limitations to direct and participant observation, when only one observer is involved in the task, and when the researcher becomes an active participant in the events being studied. "The researcher could well alter

the course of events as part of the group, which may not be helpful to the study" (p. 8). A criticism of the case study approach is knowledge cannot be generalized beyond the case. Flyvbjerg (2006) has responded to this criticism by stating that although knowledge cannot be formally generalized that does not mean the knowledge gleaned from the case cannot become part of the collective knowledge base of a society. The findings of this dissertation research study adds to the collective knowledge base of the limited amount of research that specifically addresses the effectiveness of virtual worlds as a learning environment for teaching adult learners, from the instructors' perspective. The study findings add to the evaluation literature on virtual worlds, providing analysis and documentation of the assessment techniques used in virtual worlds to evaluate teaching and adult learning. Further, the findings of this dissertation research study provide insights into the need for faculty development, support, and training for those teaching or designing educational experiences in 3D virtual worlds.

There are several limitations presented by the case study methodology. Flyvbjerg (2006) has addressed many of these limitations. Case study methodologies have been criticized as being too subjective and allowing too much scope for the researcher's own interpretation (Flyvbjerg). Flyvbjerg has addressed this limitation by explaining the importance of case study research in advancing human learning, explaining that context-dependent knowledge and experience are at the very heart of expert activity and "case knowledge is central to human learning" (p. 222). The case study approach gave each instructor generous interview time to critically reflect on one's teaching practice and on one's teaching role delivering instruction in this virtual space. To discover the meaning embedded

in each participant's experience teaching in the virtual world, the data collection for this multiple case study included in-depth interviews with each instructor, direct and participant virtual observations, via the researcher's own avatar, interacting with the professor's avatar in the virtual space, document analysis, and digital and physical teaching artifact analysis. Document analysis in the virtual world environment included reviewing note cards, document display panels, web links, wikis, text chats, instant messaging chats, and digital images. Extensive document review of both physical and virtual artifacts and archival records occurred throughout the data collection process. The extensive data collection process facilitated understanding each individual case. According to Flyvbjerg, proof is not the outcome of case study research; learning and understanding are the outcomes of this methodology, fitting the goals of this dissertation study.

Subjectivity and Positionality

Case study research is also limited by the researcher's own integrity and bias. As Merriam (1998) has stated: "The investigator is left to rely on his or her own instincts and abilities throughout most of the research effort" (p. 42). The problem of bias and the researcher's own subjectivity has led to criticism in terms of case studies lacking rigor (Merriam). Several steps were taken to guard against personal bias. This included the use of purposeful sampling based on a set of identifying criteria. To avoid biasing the study instructors who were selected for interviews taught in several virtual world platforms. Data collection included six sources of data.

A key characteristic of qualitative research is it is not value neutral and it can be difficult for the researcher to separate personal bias opinions from the data (Merriam, 1998).

Qualitative researchers are challenged to balance personal perspective and interpretation of the data (Bogdan & Biklen, 2003; Maxwell, 2005). I utilized various methods to balance my subjectivity. I recorded detailed field notes that included personal reflections and thoughts prior, during, and after my interviews with each instructor. I also kept a journal of my own personal remarks and referred to it throughout this study to examine my own subjectivity.

As the primary instrument of data collection, I had to maintain a constant awareness of my own feelings, perceptions and beliefs throughout this dissertation research study (Merriam, 1998). My own experience in distance education and my interest in virtual worlds as a learning platform was balanced against the recognition this learning environment carries strengths and limitations and is not for every learning experience or every learning style. My experience working at NC State was a potential bias so steps were taken to interview participants from other universities, both public and private, in the southeastern United States. For the virtual world observations, my personal avatar in Second Life was used for data collection. For Active Worlds, I had a guest avatar created for the virtual observation.

Trustworthiness, Validity, and Reliability

There are several steps I took to achieve trustworthiness, validity and reliability. Prior to the interview, each participant received the IRB informed consent form (for a copy see Appendix F and G). Each participant was asked to sign a consent form explaining h/her rights as human subjects. I maintained confidentiality of the data and assigned pseudonyms so the transcript could not be identified with any one interviewee. For data analysis each case was assigned a unique identifier, for example, Case 00X.

Merriam (1998) has asked the researcher to consider one's own assumptions prior to the study. I ensured trustworthiness by keeping my own assumptions in check, and by writing notes in my journal before and after the interviews. Shenton (2004) has suggested the researcher engage in continuing project evaluation, by keeping a running "reflective commentary" recording initial impressions, emergence of patterns in data collection, and the effectiveness of the data collection techniques. This commentary was noted on my document and contact summary analysis forms. I ensured trustworthiness by following the interview guide to be sure to ask all instructors the same questions. Preliminary visits to the university sites, via face-to-face where possible and online, helped me develop early familiarity with the culture of the participating institution, before I began the actual data collection and interview process (Ibid). In addition, the pilot study established trustworthiness of the research questions and the multiple case approach addressed rigor of the research.

Steps were taken to ensure internal, construct, and external validity. According to Merriam (1998), there are several ways to ensure internal validity. I conducted member checks with participant review of transcripts to ensure trustworthiness of data, returning the transcripts to the participants for review and validation and feedback. Triangulation methods included conducting follow up interviews, conducting interviews with associated support staff, and conducting both direct and participant observations in the virtual world. Triangulation was achieved through the data collection plan, which included multiple sources of data gathered in two phases. The first phase of data collection involved on-site face to face interviews. The second phase included extended observation with my own avatar's prolonged engagement in the virtual world. Contact with participants included initial preliminary

discussion about their virtual world project, preliminary observations of the virtual world classroom, and face to face interviews that lasted two to three hours, with follow-up interviews of up to two hours. The third phase involved follow up interviews, and the fourth phase involved member checks by returning copies of the transcript to participants to clarify and confirm the interview data and to verify the data gathered was truthful and accurate. Extensive document analysis, both physical and in the virtual world was used to ensure trustworthiness of data. To ensure inter-rater reliability, at each reading I made reflective notes on each transcript, I identified emerging themes, and I crosschecked my themes with several colleagues of my dissertation support group. I also asked a colleague to read and code a transcript using the predefined code list. Inter-rater reliability also helped guard against my own biases in coding the data. Triangulation of data, achieved through the data collection plan and conducting follow up interviews, conducting interviews with associated support staff, and conducting both direct and participant observations in the virtual world increased inter-rater reliability. These methods increased the reliability of the findings.

Construct validity was addressed by assessing my own subjectivity prior to the beginning of the dissertation research was addressed in the conduct of a pilot study, and in keeping of a reflective journal before and during the pilot study. Yin (2003) suggested the use of multiple sources of evidence during data collection. Using the different methods outlined in the data collection plan strengthened credibility of the data through triangulation (Shenton, 2004).

Case studies have been criticized for external validity or generalizability beyond the immediate case. I addressed external validity in the research design, following a multiple

case study approach and establishing a case study protocol (Yin, 1994). This protocal contained four important categories of content (a) an overview of the case study project (b) field procedures (c) case study questions, and (d) a guide for the case study report (Tellis, 1997).

According to Tellis (1997), the case study methodology itself is a triangulated research strategy, as research protocols involve multiple data collection sources. Maxwell (2005) has maintained collecting data from a variety of sources and methods is a triangulation strategy, as this reduces the risk that conclusions will be biased and lends credibility to the study. In this study, triangulation involved multiple sources of data, multiple methods to confirm the finding, interview, observation, document analysis, and member checking. Long-term observation in the virtual world increased the validity of the findings.

Chapter Summary

This chapter summarized the methodology for the dissertation study. The strategy of inquiry is a multiple case study. Data collection was outlined according to Yin's (2003) data collection guidelines, and data analysis followed Miles and Huberman's (1994) guidelines for open coding. As a multiple case study, the approach lends itself to Miles and Huberman's cross-case and within-case analysis following Yin's (2003) replication strategy. Cross-case analysis is an appropriate method for increasing generalizability of findings and deepening the understanding and explanation of each case, in line with the goals of case study research.

This dissertation study explored how instructors use and implement 3D virtual worlds in their teaching and the strengths and limitations 3D virtual worlds present for teaching the adult learner. This dissertation study investigated an innovative technology, 3D virtual

worlds and the types of learning experiences instructors implement in this fascinating virtual space. A challenge for this research study was the emerging and innovative application of this technology and the limited research regarding its effectiveness for teaching the adult learner. However, several exemplar studies were identified (Boulos et al., 2007) and Dickey (2003) which helped to guide the development of the methodology. As the phenomena under study occurred in two environments, the virtual and the physical, I made a specific attempt to consider data collection methods in both spaces, and to address data collection methods according to Yin's (2003) six sources of evidence framework, which provided rigor and triangulation in data collection. Chapter four presents the findings of the study.

CHAPTER 4: FINDINGS

The purpose of this dissertation research study was to explore the educational application of 3D virtual worlds in a variety of academic disciplines and to critically assess the strengths and limitations this virtual learning environment presents for teaching adult learners. This dissertation research study explored how instructors implement 3D virtual worlds in their teaching and the types of learning experiences they implement in the virtual world. The guiding research question for this dissertation research study was: *What are instructors' perceptions of the strengths and limitations of three-dimensional virtual worlds as learning spaces for teaching adult learners?* The following four questions supported this research:

1. How do instructors implement educational experiences in 3D virtual worlds for adult learners?
2. How do instructors facilitate adult learning in 3D virtual worlds across disciplines?
3. What insights do instructors describe about the adult learners' needs in this virtual environment?
4. How do instructors describe a successful immersive learning experience implemented in a 3D virtual world?

This chapter presents the findings that address the research questions.

Key Findings of the Study

Finding 1. 3D Virtual World Implementations

The first question guiding this research study was: *How do instructors implement educational experiences in 3D virtual worlds for adult learners?* During the data collection

process, it became evident that all instructors interviewed developed the virtual world learning experience with considerable planning, preparation, foresight, and a substantial amount of individual learning on their own time. Some instructors reported as much as two years of learning and preparation time depending on the design complexity of their implementation. Regardless of the virtual world platform, instructors spent considerable time learning, navigating, and planning their implementation, in addition to seeking appropriate resources in terms of funding and technical support.

To understand how instructors implement virtual worlds as an instructional tool requires an awareness of how instructors prepare themselves to teach in a virtual world. A fascinating finding was the process instructors went through to achieve virtual socialization. It was intriguing to explore the "behind the scenes" virtual socialization process instructors went through as they prepared and planned their virtual world implementation. Virtual worlds are multi-user shared social spaces with multiple avatars interacting with each other in a persistent online space. Virtual worlds have their own social norms and avatar behaviors that must be learned in order to effectively teach in this space.

Theme: Instructor Preparation

Each instructor's approach to learning how to use and navigate the virtual world was dependent on the characteristics of the specific virtual world selected for instruction. *Second Life*, for example, is an open social virtual world created and co-created by its residents. It has its own distinct virtual culture. It is international in its user membership, and therefore requires user familiarity and immersion in its social culture. Prior to teaching in this virtual world, the Second Life instructors created one or more avatars, they became members

of the virtual community, and they immersed themselves in the culture of the virtual world. Instructors immersed themselves in the virtual world entering the world with multiple avatar identities. Instructors spent as many as two years learning and navigating the social culture, meeting avatars from all over the world, making international contacts, and seeking avatars that could help identify educational resources for their implementations.

Instructors shared personal accounts of their journeys in Second Life from professor to "professor avatar." Each learning experience and orientation was unique. Some instructors journeyed into the world with multiple avatars, others worked quietly, stealthy immersed in the world with a single avatar identity. One instructor spent a full year immersed in the conceptualization of the learning experience itself, working with technology specialists, programmers, and academic support staff. The instructors' approaches to learning took several forms: self-immersion with one or multiple avatars, guided learning with colleagues' avatars in the virtual world, self-guided discovery learning, or serendipitous encounters and informal learning with avatars they met randomly in their online interest groups.

Avatars and Social Immersion

Instructors described how they conceptualized their avatars' identities and established profiles for their avatars. Their avatar representations ranged from academic, professional, to social profiles. Avatars were created with a purposeful design. An instructor, who delivered her entire class in Second Life, explained how her four avatars assisted her in her daily work. The instructor said:

> I have four different avatars, each with a purpose. I used [avatar name] for finding resources and for building [in the virtual world]. Each avatar looks different. [Avatar

> #1] is a stand out professional but became my finder, my storage keeper. I spent time moving/navigating in world. As for building, it took time, maybe a few months to be proficient. You have to dedicate the time to do it.

Immersion in the social culture was a key consideration for instructors teaching in Second Life. Another instructor, who also delivered a course within Second Life, explained how she went about her own learning, using multiple avatars. She referred to one avatar as her "social avatar" to distinguish this avatar from her "professional avatar." She describes her immersive learning experience:

> Initially, I was immersed in the virtual world as a social avatar. I came into Second Life as a social avatar. I went everywhere. It was interesting; I met people who were very educated, and very helpful. That must be because of how I constructed my profile. So I met a lot of highly educated people. I have also met people from all walks of life. But I learned Second Life. I really learned this culture. I was able to take what I learned and apply it here. I learned the social culture-- that was what I first learned—and that was important. Then I began to explore how to use this in my teaching.

Instructors stressed the importance of understanding the social culture before considering how to implement a virtual world learning experience. As instructors explained, to truly understand the virtual world, there must be full immersion in its social culture. "I taught myself how to use it. I spent time in world and learned how to move around and how to navigate the virtual world. I became the teacher. Other faculty had questions. I'd figure out how to do it." Instructors, through their own experiences learning how to navigate and

socialize in the virtual world gained an awareness of the challenges that would face their own students. They learned the need for orientation activities and they understood the types of orientation activities that would engage students. They understood firsthand the usability and accessibility issues adult learners would face. They understood the impact avatar social behaviors would have on their own students' avatars. As instructors learned from their own experiences they began to design effective orientation activities, often in the form of scavenger hunts and games, and they developed sound social policies and guidelines for their students' avatars and behaviors.

Interestingly, instructors kept several of their avatars separate from their professional lives. The process of revealing one's identity as "professor avatar" to colleagues was an evolving process: An instructor said: "I spent several months using Second Life and building in Second Life, and then one day I thought 'I must reveal myself.' Being totally restrictive with everything prevents whom you can do business with. Nothing has happened. No one comes and griefs me. I did have only one person one time approach me who had a real problem." This instructor kept his avatar role a "secret" until he felt comfortable revealing himself to colleagues. In preparation to teach in Second Life, instructors kept their avatar identities private, they created multiple avatars, and they chose to selectively reveal avatar identities.

Instructors also invested considerable time learning how to navigate the virtual world and learning how to use instructional tools such as voice and text chat. Second Life instructors faced a steep learning curve, depending on the complexity of the implementation. An instructor explained that Second Life is "really clunky" and requires "programming

proficiency" for simulations and significant 3D building and modeling. Any significant Second Life scripting, animations, or simulations required familiarity with the program's scripting language. If an instructor did not have the requisite programming background, the development process was outsourced to an in-world Second Life avatar programmer or handled by campus academic technology staff.

Development support was required in other platforms as well. For the 3D virtual laboratory implementation, a team of programmers and instructional technology staff from campus computing provided all technical support and development. The Active Worlds implementation was a group effort by several instructors and was in development for over four years. Although very technically proficient, the instructor faced other challenges such as how to visually design and conceptualize the virtual space. He found it helpful to construct his virtual classroom around a unique metaphor:

> When you start off with a blank slate and say I'm going to build a course in the virtual world but I'm not limited to four walls, a floor, and a ceiling, I'm not even limited to gravity, what does that space look like? That is the biggest struggle, coming up with a metaphor in your mind for what that space is and how it should flow and what it should feel like.

Each course in Active Worlds has its own design metaphor that is based on the content of the course and the types of interactions and activities instructors envision students will engage in, and this informs how the virtual space is designed. This instructor explained that anyone considering implementing virtual worlds in their teaching be ready to embark upon on a journey forcing them to re-think their teaching practice. "Let's question all of our

assumptions, and start from scratch. That is both liberating, and very challenging." He went on to say: "It is very, very hard to teach in this world because it suggests rethinking and challenging and questioning some of the core tenants of what we believe good teaching and good learning look like."

Theme: Types of Learning Experiences

After describing their background and preparation for implementation, instructors were asked to describe the types of learning experiences they implemented in the virtual world. There were three virtual world environments in this multiple case study, and a total of six different learning experiences. The educational applications and virtual world platforms are described in Table 4.1: Educational Application of 3D Virtual Worlds. During the interviews, instructors commented on the importance of creating learning experiences that offered the benefits of 3D visualization, authenticity, presence, immersion, and community. The participants talked about creating a "sense of home" or a "sense of place" for their learners. They were enthusiastic about the "sense of presence" and the social immersion these environments provide. They were hopeful their students would more easily grasp scientific concepts by "problem-solving" or "manipulating" 3D images and "interacting with content in a dynamic way." Instructors talked about students bonding together, forming a "community" and "engaging their peers." These instructors frequently cited presence, community, engagement, 3D visualization, authenticity, and learning in a social context as important components of their virtual world implementations.

Table 4.1: Educational Application of 3D Virtual Worlds

Case	Discipline and Course Format	Instructional Modality	Application	Primary Learning Theory	Key Element of The Learning Experience
001	Sciences ---------- *Distance Educ. (web-based)*	3D flash based game Web-based course	3D virtual lab to facilitate scientific decision making	Experiential learning	3D visualization Authenticity Problem-based Learning Self-directed
002	Health Science ---------- *Distance Educ. (3D virtual world)*	Second Life Blackboard Elluminate	Critical Reflection and group discussion in a synchronous 3D virtual classroom	Situated learning	Presence Immersion "sense of academic home" "sense of belonging"
003	Communication Education ---------- *F2F and Distance* *Blended learning*	Second Life Blackboard Elluminate	Investigative Research and peer learning	Situated Learning	Presence Immersion "sense of place"

Table 4.1 Continued

Case	Discipline and Course Format	Instructional Modality	Application	Primary Learning Theory	Key Element of the Learning Experience
004	Sciences ---------- *F2F with 3D virtual world end of course project*	Second Life F2F	Collaborative, project based teamwork to teach scientific concepts	Constructivist Learning and social constructivist learning	3D visualization Authenticity Community Co-creation and user generated content "sense of audience"
005	Business Management ---------- *Distance Education (3D virtual world)*	Second Life	Case analysis, project display, and peer evaluation in a synchronous 3D virtual classroom	Situated Learning	Presence Immersion "sense of academic home"
006	Education ---------- *Distance Education (3D virtual world)*	Active Worlds Proprietary course management system with teaching functionalities	Virtual education system and method of instruction	Situated learning	Presence Co-presence Immersion "sense of place"

It was fascinating to explore the 3D learning experiences implemented in each of these disciplines. Ranging from a 3D virtual education system to a 3D virtual scientific lab, each application was innovative, purposeful in its design, delivered in an authentic context, and immersive. Data analysis revealed instructors hoped to purposefully engage distance learning students in an authentic learning experience, attempting to simulate as much as possible the real world scenario non-distance learners experience in the classroom. Whether a virtual world was used as a supplement to instruction or as the sole delivery modality, these educational applications were engaging, innovative, and implemented with the intent to visually and psychologically immerse students in a learning experience delivered in an authentic context.

Theme: Experiential and Constructivist Learning: 3D Visualization, Authenticity, and User generated content

Implementations: 3D Virtual Lab and Space Sciences Outreach Projects

3D Virtual Lab. The first case study, a 3D virtual lab, showcased how virtual labs can be an excellent way for students to engage with 3D content in a virtual environment that mimics a real-life scientific laboratory setting. As labs are a critical component of science, the benefit of teaching in a 3D virtual world impacts distance learners who otherwise would not have an authentic lab experience available to them. The 3D virtual lab implementation examined in this case study engaged distance learners with rich 3D visual images and scientific equipment, giving them opportunities to engage in self-directed learning, problem-solve, and reach a disease diagnosis. This experience was developed in a flash based game, and each student entered the virtual world independently. The professor's avatar introduced

the lab experiment. Each student became visually immersed in the scientific laboratory. The instructor implemented this learning experience to address a common problem faced by distance learners taking science courses. The problem is engaging distance learners in a realistic lab experience similar to on-campus lab experiences. By viewing only 2D content on the web distance learners are not able to interact with the images, to visualize these images from a different perspective, and to create mental models that facilitate decision-making. The instructor hoped this immersive and visually rich learning experience would give distance learners the same lab experience as his face-to-face students, in an engaging, problem based learning environment. He explained:

> What we're trying to do is develop labs that give the distance learner as much of a realistic or hands on experience as we can, compared to sitting in the class. So, by having students be able to interact with these, to see 3D image perspectives, we think this will allow them to begin to understand the dynamics of disease, which is the point, and also the variation in ways they can visualize how a disease affects the plant.

The instructor wanted students to interact with the rich visual images in a way not possible with two-dimensional images. In the 3D virtual lab, a student collected a diseased sample, placed it under the virtual microscope, and began the diagnosis process. The instructor explained the goal of this implementation:

> The goal here, and [this discipline] is image rich….looking at two dimensional images, is not the same interaction [for students]. Can we allow them to interact in some way with this material so that they make some decisions and begin to build that

> model of what disease looks like? The idea is if we can actually get them to collect the sample and look at it that may be a more efficient way of getting them to have that mental image.

This instructor cited the purpose of this learning experience as "interaction and visualization that leads to decision making" in a real-life lab setting. According to the instructor, the benefit of examining scientific images from multiple perspectives in a visually compelling 3D environment offers the distance learner an authentic replica of real-world diagnostic images. Thus, "allowing students to interact with the material so they make some decisions." This interaction affords the distance learner a lab experience that is as much a "realistic or hands on experience as we can give students compared to sitting in the class." The instructor explained further:

> By having students be able to interact with these images, and see 3D images from various perspectives, we think this will allow them to begin to understand the dynamics of disease, which is the point, and also the variation in ways they can visualize how a disease affects the plant.

The goal of the 3D virtual lab implementation was to provide an immersive, authentic, scientific laboratory for distance education students who otherwise would not have had an opportunity to come to campus and attend weekly lab sessions with face-to-face students. With lab experience a critical component of any scientific discipline, this implementation provided distance learners an opportunity to experience, interact, and engage with 3D content. Students engaged in problem-solving activities through a scientific simulation that closely mimicked the real life laboratory setting.

Space Sciences Outreach Project. The second case study, the Space Sciences Outreach Project, was a scientific implementation in Second Life. For this implementation, the instructor frequently cited “3D visualization” and “engagement” as a key reason for immersing students in a virtual world. Although the course was face-to-face the instructor had students work in Second Life in project teams to create space science community outreach projects. This implementation involved immersive project-based work and co-creation of digital artifacts reflecting a course thematic area. All the while, the students’ avatars were immersed in a virtual world in Second Life. The instructor explained the space sciences discipline has a very strong visualization requirement. “I used Second Life for project-based work. I have students work in teams to build end-of semester outreach projects.” Each group project resulted in a visual display of end-of semester outreach projects to the larger Second Life community.

In this case, the instructor used Second Life as a supplement to instruction. The course was a face-to-face course with a virtual world project required for end of course work. The digital project was arranged via a contract between team and instructor, with an agreed upon rubric. The team had freedom in Second Life to design and develop digital artifacts in an authentic context, all related to scientific concepts in this academic discipline.

This implementation offered a wonderful opportunity for students to create, co-create and visualize the concepts covered in class. The instructor noted the benefit of teaching in a virtual world, his ability to assess student learning on the scientific concepts, remarking on the virtual world’s 3D modeling capabilities, stating, “Second Life is very good for teaching scientific concepts.” He explained that students built numerous end of semester projects that

were highly successful. Students invited Second Life participants and had an "audience attend to view the presentations." The instructor believed students understood science concepts more readily when they could visualize them in the virtual world. He observed: "For some of the concepts, Second Life just being a 3D virtual world allowed me to see what was going on in their heads—they could construct it here…according to their mental models."

This virtual world implementation required social interaction and community engagement. The instructor explained: "I wanted them to truly engage with the content, to build their own learning artifacts, to engage with science." Student engagement by creating and co-creating learning artifacts with one another fostered greater ownership over one's own learning and greater engagement in the learning process. The instructor supplemented the project experience by offering office hours in Second Life:

> I also held office hours in Second Life. I had a ton more students show up virtually than ever show up to my real life office hours. Virtual world office hours are awesome. I can help students better from home with a headset. I can look at their scripts and see what problems they are having. I can teleport from place to place to look at their [virtual world science] projects, better than being in the classroom.

For both science implementations, the value of the learning experience was enhanced by the 3D visualization component. As these instructors explained, 3D visualization enhanced student engagement, facilitated learning new scientific concepts, and allowed users to manipulate data three-dimensionally. Three-dimensional manipulation is important because students were able to "interact" with the data.

Theme: Situated Learning: Presence and Immersion

Implementations: 3D virtual education system, health sciences 3D virtual classroom, and 3D investigative research.

These three learning experiences were unique in their focus on presence and immersive learning in the design of the learning environment. Presence and immersion were cited by these three instructors as key elements in their 3D virtual world implementations. These instructors mentioned the importance of synchronous interaction with multiple users, serendipitous moments, fostering a sense of presence, and building relationships among students, their teammates, and students and instructor.

These learning experiences considered the social side of learning. The depth of social presence virtual worlds provides was described by an instructor as follows:

> You really need virtual worlds to add that sense of proximity and presence to allow those relationships to develop and for them [students] to have relationships with each other, for us to have relationships with them, and to have those relationships be high quality, meaningful, and not restricted to only scheduled, planned meetings.

3D Virtual World Education System. Proximity and presence enhance relationships and foster, as this instructor explained, "deeper and more contextualized relationships." Instructors with experience teaching in both venues, face-to-face and the virtual world commented on the virtual world as the place where they could build stronger, more meaningful, and closer relationships with their students. The sense of presence and immersion avatar representation provides in the virtual world facilitates relationship building.

An instructor describes the impact of avatar representation on the instructor-student relationship in the virtual world:

> I feel I have a much better sense of my students online than I do face-to-face. I have more quality relations with them and more interactions with them individually. If another institution approached me and said, now…here's your beautiful office with a great view, and here are all your students which you'll meet three days a week for class, and you can interact with them on Blackboard but we're not really interested in virtual worlds from an instruction standpoint I'd say 'no thanks.' I can't even imagine not teaching in this space.

As this instructor summed it up, virtual worlds, through avatar representation and proximity to other avatars provide the feeling of co-presence: "I am there, but I am there with others." The 3D virtual education system fully immerses students' avatars in the learning experience. In addition, the instructor is fully immersed in the teaching experience:

> I get the sense of [the students] in the virtual world that I could never get in a traditional face-to-face classroom, or in the traditional web based space. So, it is a deeper relationship, it's a more contextualized relationship…now that I've taught in the virtual world I can never go back.

The significance of co-presence was a unique finding. For this instructor, the feeling of sharing a social space with other avatars, and engaging in serendipitous conversation, provides a "social churn" that fosters the development of an online learning community. As this instructor explained, virtual worlds "mirror that social churn that being in a shared physical space in an academic standpoint provides, just from being there. You can't get that

same dynamic from being…on a web page. But you can then reintroduce those things through presence- based and immersive-based technologies such as virtual worlds. So that is what has really brought me into it."

Health Sciences 3D Virtual Classroom. The health sciences implementation was a well-conceptualized, interactive, 3D virtual classroom where avatars, together with their professor avatar, gathered for lectures, discussion, and presentation. The virtual classroom was designed to mimic a real life classroom. Students worked on collaborative group projects. The students were adult learner distance education students, enrolled in a fully online degree program. The instructor commented on the benefits of "immersion" and "presence." She described the immersive nature of the Second Life 3D virtual learning environment:

> Second Life is a time for [the students] to get together to discuss what they've read, to synthesize it, to be involved in discussion. It's a different way for them to learn. They don't have 'aha' moments in asynchronous instruction. You start spawning ideas when you are together in Second Life. We only use audio for discussion, so they can hear one another's voices.

The 3D virtual class experience included student avatars engaged in discussion, presentation, critical reflection, synthesis, and analysis. Using Second Life as a teaching space helped this instructor form an online learning community with her students, who are all distance learners. As she explained, it gave students the sense of an "academic home" and fostered an online learning community. "They learned how to be, I hope, engaged in a classroom situation, that we've taken away from them in distance education. I hope it helps them to

synthesize the information I gave to them and turn it into knowledge." According to this instructor, student feedback was so positive her former students continued to meet in Second Life the following semester, using the virtual classroom space to meet with classmates, in avatar representation, from other courses. She described the impact this immersive learning environment had on her students:

> One night all of my students were in Elluminate and they were begging me to come into Second Life. If I hadn't experienced this I wouldn't believe it. Going strictly from voice to avatar and voice you realize you have presence. I think it bonded the students. They bonded as a class more than they would have bonded with just texting. The appeal is definitely the sense of presence, the immersion.

The goal of the learning experience was to engage distance learners in a synchronous classroom environment, where they could have serendipitous conversations with one another and feel a "sense of academic home."

3D Investigative Research. Another fascinating virtual world implementation was the 3D investigative research learning experience in the communications discipline area. This learning experience, delivered in Second Life, consisted of avatar based investigative research and inquiry with both self-directed learning and peer learning activities. The instructor implemented an immersive learning experience for students that offered prolonged engagement in the field and provided an authentic, real-life venue to teach investigative research.

The students, as avatars in Second Life, embarked upon field research to develop the skills and competencies required for their profession as investigative journalists. Student

avatars traveled throughout the virtual world, conducting field research, taking snapshots, and creating digital artifacts such as media publications in the virtual world. The Second Life environment mimicked the type of real life work environment these students would find in the real world.

For the learning experience, each student created a personalized "avatar reporter" to engage in field research in the virtual world. This avatar reporter traveled throughout the virtual world, selecting avatars to interview. The instructor described the learning experience as:

> Real-world classroom activities were highly interactive and employed peer learning. Frequently, I used the moment to act as guide and mentor as the students developed and polished their interviewing skills. In addition, student excitement with the project promoted a great deal of peer support outside of class. Students brought back to class news of experiences they shared while exploring the Second Life world with each other in search of interview subjects.

The instructor felt the virtual world presented students with a real life scenario, as each avatar interviewed was a real person with a real life story. The instructor perceived the interview responses to be authentic, similar to interviewing participants in real-life. This created an authentic interview and both interviewee and interviewer, through avatar representation, had "real-life" encounters. The instructor stated an obvious advantage of teaching in a virtual world is students can visit places, interview others, and conduct observations and fieldwork more readily in Second Life than in real-life where travel, time, and cost constraints complicate their ability to do field research.

Theme: Situated Learning, Constructivism, and Community

Space Sciences Outreach Projects and Business Management Case Analysis

Space Sciences Outreach Projects. Several of the virtual world implementations were notable for their socially situated design and the opportunities they offered for community engagement. For instructors seeking a large audience to showcase student projects, Second Life provides a venue that engages students and community. The Second Life space sciences implementation was one example. According to the instructor, the space sciences research projects, utilizing Second Life as a teaching venue, truly expanded the virtual classroom into a synchronous online environment. The educational benefits impacted students and the larger community, as Second Life provided a large and extensive audience for student project work, immersing students socially into the learning experience.

This instructor explained the significance of community engagement, and the "sense of audience" facilitated by the social learning environment of virtual worlds. The instructor stated the virtual world venue illustrated that: "People don't want to learn on their own. They want to learn from others. They want to be part of an audience. For distance learners, Second Life offers that hands down." Clearly, a benefit to using a virtual world in teaching is the outreach potential. Creating a constructivist learning environment and sharing digital artifacts with a wider audience is an added benefit for adult learners.

Business Management Case Analysis. As a learning space, virtual worlds lend themselves to a variety of implementations and situated learning experiences, including case analysis in an immersive context. An instructor explained her implementation of Second Life this past semester, in a course taught in a 3D virtual classroom. Students were placed in small

groups to work together and complete a case analysis. They were required to develop a presentation together, and to create a design, or a visual image, that described their case analysis. Two of the benefits of teaching in Second Life for this instructor were peer learning and peer assessment:

> The rest of the class also has to do a peer evaluation. And what's great about Second Life--you can do the presentation; you can interact together without the professor, [the students] can create the documents together in world, and do the evaluations on their fellow students. This creates a notecard, so that is used as an assessment."

The instructor explained as students completed group projects, the digital artifacts were available for immediate peer review on an interactive 3D display panel. The peer review was captured in the form of a digital notecard, and stored in the instructor's online inventory for later review and follow-up assessment.

Learning in virtual worlds offers a learning environment that combines a sense of presence and community. This contributes to fostering a "sense of academic home" and a "sense of place" for distance learners. Distance learners, because of the degree of social immersion avatar representation provides can truly feel as if they are part of a larger community of learners. The business management case analysis project included 3D building. The instructor explained how students engaged in building virtual objects for the university campus in Second Life moved from feeling disconnected from the campus to experiencing feelings of belonging and connectedness. As the students worked on their 3D building projects, they slowly bonded with one another, personally identifying with their avatars. They began to express feelings of belonging, to their virtual campus, and to their

community of learners. This feeling of belonging, or connectedness to the institution and to the class developed during the group's 3D building activity. The instructor explained the moment she realized this change taking place. With her avatar immersed in the virtual world, creating and co-creating 3D buildings and objects for the virtual campus with her students' avatars, she noticed a change in how students related to one another. They began to feel connected to one another and to the virtual campus. Students revealed to her: "I have never felt like this before." Students developed a connection to the virtual campus because they designed and built digital artifacts, fostering a sense of ownership, inclusion, and buy-in for these distant learners.

Finding 2. 3D Virtual Worlds: Facilitating Learning

The data analysis revealed instructors facilitated adult learning by embedding a variety of instructional tools, in the form of social and visual media in the virtual classroom. In addition, instructors implemented a number of instructional strategies, such as role-play, that work with digital media tools. Instructors facilitated learning by shaping their own role to meet the collective needs of the group in this virtual space.

Theme: Instructional Tools: Social and Visual

The findings revealed instructors integrated social media tools into their implementations to facilitate learning. Instructors realized that students' avatars needed opportunities to meet, visit, have a cup of coffee, and congregate. To facilitate the social learning experience, the virtual environment included numerous social media tools and social gathering spaces. For example, in Active Worlds, the instructor explained the need to design

the virtual space with a social commons area, a place to have avatars congregate to facilitate serendipitous encounters as in real life. He referred to these tools as "social aggregators."

> I have social aggregators [in the virtual space] so when you log into [class name] you log into the "Commons" regardless of what institution you are affiliated with. Everybody starts in the commons and that is intentional. That encourages the "social churn" and increases the likelihood that you will bump into somebody else, and that is a critical component for success when you use these immersive environments. If you log into a virtual world and each time you do so you are the only one there, you aren't going to feel the value of it. Social aggregators really help us –they are a common space."

Synchronous communication, serendipitous learning, and creating an environment with a "social churn" are key elements in these learning experiences. The instructor explained the benefits of combining a virtual world with social media technology:

> One thing the virtual world does is open up the back channels, as I say things students can chat back and forth. I don't have that in the physical world. In Active Worlds, students carry on conversations back and forth as I'm talking, so they help each other out with their questions, they chat it out. In the traditional sense I would have stopped and helped them, but in a new pedagogy way I'm not going to do those things necessarily. I encourage an entire sidebar conversation –I open up the back channels.

The backchannel and sidebar conversations through instant messaging and text chat are important learning tools in the virtual classroom. The instructor explained how this harnesses the "collective experience and the collective expertise of the class." Instructors also benefit,

transforming their role from facilitator to "harnesser of collective knowledge." Adult learners benefit from the embedded expertise in the group and the collective learning experience of the group.

Likewise, in Second Life, conversation, serendipitous contact, community building, and group events are the primary social touchpoints in Second Life, facilitated by tools such as voice chat, VOIP, IM, text chat, and in-world events that combine images, sounds, voice chat, videos, web conferencing, and avatar movements. In fact, Second Life itself is a complex social network intertwined with activities, events, and a distinctly visual social culture. The data analysis revealed that instructors implemented many social media tools in both virtual platforms, Second Life and Active Worlds. Social media tools included wikis, blogs, RSS feeds, and scripted avatar animations.

Both Active Worlds and Second Life are powerful virtual world platforms that facilitate sharing digital images and integrating music, text, streaming audio and digital video. Instructors commented on the value of social tools and avatar representation to immerse students in the learning environment, learning from the environment while learning in the environment: "When my students immerse themselves in the virtual environment …they're learning about the environment, they're learning how to use it and teach it to others. That's the best way to learn, when you immerse yourself in the topic."

In additional to social media tools, instructors used visual tools to facilitate learning. For a comprehensive list of these media tools see Table 4.2: Educational Tools and Instructional Strategies. These included notecards and the note taker tool, used for students to drop off assignments, notes, and questions or comments, a note distributor tool which

distributes a folder with notes for the class, notecards, textures, digital images, machinimas, videos, PowerPoint presentations on pres-omatic turbo displays with laser pointer, display panels, interactive polling tool, a quiz screen, which loads questions for tests, quizzes, polls or surveys, the meeting moderator tool, HUD language translator, 3D modeling tool, sculpted prims, animations, and a blackboard that displayed text chat. For example, an instructor described the instructional tools used in her virtual classroom as a slide projector, placed behind her avatar and in front of her avatar so students can see the presentation. She includes a blackboard, which serves two purposes: anything typed into local chat is displayed on the blackboard so students who are afraid to ask questions in class can ask questions anonymously. Describing the blackboard, she states:

> The student writes questions to the instructor during the talk and it shows up on blackboard. This board stops superfluous chatter as the instructor is presenting. If chatter is posted on the blackboard it stops. Above the blackboard are web links so if you want a student to go to a web link they can click on the blue ball above the blackboard.

The classroom is as realistic as possible, with animated and customizable seats. Students can sit in various positions during class, and the various postures make the avatars realistic and give students a “sense of normalcy.” There is also a café, for social gatherings and serendipitous conversation. In addition, there is a space for students to build a customizable avatar, with clothing, gestures, and avatar templates predefined.

Table 4.2: Educational Tools and Instructional Strategies

Social Tools	Visual Tools	Instructional Strategies
-Voice chat -VOIP -Instant Messaging -Text chat -In-world events that combine ---- images, sounds, voice chat, videos -Web conferencing -Avatar animations -Wikis -Blogs -RSS feeds -Digital images/snapshots music -Streaming audio	-Notecards -Note taker tool (used for students to drop off assignments, notes, and questions or comments) -Note distributor (distributes folder with notes to the class) -Textures -Machinimas -Videos -PowerPoint presentations on pres-omatic turbo displays with laser pointer display panels -Interactive polling tool -Quiz screen (loads questions for tests, quizzes, polls or surveys) -Meeting moderator tools -HUD language translator 3D modeling tool -Sculpted prims -Animations	-Self-directed learning -Role-plays -Discussion groups -problem-solving case studies/case analysis -Reflection-on-action journaling -Simulations -Games (treasure/scavenger hunts for orientation) -Peer learning -Peer evaluation -Learning contracts -Project-based work -Lectures and presentations -Collaborative learning -Experiential learning -Problem-based learning

Theme: Instructional Strategies

The data analysis revealed instructors facilitate learning in a virtual world using a variety of instructional strategies, ranging from simulations, games, role-play, and self-directed learning and peer learning, among others. "Self-guided learning" "role-play" and "peer learning" are instructional strategies used frequently in these learning experiences. For a comprehensive list of instructional strategies see Table 4.2: Educational Tools and Instructional Strategies. As an example, students have an opportunity to conduct investigative research, following the apprenticeship model of learning. Through their own self-directed experience in the virtual world they learn how to become field researchers in real life. The instructor explained how realism comes into play:

> Second Life mimics real life because human beings are behind the keyboards when people are in Second Life. Those human beings bring their personal foibles in-world. The point here is all sorts of media we find in real life can be found in Second Life…newspapers, magazines, books, TV, radio, pamphlets, blogs, etc. When I discuss what various media and how they operate and why they exist….examples are on hand in Second Life. The advantage is students can visit and observe easier than in real life where permissions, and travel, and time elements, and expenses complicate all that.

The data analysis revealed potential benefits to adult learners include the ability to participate in simulations, preparing them for real-world experiences in a safe environment. Simulations and role-plays were noted by several instructors as key to the effectiveness of the learning experience. An instructor commented: "I like the role play aspect of Second Life. Students

can visualize this as a real place, and react to it as if it is real. That is the benefit to teaching and learning in this space."

Virtual worlds can enhance experiential learning with the instructor serving as guide, allowing students to practice skills in a safe learning environment. Experiential learning by problem solving is a direct benefit to adults learning in this virtual environment. As an example, with the 3D virtual lab learning experience, the instructor described the many benefits to students. Students were able to question the 3D images, given a set of characteristics to make a decision, and to reflect on the process "…this happened, or this, and this, and this happened, it's a watchful flow of ideas." 3D visualization allowed the students to interact with the content and images, and to make decisions, in a way not possible in a 2D environment, especially in scientific disciplines. Students engaged in problem-based learning.

Instructors commented on the benefits of the community aspect of virtual worlds, as students truly feel they are in a shared space with others. Students felt they were part of an online learning community, a key benefit to distance learners who would otherwise feel remote from the campus. In addition, virtual worlds offer the opportunity to engage students in a larger community beyond the boundaries of the virtual classroom. An instructor explained:

> Second Life allows you to explore other cultures, so when we created our classroom on the island, there was a French group that came uninvited to my class and started interacting with us. You don't know what to think, you don't know how to communicate, they are speaking a different language, but using some of the tools like

> a HUD will translate language, and we used that to communicate and learn ….. so this opened a new world for my students.

If an instructor is seeking a large audience for h/her course, a virtual world provides the audience as well as the public venue for public presentations and research projects, expanding the virtual classroom into a synchronous, persistent online environment.

In addition to interacting with other avatars beyond the virtual classroom, instructors extended the scope of projects beyond the classroom space. This was accomplished by assigning project work that required exposure and community interaction among many Second Life communities. For example, in the investigative research implementation students explored Second Life traveling the virtual world to locate interviewees and conduct their field research. They searched for interesting places to investigate, and visually compelling sites to photograph for their photojournalism projects. Students created avatar reporters that traveled throughout the virtual world and conducted interviews. The field research included gathering digital artifacts in the form of snapshots and digital notecards. The students later published their findings within the virtual world using the media tools available in-world.

Instructors cited avatar representation fosters presence, helping students feel "in the moment" as they experience a "sense of co-presence with others." Instructors explained that with proper design and planning, virtual worlds potentially provide a "safe learning environment" for adult learners. An instructor commented on the virtual worlds' broad potential for using simulations to "prepare for real-world experiences in a safe environment." The instructor perceived virtual worlds as: "a good way to enhance experiential learning

under an instructor's guidance, [to] allow individuals to practice skills with mentoring, to try out new ideas, and to learn from their mistakes."

Theme: The Changing Role of the Instructor

A fascinating finding was the changing role of the instructor in the virtual world. To facilitate adult learning in the virtual world, instructors found themselves frequently adopting various instructional roles. Most often, instructors cited "facilitator, mentor, guide, and teacher." The instructor's role changed at various times throughout the learning experience. For example, during orientation the instructor served as "mentor" "guide" or even "disciplinarian" if avatar behavior became an issue. During the instructional activity, the instructor often served as "facilitator" "teacher" "presenter" "professor" or "knowledge aggregator." During the design and implementation phase, some instructors served as "builder" "programmer" and "designer." Several of the instructors referred to themselves as "change agent" "innovator" and "early adopter." At times, instructors were challenged to balance multiple roles, including that of "technology support person" when students engaged in building activities. For a complete list of instructor roles, see Table 4.3.

Table 4.3: Instructor Roles in a Virtual World

Case	Discipline	Application	Instructor Role
001	Sciences	3D virtual lab to facilitate scientific decision making	Teacher Facilitator Early Adopter Builder Guide Disciplinarian
002	Health Sciences	Critical Reflection and group discussion in a synchronous 3D virtual classroom	Facilitator Presenter Professor Guide Disciplinarian
003	Communication	Investigative Research and peer learning	Early evangelist Early adopter Teacher Facilitator Builder Director of the Campus
004	Sciences	Collaborative, project based teamwork to teach scientific concepts	Facilitator Technical Trainer Tech Support Person Programmer Early Adopter Technology Champion

Table 4.3 Continued

Case	Discipline	Application	Instructor Role
005	Business Management	Case analysis, project display, and peer evaluation in a synchronous 3D virtual classroom	Facilitator Troubleshooter Technical Support Multi-tasker Builder Teacher Mentor
006	Education	Virtual education system and method of instruction	Facilitator Innovator Change Agent Harnesser of Collective Knowledge Builder Designer Knowledge aggregator

Instructors frequently found themselves in the role of mentor, guide, and technology support person while orienting students to the virtual world. Instructors commented on the importance of providing well-thought out orientation activities as many of their students were new to virtual worlds. From creating avatars to understanding avatar behavior and movements, instructors found themselves frequently addressing avatar related concerns during the orientation process. An instructor explained the types of avatar issues he addressed with his students in Second Life: "In my classes I talk about newbism….[and] biases against furries, vampires and gangsters in Second Life."

Instructors in Second Life and Active Worlds had well developed orientation activities and guidelines for avatar behavior. In Second Life, however, the guidelines and policies were more extensive given the open nature of the environment. For Second Life users, policies were distributed for avatar appearance and social behavior. Orientation activities covered basic avatar movements, teleporting, and avatar communication skills. An instructor explained his process for orienting students to Second Life:

> Orienting students was a challenge because of the media attention to all things that are sensational with Second Life. As to the threats, I'm the kind of person who would speak frankly about this and I explain to the students how to teleport away. I also have documents I present to them. I have documents on what to look out for in Second Life.

The role of "disciplinarian" was distinctly attributed to Second Life, where the open nature of the environment presented special considerations for maintaining a safe learning atmosphere. An instructor explained: **"**It is import to acclimate students. I have a tutorial. Overall, 90% are happy with the experience, about 10% aren't happy." All of the virtual world implementations I examined had associated guidelines, policy guides, tutorials and orientation sessions for students.

A fascinating finding was the role of "knowledge aggregator." An instructor defined his role as "one who captures the collective knowledge of the group." The instructor describes his role as harnessing the knowledge expressed through informal channels, such as chatting and instant messaging, considered the "back channels of communication." He explains his role in Active Worlds:

> In the traditional format, all [knowledge] had to pass through me. I was the bottleneck and the sieve because I'm the professor [and] because I'm the professor I'm the only one who has legitimate expertise. I don't think that's the most efficient or effective way. Now we have tools that allow each person in [the] group to share their personal expertise with other members of that group to add to the overall value of the entire experience collectively.

Finding 3. Adult Learners' Needs in the Virtual World

A third key finding pertained to the instructors' perceptions of the needs of adult learners in the virtual world. The findings revealed adults have expectations and needs in the following areas: safety and privacy, support-centered needs in the areas of student services and technology, and social needs in the form of community and engagement. Instructors commented on adult learners' needs for a "sense of place," a "sense of space," a "sense of academic home," and "sense of audience."

Theme: Safety and Privacy Needs

Instructors teaching in virtual worlds explained adult learners needed a safe place for learning, a place where students feel included, welcomed, and free to explore their virtual surroundings and the environment. Safety needs were heightened in Second Life, due to the open nature of this virtual world. Instructors were challenged to balance the benefits of having their students interact with populations outside their class boundaries, and ensuring their safety while doing so. One instructor built a safe haven for his students: "I realized that students needed a safe place to come to in Second Life, so I built this huge sandbox and I had to keep the build locked down because griefers would come." Instructors felt their virtual

offices were a “safe” place for students to congregate. An instructor teaching in Second Life explained: “I want the students to meet one another. Here in my virtual office, they can arrive and, while talking with me, they can be introduced to one another. It allows me and my students to interact with each other in a way similar to our being in a room together.” Virtual offices were a safe place for students to serendipitously connect and meet one another.

Instructors perceived that adult learners have privacy needs, especially in terms of their avatar representation. In Second Life, avatar dress and customization is very flexible. Instructors realized students needed a “dressing room” to try on avatar clothing, so an instructor built one on the campus. An interesting finding was the adult learners’ needs surrounding avatar identity and body image, and the need for their avatars to stay safe and retain their sense of privacy. In Active Worlds, a secure virtual classroom space, the instructor noticed that students had concerns about avatar behavior and avatars violating their personal space. He created guidelines to protect students from “rude” and “annoying” avatar behaviors.

Theme: Support Needs

In all of the implementations under investigation, instructors made frequent mention of adult learners’ support needs. Instructors cited “attitudes” and “perceptions” as contributing factors to students experiencing “phobias” with this technology. Instructors noted that adult learners perceived these virtual worlds as “games” stating “I don’t have time to play games.” In Second Life “griefers” posed a potential threat to new users. Instructors adjusted their roles to assist students, serving as guide, mentor, and disciplinarian when needed.

According to these instructors, overcoming perceptions and attitudes to the virtual world learning environment is the first hurdle that must be overcome. Some students perceived the learning environment as "game-like" and did not immediately recognize the value in the educational experience. Instructors stated that some students would "physically recoil" and react by adopting the mindset of "I don't play games. I'm not a gamer." According to one instructor, students tended to "transfer all their assumptions about gaming onto the learning environment." The instructor made it clear that "this isn't a game, there's no points, it's a social space, this is our campus."

Instructors routinely commented on the adult learners support needs, which ranged from "handholding" to training and orientation, to academic support services. One instructor described his students' reactions to learning in this virtual environment as "scared to death." However, with "a lot of handholding" students began to acclimate to the virtual environment. Instructors cited "technology support" "encouragement" "tutorials" and "handholding" as the most common needs of adult learners. Instructors commented their students surprised them by lacking the digital media fluencies they had expected. An instructor described her adult learners' support needs:

> I have a lot of non-traditional students, not your 18-25 year olds. These are students in the workforce, they came back to school. They are 30 – 65. They are afraid of a new environment, they are afraid of learning a different way. You have to hold their hand.

Instructors commented on adult learners' struggles to overcome the steep learning curve, particularly with Second Life. Students found the interface difficult to navigate, most

specifically in Second Life. Instructors noted there were usability issues with Second Life and difficulty using voice chat. The programming background required of Second Life users to perform complex animations using the programs' scripting language was another area of concern. The Active Worlds learning experiences did not present usability and technical problems because the instructor commented the environment is usable, accessible, and easy to navigate. However, Macintosh users needed support using Active Worlds, since the platform is Windows based. Some students experienced difficulty installing the client, and others had technical issues using Active Worlds with Vista.

The 3D virtual lab implementation was unique in the instructor having extensive development support and a team of professionals to develop the learning experience. However, the virtual lab presented usability and accessibility concerns, and these were addressed in the development phase. The lead developer explained the challenges, stating, "User Interface design was always a concern and a challenge, as well as the specifics of gameplay, and there were many, many meetings and reviews held on those issues. Accessibility was also an issue, and still is, as with most virtual worlds." The developer goes into more detail, explaining usability issues:

> The interface is pretty complicated and there are many new windows that come into and out of view at various points during the exercise, and it didn't take long to realize that making the application accessible via keyboard navigation or other methods was not as feasible as we were hoping. In hindsight we realized that in order to truly integrate accessibility into the application we would have had to have spent a lot more time in the beginning planning on how to integrate accessible features into the

> gameplay and the application, and even then evaluate whether it was worth making one version that was all-around accessible or if was better to have adapted versions to tackle different accessibility problems.

In addition to the usability and accessibility concerns, instructors cited adult learners "technical phobias" as an issue for teaching adults in a virtual world. An instructor described adult learners' fear of technology: "They are afraid of technology…they have some technical phobia. It is import to acclimate them." Instructors believed support should be personal and "just-in-time." Help was also available in multiple media formats.

All virtual world implementations had support services as part of the implementation. An instructor explained the design of his 3D virtual education system in Active Worlds:

> We built support services in there, such as the library, discussion boards, blogs, tutorials, all that stuff is in the "Commons" so it encourages people to run into each other. That was lost when we moved into the strict 2D web environment like Blackboard.

According to the instructors, student support services were very important because they fostered inclusion, safety, and a feeling of "belongingness." One instructor described his perception of adult learners' needs in a virtual world:

> Understanding that adults in particular are really going to be looking for a value relationships, with each other and with their faculty, and to be able to take advantage of the benefits of online learning, like control of where and when you are learning, you really need virtual worlds to add that sense of proximity and presence to allow

> those relationships to develop …..and to have those relationships be high quality, meaningful, and not restricted to only scheduled, planned meetings.

Additional support services in this implementation included the availability of students to access multiple instructors. In Active Worlds, the instructor addressed this concern by having multiple instructor avatars available in-world to respond to student questions. When students first logged into the virtual world, they had already been "conditioned" to look for first names, and they knew to approach any of the instructor avatars if they had a question or concern. Each instructor's avatar was visible with a first name display. Thus, "any instructor can serve them… so people feel more connected and better served. They can find someone to help them with their basic questions."

Theme: Social Needs

Adult learners need guidelines that define social behavior expectations for their avatars, including guidelines and policies for avatar appearance and social behavior. As one instructor noted, proximity transfers in the virtual world, much like it does in the real world. "People whose avatars violate personal space are considered rude and annoying." Avatar representation fosters presence and fulfills students' social needs. In Active Worlds, the instructor explained the avatars are "humanoid by and large and they are realistic enough so when you see an avatar, you can make some assumptions about the existence of a person behind that avatar. There are gestures that are attached to each avatar. I can smile, I can dance, I can move my avatar closer to you, I can wave." These gestures, animations, and proximity all factor into the construct of presence.

Adult learners' social needs included the need for "dialogue," and the need to be a part of a "learning community." It is this community participation, which is central to authentic learning. One instructor referred to this community as offering students a "sense of place" stating: "Students experience rich, discussion-based gatherings and they can reflect and synthesize material, with a "sense of place" lacking in other environments. Instructors found value teaching in a virtual world because they felt distance learners were receiving an experience closer to a "true college experience" as many of these students would otherwise never come to campus except for graduation day.

Social needs included value relationships, friendships, online learning community, bonding with the instructor and with each other, and feeling a "sense of academic home." These needs were addressed through proximity with avatar representation, synchronous and serendipitous interactions, and the "deeper and more contextualized" relationships these virtual interactions fostered among students. An instructor stated: "Adult students are looking for value in their relationships, their learning must be relevant so the relationships relevant as well." Instructors commented on the need for relevance, which is one of the hallmarks of adults going back to school.

Finding 4. Virtual World Implementations: Success Indicators

Instructors discussed assessment measures for learning outcomes, and the ways they defined a successful immersive learning experience for their students. The key findings revealed instructors captured student learning using assessment measures uniquely suited to the virtual world environment. Instructors noted assessment measures such as reflections and journaling, peer reviews, presentations with 3D display panels, machima, interactive quizzes

and surveys, 3D projects, and other methods that illustrated "evidence of creativity and exploration within the learning process." An instructor described his assessment process:

> So, how do you assess when you are in a traditional space? Well you give tests and exams. And you do those things because the traditional space is divorced from the actual relevant spaces in which the knowledge and skills and affects that are being learned are to be applied. So tests and quizzes are intermediate for what we really want to be able to be able to measure and those are actual performances.

Assessment of learning takes the form of formal and informal assessment. Methods used include: student feedback, student journaling, student reflections, student surveys, and peer review.

An instructor described the benefits of assessment in a virtual world, as these social tools facilitated "engaging distance learners" and "embed[ding] learning opportunities in a real-world setting." Virtual worlds offer new possibilities for assessing student performance:

> We can now use those real life, tangible, measurable challenges as not just the impetus for our curriculum but also as the marker points for evaluating and judging the value of those in a way that we couldn't do before. So it makes no sense to me to spend 15 weeks in a virtual world communicating with each other, totally immersed, collaborating…[the] evaluation measures must be based on the learning theories that inform this whole world.

In terms of assessing the success of the learning experiences, indicators included performance assessments and social measures to evaluate student learning. Instructors

referred to assessments that captured “social learning” and the creation of “digital artifacts” and “performance-based artifacts” as indicators of learning outcomes being achieved.

Theme: Success Indicators: Performance Assessments

Instructors described the virtual world environment as ideal for problem-based learning. Assessment measures included asking students to demonstrate their learning by creating a digital artifact that solved a problem. For one instructor, a criteria was the assessment artifact had to be relevant and be of value to the student’s work life. For end of course projects, students produced digital artifacts. As an example, students produced a behavioral artifact that demonstrated their competence in applying the knowledge and skills they learned into a relevant space outside the virtual world.

An instructor explained his assessment measures included requiring students to find a problem that is “meaningful and relevant” and to” contextualize learning around that problem.” For the space sciences implementation in Second Life, a successful project was described as the students creating a digital artifact of the solar system, providing a detailed note card and distributing the notecard to a virtual audience. Success indicators included students hosting a presentation to the general public, via their avatars, constructing a venue for the event, engaging the public, and answering their questions. The instructor wanted students to “engage the audience” and make learning a “community event.”

Theme: Success Indicators: Social Learning Measures

Instructors commented that evaluation measures must be based on the learning theories that inform 3D virtual worlds. Social learning facilitates evaluation that is embedded learning, embedded into the daily lives of the students, rooted in context. An instructor

explained learning in a virtual world "is all about performance and relevance, if you can create an artifact that solves a problem…if you can engage in some kind of behavior that influences practice...these are the value points." Instructors commented on the benefits of peer learning and the "communal learning experience" virtual worlds make possible. The virtual world immersed students in an "engaged community of learners." Engaging the community was a key outcome for the space sciences implementation. The instructor described the students' end of course projects: "They built numerous end of semester projects that were highly successful—they had an audience attend to view the presentations." Students were evaluated on engaging the Second Life community in the learning experience. According to this instructor, the implementation was highly successful. He shared what he learned from teaching in a virtual world:

> Here is what I learned from the experience, that people don't want to learn on their own. They want to learn from others. For distance learners, Second Life offers that hands down. You could come to a virtual community and feel as you are sitting at a desk with a professor. College students are coming here for the college experience [and]…distance learners, they'd like the virtual college experience, and that's what Second Life offers. People want to be a part of an audience when they learn, more so than learning on their own…..they want to be part of a learning experience.

He explained his goal in evaluation was not to evaluate the effectiveness of Second Life, but to assess the students' learning of a topic and to provide an audience to share that topic with. For the end of course projects, this instructor made a learning contract with his students, and together each group had a rubric, which detailed how the projects would be evaluated in

Second Life. According to the instructor, this helped to focus the assessment on content mastery, not technical mastery of the software. He stated: "I tell [the students] they are graded on how well they understand the [discipline]. I make a contract with my students and together we create a rubric for their project."

The 3D virtual lab instructor also used a customized rubric to evaluate student learning based on making a successful diagnosis, assigning a certain number of points for each of the aspects of discerning symptoms, and for navigating laboratory environment. The instructor found: "they loved the experience." He found the distance education students were just as capable of diagnosing disease as the on-campus students, even though they had never seen the plants in a real life laboratory setting. The students who completed the 3D virtual lab came to as accurate a diagnostics solution as the face-to-face students.

Theme: Instructors' Perceptions of a Successful Learning Experience

In all cases, the implementations were deemed successful. One instructor commented the virtual world learning experience was so successful students continued to access Second Life to work in collaborative groups once the class was finished. Instructors commented on the appeal for students: interaction and presence. The social interaction and the social presence that avatar representation and audio capabilities made possible was very appealing to distance learners.

An instructor described her assessment of the success of her teaching experience: "My use of Second Life….I've had very high success rate. I can bring students in and acclimate them in a short period of time because I have these resources for them. Within 15 minutes after they get their avatar they can be fully functioning." Indicators of success

included effective and engaging virtual world presentations, and students "bonding in a learning community." A second instructor described indicators of success as the "ability to show real life application," the "success of communicating an idea or a scientific concept in a 3D virtual lab," and the ability for the students to "visualize the concept." An instructor described his perception of a successful implementation:

> Was I successful in communicating an idea or a concept to them, in this case, diagnosis? So far the answer is a very resounding yes. In this case it was. When people come back and say they can see applications in other areas, that means they get it, that it's usable, it's valuable, and it's getting across the ideas it's intended to get across. When I hear feedback like that I know the technology has been highly successful. Any time you are taught something that you see other applications for or you see how you can best use it, that is a positive feedback for what students want and what they can use.

Instructors also described success as students feeling a "sense of presence" and "immersion" in the learning experience. Seeing students "socialize" "congregate" have "serendipitous" encounters and "form a community" were also key success indicators. As an instructor explained, virtual worlds facilitated a "sense of co presence" described as "I am there, but I am there with others." An instructor explained: "If you log into a virtual world and each time you do so you are the only one there, you aren't going to feel the value of it. Social aggregators really help us –a common space."

Chapter Summary

The key findings for this heuristic multiple case study were developed from extensive data collection and data analysis including interviews, document review, and virtual observations. I gathered and analyzed data and digital artifacts such as snapshots, notecards, image displays, web conferencing and audio and text chat files. These findings and the themes that emerged were informed by the four research questions guiding this study:

1. How do instructors implement educational experiences in 3D virtual worlds for adult learners?
2. How do instructors facilitate adult learning in 3D virtual worlds across disciplines?
3. What insights do instructors describe about the adult learners' needs in this virtual environment?
4. How do instructors describe a successful immersive learning experience implemented in a 3D virtual world?

The four key findings were analyzed and categorized according to type of learning experience implemented in the virtual world, instructor strategies and instructional tools for facilitating learning in a virtual world, the needs of adult learners engaged in instructional activities in the virtual world, and the assessment measures instructors used to evaluate successful immersive learning experiences.

By interviewing instructors who implemented an educational experience in a 3D virtual world, and by observing their virtual learning space and teaching artifacts, I began to understand from the instructors' perspective the strengths and limitations 3D virtual worlds presented for teaching adult learners. By closely examining the virtual space and teaching

artifacts, from both perspectives, virtual, in the form of my avatar, and physical, in my real-life representation, I was able to understand and analyze the types of learning experiences implemented in this virtual space.

CHAPTER FIVE: DISCUSSION, IMPLICATIONS AND RECOMMENDATIONS

The purpose of this dissertation research study was to explore the educational application of 3D virtual worlds in a variety of academic discipline areas and to assess the strengths and limitations this virtual learning environment presented for teaching adult learners. This multiple case study was designed as a heuristic case study. The heuristic quality of the case, interviewing multiple participants, selecting a variety of academic disciplines, and exploring innovations in three different virtual world platforms strengthened the findings and explained, as Merriam (1998) suggested, "Why an innovation worked or failed to work." The heuristics included an understanding of evaluation measures and indicators of successful implementation. The findings in this heuristic case study add to our understanding of how instructors prepare for, plan, and implement these innovative learning experiences. Chapter five provides a discussion of the key findings and concludes with implications for practice and recommendations for future research.

The Benefits of Learning in Virtual Worlds

These six case studies explored learning experiences delivered in virtual worlds, across a variety of academic disciplines. Although the purpose and context for each implementation was unique, an analysis of the findings revealed instructors' perceived certain key attributes of virtual worlds as beneficial to teaching adult learners, across disciplines. These attributes included: 3D visualization, authenticity, presence, immersion, and community. The virtual world implementations explored in this multiple case study offered experiential, situated, and constructivist learning experiences. Thus, learning experiences were grounded in the adult learning theories most suited to the 3D virtual

environment. The benefits of learning in 3D virtual worlds, for adult learners is the opportunity to engage in an educational experience that fosters the ability to experience content, experience community, experience collective wisdom, experience immersion, experience authentic learning, and experience a "sense of home."

Experience Content

An analysis of the findings revealed instructors implement learning experiences where students can interact with 3D content in an exciting and powerful way. Although each discipline area presents a unique academic context, instructors selected a virtual world platform to deliver the learning experience so their students could *experience the content*. Instructors frequently cited the importance of students "interacting" with content, engaging students in "3D visual images" and allowing students to "manipulate" the 3D images. Instructors cited the importance of 3D visualization for teaching scientific concepts, especially in the visually rich scientific disciplines examined in these case studies.

Experiencing the content was possible through experiential, situated, and constructivist learning activities. As an example, both the 3D Virtual Lab (see Figure 5.1) and Space Sciences Outreach Projects (see Figure 5.2) implementations were significant for their use of experiential learning activities, the impact of 3D visualization, and the authentic, real-world scientific experiences they provided for students. Bersin (2004) has maintained the highest level of mastery comes from experiential learning, learning by doing. "These are learning activities that create high levels of understanding, context, and retention. 3D virtual worlds create experiential learning activities and thus benefit adult learners. They are similar to simulations that immerse the learner in a real-world situation" (p. 34).

Figure 5.1: 3D Virtual Lab

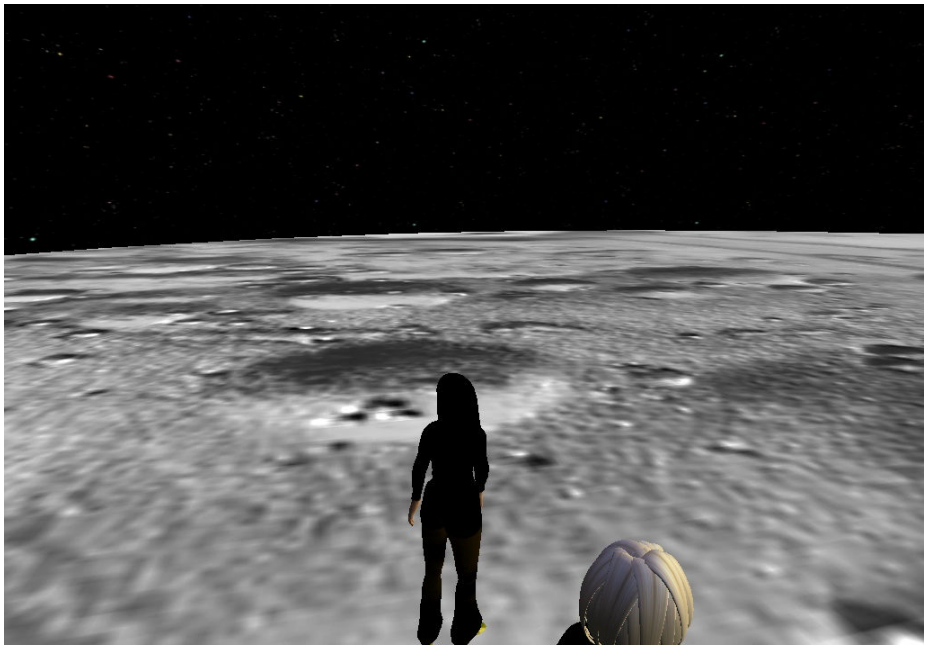

Figure 5.2: Space Sciences Outreach Project

Virtual world lab experiences were designed to provide an experiential learning experience for students. Thus, distance learners had an opportunity to practice their decision-making skills, to learn from their mistakes, and to receive mentoring and guidance as they worked through their decision-making processes. Feinstein, Mann and Corsun (2002) and Gredler (2004) have researched the role experiential learning plays in simulation-based environments and noted the many benefits to students. According to Fenwick, experiential learning involves the reflective construction of meaning with emphasis on critical reflection and dialogue (2000; 2000a). As Fenwick has stated, a learner's reflection on lived experience and the subsequent interpretation that forms mental structures, or knowledge, is a constructivist activity.

Experiencing the content is possible when students can first *experience the concepts* they are trying to learn. Experiencing scientific concepts is possible in 3D immersive spaces given the constructivist nature of virtual worlds, the social media tools available in these spaces, and the 3D visualization and modeling capabilities they provide. *Experiencing the content* requires an *engagement with content*. Engagement with content was facilitated through a host of social media applications, and most importantly through the use of social aggregators and audio capabilities (See Figure 5.3). The importance of engaging learners with content in real-world tasks, as they problem-solve and view problems from multiple avatar perspectives facilitates learner experimentation with cause and effect in the decision making process. As the research suggests, designing tasks that ask learners to assume multiple roles and perspectives, made possible by the perspective taking of avatar

representation may be applied to a variety of learning contexts such as case studies, role-plays, scenarios, and simulations (Herrington, Reeves, Oliver & Woo, 2004).

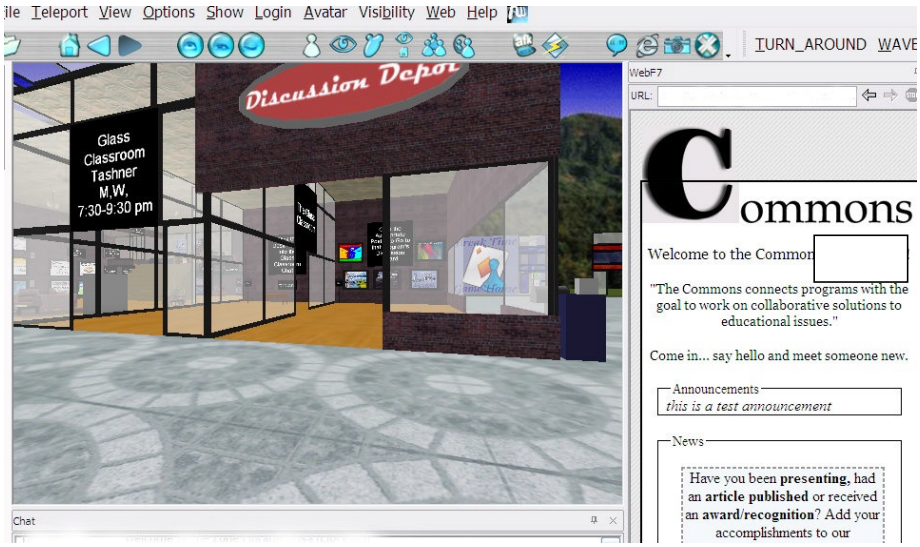

Figure 5.3: Social Aggregators in a Virtual World

Experiencing content was achieved through student engagement, interaction, and authentic design, as many of the implementations included the characteristics of authentic activities according to the framework proposed by Herrington, Reeves, and Oliver (2007). Both the space sciences and the 3D virtual lab implementations addressed the strong visualization requirements of the science disciplines, an important component for experiencing the content**.** An important benefit to adult learners was the ability to experience content in an authentic environment that was safe and non-threatening, where students could learn from their mistakes (See Figures 5.4 and 5.5). This is in keeping with Knowles' (1998) principles of adult learning, which emphasize a self-directed, problem-solving, experiential

approach to education. 3D virtual learning environments can be designed to allow learners' flexibility, exploration, the ability to repeat tasks in a safe environment, and self-paced learning through a learner centered, constructivist approach (Huang, 2002). In addition, the ability to generate user created content gives adult learners the flexibility to create their own visually compelling learning environments (Chittaro & Ranon, 2007; Kelton, 2007).

Figure 5.4: 3D Virtual Learning Environment: Informal Learning

Figure 5.5: 3D Virtual Learning Environment: Formal Learning

Experience Community

The benefit, *experience community*, emanates from "social aggregators" in the virtual space, which facilitate students gathering together, chatting, and "milling around" (Figure 5.3). The implementation in Active Worlds, a virtual education management system, was an excellent example of the power of virtual worlds to facilitate adult learning by designing the learning space to be engaging and socially dynamic, enabling *experiencing community*. This implementation was designed with multiple instructors and multiple universities represented in this virtual learning environment. The instructor commented that at any point on a weekday evening, one can find over a hundred avatars and a half dozen institutions "milling around" in this shared social space.

"Social aggregators" were key elements in this implementation. The design of this virtual space was truly a shared social space, with places for avatars to meet, talk, and engage

in active discussion. Several implementations included shared social spaces, places to congregate, and meeting areas. Virtual classrooms were designed to be both flexible in their seating arrangements and conducive to encouraging students to bond with one another (See Figures 5.4 and 5.5).

The findings point to the significance of bringing the social side of learning into online learning. Researchers such as Steinkuehler (2004; 2006) and Gee (2003) have argued that learning is a social process and immersive learning environments are effective teaching and learning tools. As an instructor noted, the virtual learning space in Active Worlds included "social dynamics and social constructs that have been available in traditional and face to face interactions, but are lost in traditional, web-based learning management systems, which function more as "repositories for artifacts of instruction." 3D virtual worlds provide adult learners an opportunity to become fully immersed in a community of practice. The Active Worlds implementation was an excellent example of a social constructivist learning space (see Figure 5.6).

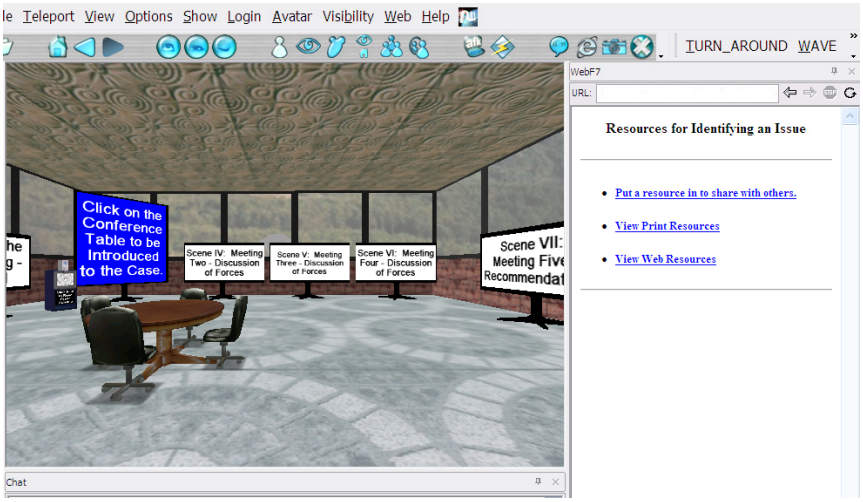

Figure 5.6: Social Constructivist 3D Virtual Learning Environment

Several of the case study virtual world applications combined situated learning, constructivist activities, and community building with the flexibility of collaborating in a 3D virtual classroom. These learning experiences were designed to facilitate adult learners' experiencing a sense of community in the shared virtual space. The feeling of community, in some cases, extended *beyond the boundaries of the learning space*. For example, the space sciences implementation included outreach to the larger community, with each student avatar hosting an educational event, creating the presentation venue, and inviting the Second Life public to view the presentation (See Figure 5.7). These presentations were hosted to a larger audience that extended the boundaries of the physical classroom, truly allowing students to experience the benefit of a learning community.

Figure 5.7: Extending Boundaries Beyond the Virtual Class Space

For adult learners there are clear benefits to learning in virtual worlds. These shared social spaces, rich in 3D visualization allow students to experience both content and community at the same time. As students interact with content, whether building, modeling, or creating learning artifacts, they interact socially with each other's avatars.

The findings confirm that 3D virtual worlds, as constructivist learning environments, combining the ability to co-create with others, while interacting and negotiating content with others in the same space, are communal constructivists learning environments. Thus, they are social constructivist learning spaces. Social constructivists such as (Vygotsky, 1978) stated learners construct knowledge through social interaction with others. Social constructivism maintains that collaboration and communication are important components for learning, placing an emphasis on the social context of learning.

In this dissertation research study, the findings indicate in 3D virtual world learning experiences, instructors can harness the strengths of the socio-cultural context in which learning takes place. This suggests as Huang (2002) noted, the context in which learning takes place impacts the learning process. For example, students can design and co-create learning artifacts within a constructivist framework, collaborate on project-based teamwork to experience working with their peers, and invite a larger audience to their presentations to experience community, and to interact with a larger community.

The findings reveal these virtual world implementations fit the well-known Herrington, Oliver, Herrington and Sparrow's (2000) situated learning model, which identifies six principles important in the design of learning. These principles involve learning in a social context: apprenticeship, collaboration, reflection, coaching, multiple perspectives,

and articulation through rhetoric and dialogue. Principles for situated learning in online environments include presenting authentic tasks in context, with “ill-defined” complex and uncertain problems.

A central principal of situated learning theory is context and social setting play an important role in the learning process. Situated learning theorists (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991) argued learning should be situated in context. As such, situated learning is well suited to learning in virtual worlds, as these case studies identified. Wilson (1993) has stated situated learning theory builds on many of the principles and characteristics unique to how adults learn. Implementing learning experiences that facilitate learning from one another is a form of shared learning called “distributed cognition” (Holmes & Gardner, 2006), well suited to 3D virtual worlds.

The findings confirmed instructors used a variety of social and visual educational tools to foster social presence, immersion, and community building among adult learners. Instructors facilitated adult learning using instructional tools that integrated social media applications and fostered learner-centered instruction. Instructors used participation, interaction and voice-enabled technologies to facilitate learning.

Experience Collective Wisdom

The findings indicated instructors facilitated adult learning by embedding a variety of educational tools, in the form of social and visual media, in the virtual classroom. These social media tools helped instructors design learning experiences that facilitated the adult learners’ ability to *experience collective wisdom* through their application of collective knowledge and the growth of the collective expertise in the group. As the findings indicated,

the power of virtual worlds is the students' ability to build this collective expertise while actively interacting with content in an authentic way. As an instructor commented, it is the "collective expertise" that is the benefit for adult learners. The space sciences outreach projects (Figure 5.8) is an excellent example of using authentic learning to build collective wisdom in a social learning environment. The display panel tool in Second Life is an excellent example of harnessing the collective knowledge of the group (Figure 5.9).

Figure 5.8: Authentic Learning Experience

Figure 5.9: Display Panel: Collective Wisdom

A surprising finding was learning how virtual worlds add to our "*dimensions of learning*." Virtual worlds extend the benefits of a learning management system from a repository of digital artifacts to a "living" system, to include additional "dimensions of learning" –presence, immersion, social aggregators, and reporting and archiving functions. The instructor notes these benefits:

> The final one [dimension of learning] is reporting and archiving. So when you walk through [virtual world zone] it is going to bring up a wiki, that is a living curriculum, or it is going to bring up a word press site, faculty have blogs, students have blogs, so when you combine these things together they are a pretty powerful online environment. This allows us to do things that we cannot do face-to-face.

Social media tools facilitated adult learning by making available "backchannel" conversations, harnessing the collective expertise of all learners in this shared social space, and turning those conversations into digital learning artifacts.

This is one of the most intriguing findings, and in keeping with the latest research on digital wisdom. The "collective expertise" that emerges in a shared social space is similar to what Prensky (2009) refers to as "digital wisdom"—harnessing the technology to access our cognitive power. As Prensky states, "Digital technology, I believe, can be used to make us not just smarter but truly wiser." Dede (2004) explained this mediated immersion fosters communal learning involving "diverse, tacit, situated experience, with knowledge distributed across a community and a context as well as within an individual."

Experience Immersion

Social media tools in virtual worlds allow learners to fully experience a sense of immersion in the learning experience, visually and socially. Through conversation, serendipitous contact, community, discussion and reflection, facilitated by social tools such as voice chat, VOIP, IM, text chat, and learning experiences that combine images, sounds, voice chat, videos, web conferencing, and avatar movements students become fully immersed in the learning environment. Since virtual worlds are a persistent, online, shared social spaces, they are a social network unto themselves. Social media tools such as wikis, blogs, RSS feeds, and scripted avatar animations add to the sense of immersion students experience. Virtual worlds, offering the benefits of the 3D social web with avatar representation, offer, as an instructor stated: "a wonderful sense of place…you feel as if people are really there." That sense, combined with the potential to apply learning in a real life context, is the value for adult learners. Note how Figures 5.6, 5.7 and 5.8 provide an immersive learning experience.

In these virtual worlds, immersion is increased in intensity with "flow state." With the right activities, such as simulations and role-play, adult learners can experience learning in a "flow state," which occurs with a learner's active and prolonged engagement (Bartle, 2007; Van Eck, 2006;Yee, 2006). This "flow state" takes the learner beyond a passive recipient of knowledge to active learning. According to the research, "flow state" enhances learner motivation and persistence while evoking confidence, exploratory behaviors, and deeper learning. Flow state and presence help adult learners experience a deeper sense of immersion

in the learning experience. Figure 5.10 is an example of a highly immersive learning experience.

Figure 5.10: Immersive Learning

Experience Authentic Learning

The findings illustrated how these virtual world implementations provided adult learners an opportunity to become fully immersed in a community of practice, engaged in authentic activities rooted in context. For example, as students built models and artifacts for their university's virtual campus, instructors referred to students "bonding" with one another, feeing a "sense of academic home" and feeing a "sense of place." As students engaged in building their learning artifacts in an authentic, "real-world" setting, they were actively engaging in the social construction of knowledge. A defining characteristic of 3D virtual worlds is the authentic learning experience, rooted in context in a social environment, that learners experience (Dodds, 2007).

Virtual worlds are contextually relevant learning spaces where adult learners can create artifacts of value to their own work, and these artifacts can be shared with others (See

Figure 5.8). The findings suggest the importance of situating the learning activity in an authentic context to facilitate learning outcomes. This is in keeping with situated learning theories two main tenets: (a) knowledge needs to be presented in an authentic context, i.e., settings and applications that would normally involve that knowledge, and (b) learning requires social interaction and collaboration, as learners become part of a "community of practice." A central principal of situated learning theory is context and social setting play an important role in the learning process (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991). Lave and Wenger (1991) have maintained understanding is linked with interaction in a community of learners, and individuals learn through participation and interaction with the community, the tools at hand (including objects, technology, languages, and images), and the activity of the moment. Knowledge emerges as a result of these elements interacting. Modeling and learning from others is a benefit of learning in 3D virtual worlds. Learning emerges in virtual spaces in the apprenticeship model of situated learning theory.

Learners experienced prolonged engagement in these virtual world implementations, an important component of situated learning theory. To encourage prolonged engagement, instructors designed an authentic context and authentic activities, facilitating task progression, and encouraging critical reflection, well suited to how adults learn. Designing tasks that have the learners take on multiple roles and perspectives, fostered by the perspective taking of avatar representation can be applied in a variety of learning contexts as studied in this dissertation research, including case studies, role-plays, scenarios, and simulations (Herrington, Reeves, Oliver & Woo, 2004). The example of students conducting semester long investigative field research was an excellent application of 3D virtual worlds

to teaching. Learners could immerse themselves in the learning environment by acting out the role of a character (an investigative reporter) through their avatars in a simulated setting. This created an effective learning environment that allowed learners to explore and learn independently (Feinstein, Mann & Corsun, 2002).

Flow state and presence combined, made possible by situating learning in authentic context, is a defining characteristic of situated learning theory. The potential for adult learners is to experience a state of "deeper learning" in 3D virtual worlds. A situated learning environment provides an authentic context that is reflective of how knowledge will be used in real-life settings (Herrington, Reeves, Oliver & Woo, 2004). Virtual learning environments can provide a solid level of realism and interactivity, fostering situated learning experiences. All the implementations examined in this dissertation research study immersed the students in authentic environments. Instructors commented frequently their intent, to engage students in "real-world" tasks in a "realistic setting." An analysis of the findings reveal these learning experiences address the key elements of constructivist design principles: "Cognitive authenticity," "experimentation and engagement," and "contextual authenticity," tasks related to the real world (Dede, 2004).

The findings also revealed these virtual world implementations contained many of the characteristics of authentic activities according to the framework proposed by Herrington, et al. (2004). Learning activities had real-world relevance and included sustained, complex tasks. Authentic activities provided opportunities for collaboration and reflection, and resulted in the development of an authentic learning product as the end result of the course

work. These end products were either performance based or behavior based digital learning artifacts.

However, the findings revealed that several implementations lacked one significant authenticity characteristic "interdisciplinary." Only one of the case studies had authentic activities that could be integrated and applied across different subject areas, and that was the Active Worlds implementation. Established as a virtual world education system, this implementation facilitated avatars interacting with multiple instructors across multiple courses.

Experience a "Sense of Home"

I was intrigued to learn how instructors perceived the needs of adult learners in the virtual world. Instructors' perceptions were adult learners had safety, privacy, support-centered, such as student services and technology, and social, such as community, engagement needs. When these needs were met, the students experienced a "sense of home," addressing their needs for a safe and comfortable learning environment. A "sense of home" was referred to as a "sense of academic home" and a "sense of belonging."

From the research (Wlodkowski, 1999) we know adults are motivated to learn in safe climate. Motivation is an important principle in how adults learn, and 3D virtual worlds have unique characteristics that can enhance adult motivation to learn. Adults learn best in a psychological climate that is non-threatening and nonjudgmental. Wlodkowski asserts that motivation provides the drive that sustains the efforts required for learning and motivation is enhanced in an inclusive learning climate. Merriam and Brockett (1997) have observed that

the physical, psychological, and social environment plays an important role in successful learning.

Adult learners' need for safety can be met in virtual worlds if the learning environment is designed to accommodate their needs. For example, instructors found their students had safety and privacy needs in regards to their avatars. They needed a "safe place to change" so an instructor created a "dressing room." Instructors established expectations for avatar appearance and published those guidelines for their students.

However, climate setting in 3D virtual worlds carries special implications given the social learning and constructivist framework of these worlds. Climate setting is important in 3D virtual worlds, as the literature indicates that deviant behavior does occur ("griefing") and some places in Second Life are simply unsafe virtual settings where avatars can be harmed, both physically and psychologically (Conklin, 2007). Adult learners need to feel their personal space was not violated so instructors created policy guides for avatar behavior.

The findings revealed some adult learners needed additional support to overcome the fear and phobia they experienced upon entering the virtual world environment. The degree of fear is more pronounced with Second Life, due to the open nature of this learning environment. In both virtual worlds adults' comfort levels increased with availability of support resources, including instructors holding office hours in their virtual office space (Figure 5.11).

Figure 5.11: Virtual Office Space

A learning climate that builds a strong sense of presence, both physical and psychological, enhances learning. In a virtual world, the climate can be enhanced by a high degree of teaching and social presence, manifested by high teaching immediacy behaviors, through dialogue and instructor feedback (Swan & Shea, 2005). 3D virtual worlds support instructor presence and social presence through the use of avatars and real-time chat, fostering inclusion.

I had a rather unexpected finding. I was surprised to learn that several of the instructors did not believe the gestures, animations, or poses assumed by a student's avatar enhanced the instructor-student communication experience. These visual cues did not necessarily enhance the "quality of communication," as one instructor stated. In fact, these visual cues were considered to be a distraction at times, as the poses and animations were not always in keeping with the tone of communication. Expectations for avatar social behavior had to be carefully managed to ensure a proper climate for learning was maintained.

Characteristics of Successful Implementations

The fourth key finding revealed how instructors assessed successful learning in the virtual world. Instructors assess the success of a learning experience by measuring performance, which included evaluating digital learning artifacts co-created in a "contextualized space." Instructors used social measures to evaluate student learning. Instructors referred to assessments that capture "social learning" and the creation of "digital artifacts" and "performance-based artifacts" as indicators of the achievement of learning outcomes. Assessment methods are uniquely situated to take advantage of the attributes of 3D virtual worlds, the social learning made possible, and the digital artifacts this space affords.

As an example, instructors considered the unique benefit this environment offers instructors to capture learning that measures performance. Once in a virtual world, instructors are no longer limited to traditional assessment measures. Learning is situated in context, opening up possibilities for group projects that measure performance in a "real-world" setting. Instructors described a benefit of teaching in virtual worlds as the ability to evaluate student learning in a contextualized learning space, which results in unique behavioral artifacts that demonstrate student competence. Instructors commented this evaluation mode is well suited to adult learners, who seek relevance in their learning, because they can conceptualize and create relevant digital artifacts that are situated and evaluated in an authentic context. Instructors used evaluation methods such as reflections and journaling, peer reviews, presentations with 3D display panels, interactive quizzes and surveys, 3D projects, and other methods that illustrated "evidence of creativity and exploration within the

learning process." The findings indicate that evaluation measures based on authenticity and social learning are most effective in this virtual space. The social tools used in virtual worlds (text chat, audio, blogs, wikis) serve to enhance student engagement and to embed the learning opportunities in a real-world, authentic setting. Since social virtual worlds immerse participants in an "engaged community of learners" student engagement is a key outcome that can be evaluated with user-created projects and community engagement in the learning experience.

While it is still early for an assessment of the overall learning environment and its impact to student learning, the findings indicated instructors perceived that students, in general, found learning in a 3D virtual world to be a positive experience. Student complaints primarily focused on the specific issues with each platform. For Second Life, students cited technical issues, steep learning curve, and usability issues. Students had difficulty following chat conversations during a presentation in Second Life, and managing chat, instant messaging, and the presentation at once. In Active Worlds, Macintosh users had to download a Mac emulator to install the software. The learning activities were overall positively received. However, instructors perceived students found the benefits of real time communication and the sense of presence preferable to the asynchronous communication available in a learning management system.

Summary of Benefits

An analysis of the findings point to specific benefits the virtual world learning environment presents for teaching adult learners. Brookfield (1995) identified four major unique adult learning processes, which build on the self-directed nature of adult learning.

According to Brookfield, adults will establish their own learning goals, seek out appropriate resources, and evaluate their progress. Adults engage in critical reflection; thus, the learning environments should be based on adults' experiences, which is a valuable resource in learning. Knowles and Brookfield clearly have the adult learner at the center of the learning activity. They also need to anticipate obstacles to education and eliminate situational (cost, time, life situation), dispositional (beliefs, attitudes, confidence), and institutional barriers (support services, access) (Rogers, 2002).

Overall, the findings indicate the learning experiences were successful, as they added value to what adult learners look for in an educational experience. One instructor explained a successful virtual world implementation draws on the characteristics that are uniquely adult: relevance and problem solving. Distance learners, particularly returning adult students, need to feel like they have an "academic home." Adult learners need to feel a part of a larger learning community. They value relationships; so online environments that foster interaction and engagement are considered value-added. The findings are in keeping with Knowles' (1998) core adult learning principles which emphasize a self-directed, problem-solving, experiential approach to learning.

The findings revealed many instructors offered opportunities for formal and informal learning, addressing principles unique to adult learners, including the self-directed and experiential learning fostered in a socially situated context (Hayes, 2006). In addition, the findings address adult learning theories, situated, experiential, and constructivist, that support the potential for learning in these multi-user, persistent, shared social spaces. For a full list of benefits, see Table 5.1: 3D Virtual World Educational Benefits for Adult Learners.

Table 5.1: 3D Virtual World Educational Benefits for Adult Learners

Potential Educational Benefits for Adult Learners in 3D Virtual Worlds	
BENEFITS: Experience Content	
3D visualization	student engagement
authentic learning environment	self-directed learning
manipulation of 3D images	experiential learning
social aggregators	situated learning
problem-solving	reflection-in-action
decision-making	reflection-on-action
perspective taking	Dialogue
BENEFITS: Experience Collective Wisdom	
social aggregators	Outreach
Presence	Collaboration
Immersion	Apprenticeship
collective knowledge	Dialogue
constructivist activities	Reflection
situated learning	communication backchannel
BENEFITS: Experience Immersion	
Dialogue	authentic context
serendipitous meetings	situated learning activities
Reflection	experiential learning with prolonged engagement
visual learning artifacts	flow state
voice and text chat	problem-based learning activities
avatar gestures and animation	simulations and role-plays
BENEFITS: Experience Authentic Learning	
immersion	Reflection
online community	Dialogue
creation and co-creation of learning artifacts	prolonged engagement and flow state
problem-solving and decision-making	situated learning
avatar perspective taking	experiential learning
Collaboration	case studies, role plays, scenarios
experimentation and engagement	presence and co-presence
real world tasks	case based learning
BENEFIT: Experience a Sense of Home	
avatar privacy	virtual world support resources
Coaching	avatar social behaviors
Mentoring	avatar representation

Implications

Implications for Practice: Planning for Implementation

Virtual worlds are not institutionalized; therefore the primary users of these spaces tend to be the early adopters. Thus, an instructor may find himself on the fringes of the institution and often working alone. For example, the participants in this dissertation study were all early adopters of the virtual world platform at their institutions. The findings revealed some of these instructors did more than create a virtual world learning experience for a single course. They were instrumental in the design of a college virtual space, or an entire campus presence. An instructor summed it up by stating:

> I have developed the entire campus, not built every object, but I've put it together, 40-50 buildings and sites. I have lots of instructors engaged one way or the other with the campus. You could say I'm the "Director of the Campus."

Instructors described themselves as "early adopters," "innovators," and "early evangelists." These instructors were the key players who brought this innovation to the forefront of their institutions. An instructor offered these insights:

> I stumbled across Second Life, I realized it was an interesting tool, and I wondered how it could be applied in the classroom. I like to say, "Here is a tool, I wonder what you could do with it?" Others say, with their teaching practice: "I have a problem; I need to find a tool." But there wasn't a problem I was trying to solve. I'm an early adopter of technology. I see that as my role on campus.

The findings also point to the virtual world implementations not being institutionalized at the university level. There were no formal processes and policies in place for management,

funding, and oversight at the university level. One of the instructors stated: "I did all this on my own. The island, I own it personally. The university paid for it but it is in my name…. I'm trying to offload it so it will be in the university's name and not mine." Instructors planning to teach in a virtual world need to carefully examine the resources available for developing and sustaining a virtual world implementation.

I was impressed by the energy, commitment, and innovation these instructors brought to their teaching practice. However, even as their innovations resulted in press activity and recognition, some of the instructors felt as if they were not an integral part of the institution. An instructor explains:

> There's an explosion, on the horizon, and I'm real excited about it, but currently I feel very much on the outskirts of things. I'm fortunate to have an amazing department chair, and a visionary dean, so I'm in a place where they are willing to support me. In that sense I feel very fortunate, and they get that what I'm doing is good, but I don't feel like I am part of the fabric of the institution.

Instructors found themselves on the "fringes of the institution." One commented, "Second Life is drawing only 1% of the students, and 1% of the faculty."

Instructors need to carefully consider the investment required to use this technology in their teaching practice and to match that investment against the resources available. As the findings revealed, many of these virtual world implementations are initiated by faculty at the grass roots level. This is not unusual for large academic institutions. Innovation is more difficult in a mature enterprise, as organizational culture and ways of doing business are well established (White & Glickman, 2007). Since these virtual world implementations were so

new, instructors teaching in Second Life found themselves developing policies for social behavior for student avatars, and preparing a significant amount of orientation resources and procedures for class management and student conduct. Simply put, many policies, processes and procedures required for teaching need to be re-thought in this virtual space.

Implications for Practice: Technical Expertise, Funding, and Sustainability

The findings point to an added complexity that carries implications for practice: the technical expertise needed to design these learning environments. For example, to implement a complex scientific learning experience with 3D data, graphics, and simulations, instructors needed programming experience, technical expertise, and additional funding to implement the virtual world learning experience. For the more complex scientific simulations, a team of technology experts was needed including instructional designers, applications development staff, and multimedia experts. Instructors must not underestimate the time commitment required. Production for one of these implementations took a total of three years. Technology support for these instructors came from the campuses' academic technology group, or was outsourced. The findings indicate that in all cases, instructors were equally vested in their implementations whether the development was outsourced or built in-house.

Implications for Practice: The Faculty Role and Faculty Development

Teaching in a virtual world carries implications for the faculty role. As the dissertation findings revealed, instructors are challenged to balance a multiplicity of roles as they plan for, develop, and implement a virtual world experience in their teaching. As noted in Table 4.3, instructors adopt a variety of roles to promote student learning, including guide, mentor, and facilitator, with the instructor's role changing at various times throughout the

learning experience. In addition to their instructional role, during the design and implementation phase, instructors may find themselves taking on instructional design, programming, or other technical roles, depending on the amount of institutional support and resources available to them. These roles are in addition to the existing faculty roles and responsibilities that are a part of an instructor's daily work. It is advisable for instructors to consider the impact of these additional roles on their professional work during the virtual world planning process.

Another implementation issue concerns the skills and competencies instructors need to teach adult learners in these virtual spaces. As Boulos et al. (2007) reported in their study, faculty development efforts have not been fully examined and documented. The findings revealed instructors invested considerable time to conceptualize, create, and develop these learning experiences. Depending on the type of virtual world platform under consideration, instructors needed an array of technical skills, at the minimum basic texturing, such as importing and using graphics, basic interactions, such as modifying easy scripts for instructional use, and a general knowledge of a wide range of social media tools.

One of the most intriguing findings concerns implications for faculty development and training. The finding on instructor preparation to teach, and the methods Second Life instructors used to culturally assimilate into the social virtual world were significant for one's teaching practice. Their personal journeys into a new social virtual culture and their assimilation to the culture, values, and behaviors of the virtual community were noteworthy because instructors mirrored their own students' potential learning experiences as social avatars. This finding is significant because it illuminated many of the benefits virtual learning

environments provide for adult learners, such as social immersion and presence. However, the finding also revealed the vast amount of time and energy instructors devoted to understanding the virtual world culture and to overcoming the learning curve, a limitation for teaching in this space.

Instructors who teach in virtual worlds discover the learning process is a shared social experience. Instructors teaching in Second Life immersed themselves in the virtual world, for a period of six months to two years. They navigated Second Life with multiple avatar identities, completely immersed, visually, physically and psychologically in the virtual world. For Second Life instructors the approach to learning was a social one. They entered the online community and became members of the virtual culture, learning its habits and values, and developing a shared history with other avatars.

The learning process for these instructors was both situated, and social, in keeping with the tenets proposed by Steinkuehler (2004, 2006) and Gee (2003), who maintained learning is a social process and should be situated in context. Steinkuehler offers as one example how newcomers are introduced to these worlds, through the assistance of other in-world residents. Information sharing and collaboration are facilitated in-world. Through active participation in-world residents begin to understand the community practices and culture, and they gradually become a part of the community of practice, similar to Lave and Wenger's legitimate, peripheral participation (as cited in Delwiche, 2006).

Second Life instructors were aware of the importance of understanding the social culture as they joined the virtual world's "distributed immersive lifestyle." As Dickey (1999) states, "Three-dimensional worlds are for the most part pre-constructed environments.

Parameters for both personal and social construction are to some degree pre-determined by the values and assumptions embedded in the design" (p. 45). Through prolonged engagement and social immersion in the form of their multiple avatars, instructors were better prepared to understand the hidden values, agendas and assumptions in the virtual world. As Steinkuehler (2004) commented, "As these worlds mature, they have developed many characteristics of physical communities such as a specialized language, political structures, complex social rituals, and shared history" (p. 160).

Prior to implementing a virtual world learning experience, instructors invested time in planning and preparing the virtual space, from conceptualizing the learning experience, to planning for technical implementation. One instructor planned the learning experience by first conceptualizing the virtual space in a visual metaphor. He explained, "Using virtual worlds makes you think about how you deliver your current material, how it could be developed in-world, and to determine the value added by using the tool. You have to be a planner, organized and somewhat futuristic to do this." An awareness of how the participants approached the application of this technology in their teaching practice gave me the foundation from which to explore their educational innovations.

Implications for Practice: Institutional Support

Instructors implemented successful learning experiences in the virtual world, noting the many benefits for adult learners, such as 3D visualization, authenticity, presence, immersion, and community. Learning in a socially situated context was a key component of these learning experiences. Although instructors were pleased with the outcome, there were several challenges to implementation. Instructors commented on the lack of institutional

support in terms of funding. Virtual world implementations are not mainstreamed in the institution. An instructor noted:

> The implementation is grass roots and faculty driven. The reason it has to be faculty driven is because the people that know the technology don't know the material. Especially in the sciences, it really comes down to having someone to push it forward. These things are faculty driven, you have to have someone with the energy and time to do this.

There are substantial development costs in terms of technical expertise and the high-end multimedia expertise required.

> You can't, you don't have, or I didn't have, the expertise in instructional design and multimedia to really optimize the students' learning experience. But multimedia 3D specialists are dying to have material that they can work with.

Faculty expressed concern for funding future projects. They expressed concern over the sustainability of their virtual world innovation in terms of project costs, time, personnel, and available resources. As one instructor commented: "I would say we are still the outliers, even within our own institutions, within our own department… that continues to be a challenge."

Implications for Practice: Collaborative Learning

The findings in this dissertation indicate that virtual worlds offer great opportunities for collaborative learning, across a variety of academic disciplines. A significant implication is the opportunity for collaborative learning in the sciences, particularly for distance learners. 3D virtual worlds, as the findings indicate, offer distance students an opportunity to work in a "real life" laboratory setting, collaborate with other online students, and engage in the

learning experience. As instructors noted, online students can experience the science concepts, in a tangible way. 3D virtual worlds offer exciting possibilities for harnessing the collective knowledge of distance learners, contributing to the lab experience, which is often difficult to mimic in a real-life setting for distance learners.

Recommendations for Future Research

Recommendations for future research in the area of teaching in virtual worlds include usability studies, transfer of learning and assessment, faculty development, and pedagogy. Given the numerous concerns over usability issues in platforms such as Second Life it would be worthwhile to develop usability standards and conduct usability evaluations prior to implementation. Second Life has a steep learning curve and an interface that can be difficult to navigate, particularly for adult learners. As one instructor noted: "For the adult learner, I think Second Life may or may not be the best approach, initially. I would suggest that any tool that is put out there, that you get some sort of usability study on it." Instructors commented on the Second Life platform as "not intuitive enough for new users."

A second area for research is transfer of learning and assessment. Assessment is a critical component for evaluating the effectiveness of a virtual world platform as a learning space. The findings indicate instructors are conducting assessment in these virtual spaces, however; there is limited research on the assessment measures most effective in virtual worlds (Baker, Wentz & Woods, 2009; Oliver & Carr, 2009). Further, there is limited research that speaks to the measurement of outcomes or impact to student learning (Jarmon, Traphagen, Mayrath, & Trivedi, 2009). Foreman (2003, 2004), a leading scholar in the area of digital game based learning, has predicted shared graphical worlds are the learning

environments of the future. However, he has questioned whether these simulated environments can authentically replicate the situated learning experienced by students in the real world, citing more research is needed to illustrate students can apply the knowledge learned in virtual worlds to the real world. There needs to be an increasing focus on assessment and evaluation of learning outcomes in virtual worlds.

Future research is needed in the area of faculty development. After learning of the time, energy, and commitment these instructors invested in their virtual world implementation, it is clear further research is needed to investigate the specific competencies and skills instructors must have to successfully implement this technology in their teaching. Finally, additional research is needed into the "pedagogical affordances of virtual worlds." An instructor captures the importance of this by stating:

> It's not going to be the computer that challenges your future colleagues, it's going to be the pedagogical affordances these things present that's going to challenge them, because they were successful with a traditional model as students, they built careers using that model as professionals, and then you walk in and change the rules on them and in many ways what's good in one space is often times not good in another.

3D virtual worlds present new opportunities and challenges for faculty, instructional designers, and learners. A virtual classroom in a 3D world becomes the interface, content, and context for user interaction. The entire course is structured and organized within a visual context. In fact, course content takes the form of a visual narrative (motion, sound, and animations), and the learning space becomes an environment of distributed learning anchored within a simulated context. Virtual worlds offer adult learners the opportunity to analyze

phenomenon from multiple perspectives. This requires a careful re-thinking of the pedagogy of teaching. Research needs to be undertaken that examines the instructional design models for these virtual learning environments, to ensure models fit with the tenets of the principles of adult learning. Finally, it would be beneficial to replicate this study to explore student perceptions of the effectiveness of learning in a virtual world environment, from a cross-disciplinary perspective. This dissertation study focused on instructors' perceptions of the strengths and limitations for teaching adult learners in virtual worlds. As more research is undertaken that investigates these innovative virtual learning environments, an investigative research study that explores these learning spaces from the adult learner perspective is recommended as an area of future study.

Chapter Summary

This chapter presented a discussion of the key findings that address the four research questions guiding this dissertation research study, and presented implications and recommendations for future research. The findings reveal how instructors use and implement this technology to design effective learning experiences and the strengths and limitations virtual worlds present for teaching adult learners. Although many instructors believed their virtual world learning experiences were beneficial to adult learners, the 3D virtual learning environment did present unique challenges within the context of teaching adults. This dissertation study explored these considerations from the instructor's perspective.

Although instructors agreed virtual worlds, as an instructional tool, offer potential educational benefits, implementation presents challenges which include funding, technology support, technology expertise, and faculty and student buy-in, among others. However, the

educational benefits of immersion, social presence, 3D visualization, community, and authenticity in the learning environment compel instructors to apply this 3D virtual learning environment to deliver instruction.

Future research must address the limitations of virtual worlds. Although the dissertation findings point to many educational benefits for adult learners, these virtual spaces present significant considerations, ranging from usability issues, difficulty in navigation and using the 3D interface, technical issues, and implementation issues (Boulos et al., 2007; Gronstedt, 2007; Johnson, 2007). In addition there are issues concerning institutional management, teaching functionality, evaluation and assessment, seamless integration into the existing online learning environment at one's institution, disciplinary issues in the learning environment, and issues with avatar representation, including trust, identity, privacy, and social expectations for avatar behavior in the virtual world.

REFERENCES

Alvarado, R. C. (2008). Overcoming the fear of gaming: A strategy for incorporating games into teaching and learning. *Educause,* 31(3), 4-5.

Alexander, B. (2006). Web 2.0: A new wave of innovation for teaching and learning. *E-Learning*, 41(2), 32.

Ankoleka, A., Krotzsch, M., Tran, T., & Vrandecie, D. (2008). The two cultures: Mashing up Web 2.0 and the semantic web. *Journal of Web Semantics*, 6(1), 70-75.

Annetta, L. A., & Holmes, C. A. (2006). Creating presence and community in a synchronous virtual learning environment using avatars. *International Journal of Instructional Technology and Distance Learning, 3*(8) Retrieved April 20, 2008, from http://www.itdl.org/Journal/Aug_06/index.htm

Annetta, L., & Park, J. C. (2006). Game on: Graduate science education students creating role playing video games in a 3-D virtual environment through synchronous online instruction. *2006 Annual Conference of the Association for Science Teacher Education,* Portland, OR. 1-24.

Appelman, R. (2004). Designing experiential modes: A key focus for immersive learning environments. *Techtrends, 49*(3), 64-75.

Baker, S. C., Wentz, R. K., & Woods, M. M. (2009). Using virtual worlds in education: Second Life as an educational tool. Teaching of Psychology, 36, 59-64.

Bainbridge, W. S. (2007). The scientific research potential of virtual worlds. *Science, 317*(5837), 472-486.

Bartle, R. (2007). Presence and flow: Ill-fitting clothes for virtual worlds/ Technè 10 (3),

Retrieved August 15, 2008, from http://scholar.lib.vt.edu/ejournals/SPT/v10n3/pdf/v10n3.pdf#page=42.

Baumgartner, L., Lee, M., Birden, S., & Flowers, D. (2003). Adult Learning Theory: A primer. Information Series No. 32, Center on Education and Training for Employment, College of Education, The Ohio State University. Retrieved October 1, 2008, from http://eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/1b/8b/4b.pdf

Bell, L., Peters, T., & Pope, K. (2007). Get a (second) life: Prospecting for gold in a 3-D world. *Computers in Libraries, 27*(1), 10-15.

Bersin, J. (2004). *The blended learning book: best practices, proven methodologies, and lessons learned*. San Francisco: Pfeiffer.

Billhardt, B. (2004). The promise of online simulations. *Chief Learning Officer, February, 2004*, 38-49.

Blashki, K., Nichol, S., Jia, D., & Prompramote, S. (2007). 'The future is old': Immersive learning with generation Y engineering students. *European Journal of Engineering Education, 32*(4), 409-420.

Bogdan, R., & Biklen, S. K. (2003). *Qualitative research for education: An introduction to theory and methods* (4th ed.). Boston: Allyn and Bacon.

Book, B. (2004). *Moving beyond the game: Social virtual worlds.* Retrieved December 12, 2007, from http://www.virtualworldsreview.com/papers/BBook_SoP2.pdf

Boud, D. (2001). Using journal writing to enhance reflective practice. *New Directions for Continuing Education, 90*, 9-17.

Boulos, M. N., Hetherington, L., & Wheelert, S. (2007). Second life: An overview of the potential of 3-D virtual worlds in medical and health education. *Health Information and Libraries Journal, 24*(4), 233-245.

Boyd, D. M., & Ellison, N. B. (2007). Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication, 13*(1) Retrieved October 1, 2008, from jcmc.indiana.edu/vol13/issue1/boyd.ellison.html

Brookfield, S. (1995). Becoming a Critically Reflective Teacher. Jossey-Bass: CA.

Brookfield, S. *Adult learning: An overview.* Retrieved November 30th, 2007, from http://www.fsu.edu/~elps/ae/download/ade5385/Brookfield.pdf

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 32-42.

Brown, K. (2004). Technology: Building interaction. *TechTrends: Linking Research & Practice to Improve Learning, 48*(5), 36-38.

Bruckman, A. Gender swapping on the Internet. *The Internet Society Proceedings of INET '93,* Reston, VA.

Bugeja, M. (2007). Second thoughts about second life. *The Chronicle of Higher Education, 54*(3) Retrieved October 25, 2008, from http://chronicle.com.www.lib.ncsu.edu:2048/weekly/v54/i03/03c00101.htm

Calongne, C. M. (2008). Educational frontiers: Learning in a virtual world. *Educause Review, September/October 2008*, 36-48.

Carr, V. H. Jr. (2007). *Technology adoption and diffusion.* November 15, 2007, from tlc.nlm.nih.gov/resources/publications/sourcebook/adoptionanddiffusion.html

Carter, B., & Click, A. (2006). Imagine the real in the virtual: Experience your second life. Paper presented at the *22nd Annual Conference on Distance Teaching and Learning,* Wisconsin, Madison. Retrieved February 10, 2008, from http://www.uwex.edu/disted/conference

Castronova, E. (2003). *The price of 'man' and 'woman': A hedonic pricing model of avatar attributes in a synthethic world* (No. 957). Bloomington: Indiana University - Department of Telecommunications.

Castronova, E. (2005). *Synthetic worlds: The business and culture of online games*. Chicago: University of Chicago Press.

Chapman, D. (2008). Virtual worlds: New directions for HRD research and practice. Paper presented at the *Academy of Human Resource Development,* Panama City, Florida.

Cheal, C. (2007). Second life: Hype or hyperlearning? *On the Horizon, 15*(4), 204-210.

Childress, M., & Braswell, R. (2006). Using massively multiplayer online Role - Playing games for online learning. *Distance Education, 27*(2), 187-196.

Chittaro, L., & Ranon, R. (2007). Web3D technologies in learning, education and training: Motivations, issues, opportunities. *Computers & Education, 49*(1), 3-18. Retrieved April 20, 2008, from http://hcilab.uniud.it/publications/2007-03/LearningEducationTraining_ComputersEducation07.

Collins, C. (2008). Looking to the future: Higher education in the metaverse. *Educause Review, September/October 2008*, 51-62.

Conklin, M. (2007). *101 uses for second life in the college classroom* Retrieved April 30, 2008, from http://trumpy.cs.elon.edu/metaverse

Coutts, N., & McArdle, K. (2003). A strong core of qualities—a model of the professional educator that moves beyond reflection. *Studies in Continuing Education, 25*, 225-237.

Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks, Calif.: Sage Publications.

Cross, J., O'Driscoll, T., & Trondsen, E. (2007). Another life: Virtual worlds as tools for learning. *ELearn Magazine, 2007*(3), Retrieved June 1, 2007, from http://elearnmag.org/

Darbyshire, P. (1993). In defense of pedagogy: A critique of the notion of andragogy. *Nurse Education Today, 13*(5), 328-335.

Dede, C. (1995). The evolution of constructivist learning environments: Immersion in distributed, virtual worlds. *Educational Technology, 35*(5), 46-52.

Dede, C. (2004). Enabling distributed-learning communities via emerging technologies. *Proceedings of the 2004 Conference of the Society for Information Technology in Teacher Education (SITE),* Charlottesville, VA. 3-12.

Dede, C. (2005). Planning for neomillennial learning styles. *EDUCAUSE Quarterly, November 1*, 7-12.

Delwiche, A. (2006). Massively multiplayer online games (MMOs) in the new media classroom. *Technology and Society, 9*(3), 160-172.

Dickey, M. D. (1999). 3D virtual worlds and learning: An analysis of the impact of design affordances and limitations in active worlds, blaxxun interactive, and onlive! traveler; and a study of the implementation of active worlds for formal and informal education. (Doctoral Dissertation, The Ohio State University, 1999).

Dickey, M. (2003). Teaching in 3D: Pedagogical affordances and constraints of 3D virtual worlds for synchronous distance learning. *Distance Education,* 24(1), 105-121.

Dickey, M. D. (2005). Brave new (interactive) worlds: A review of the design affordances and constraints of two 3D virtual worlds as interactive learning environments. *Interactive Learning Environments, 13*(1), 121-137.

Dickey, M. D. (2005a). Three-dimensional virtual worlds and distance learning: Two case studies of active worlds as a medium for distance education. *British Educational Communications and Technology Agency, 36*(3), 439-451.

Dodds, T. Information technology: A contributor to innovation in higher education. *New Directions for Higher Education, 137*(Spring 2007), 85-95.

Dourish, P. (1998). Introduction: The State of Play. *Computer Supported Cooperative Work: The Journal of Collaborative Computing* 7: 1–7,

Downes, S. (2007). Learning networks in practice. Retrieved March 22, 2007. *Emerging Technologies for Learning, Retrieved November 2, 2008, from* http://partners.becta.org.uk/page_documents/research/emerging_technologies07_chapter2.pdf.

Drapeau, M. (2002). Subjectivity in research: Why not? *The Qualitative Report*, 7 (3), available online from: www.nova.edu/sss/QR/QR7-3/drapeau.html

Driver, R., Asoko, H., Leach, J., Mortimer, E., & Scott, P. (1994). Constructing scientific knowledge in the classroom. *Educational Researcher, 23*(7), 5.

Feinstein, A. H., Mann, S., & Corsun, D. L. (2002). Charting the experiential territory: Clarifying definitions and uses of computer simulation, games, and role-play. *Journal of Management Development, 21*(10), 732-744.

Fenwick, T. J. (2000). Expanding conceptions of experiential learning: A review of the five contemporary perspectives on cognition. *Adult Education Quarterly, 50*(4), 243-272.

Fenwick, T. J. (2000). Experiential Learning: A Theoretical Critique from Five Perspectives. Columbus, OH: Center on Education and Training for Employment. (ERIC Document Reproduction Service No. ED454418)

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry, 12*(2), 219-245.

Foreman, J. (2003). Next-generation educational technology versus the lecture. *EDUCAUSE Review,* July/August 2003, 12-22.

Foreman, J. (2004). Game-based learning: How to delight and instruct in the 21st century. *EDUCAUSE Review, 39* (September/October 2004), 51-66.

Foster, A. L. (2005). The avatars of research: Students and professors join popular virtual worlds like second life to study the real-world interactions they represent. Retrieved August 2, 2008, from http://chronicle.com/weekly/v52/i06/06a03501.htm

Foster, A. L. (2007). The death of a virtual campus. *Chronicle of Higher Education, 53*(45), A22-25.

Foster, A. L. (2007). 'Immersive education' submerges students in online worlds made for learning. *Chronicle of Higher Education, 54*(17), A22-A22.

Foster, A. L. (2007a). Professor avatar. *Chronicle of Higher Education, 54*(4), A24-A26.

Foster, A. L. (2007). Second life: Second thoughts and doubts. *Chronicle of Higher Education, 54*(4), A25-A25.

Gartner, I. (2007). *Gartner says 80 percent of active Internet users will have a "second life" in the virtual world by the end of 2011.* Retrieved May 1, 2008, from gartner.com/it/page.jsp?id=503861

Gee, J. P. (2003). What video games have to teach us about learning and literacy. *ACM Computers in Entertainment, 1*(1), 1-4.

Gredler, M. E. (2004). Games and simulations and their relationships to learning. In D. Jonassen (Ed.), *Handbook of research on educational communications and technology* (pp. 813-828). Mahwah: NJ: Erlbaum.

Green, M. & Sulbaran, T. (2006). PREVIEW: Of Using Distributed Virtual Reality in Construction Scheduling Education. In T. Reeves & S. Yamashita (Eds.), *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2006* (pp. 51-56). Chesapeake, VA: AACE.

Gronstedt, A. (2007a). Second life produces real training results. *Learning Circuits. Retrieved September 25, 2008, from* http://www.astd.org/LC/2007/0807_gronstedt.htm

Gronstedt, A. (2007). Second life. *T+D, 61*(8), 44-49.

Hanson, A. (1996). The Search for a Separate Theory of Adult Learning: Does Anyone Really Need Andragogy? In R. Edwards, A. Hanson, and P. Raggatt (eds.), *Boundaries of Adult Learning*. (pp. 99-106). New York: Routledge, 1996.

Hartree, A. (1984). Malcolm knowles' theory of andragogy: A critique. *International Journal of Lifelong Education, 3*(3), 203-210.

Hayes, E. R. (2006). Situated learning in virtual worlds: The learning ecology of second life. *Proceedings of the 2006 Adult Education Research Conference, USA. , 47,* 154-159.

Hedley, D. (2007). Selling to the virtual consumer. *Euromonitor Archive*, March 8, 2007. Retrieved November 13, 2007, from http://www.euromonitor.com/Selling_to_the_virtual_consumer

Hendaoui, A., Limayem, M., & Thompson, C. (2008). 3D social virtual worlds: Research issues and challenges. *IEEE Internet Computing, 12*(1), 88-92.

Herrington, J., & Oliver, R. (2005). Critical characteristics of situated learning: Implications for the instructional design of multimedia. Retrieved August 15, 2008, from http://www.konstruktivismus.uni-koeln.de/didaktik/situierteslernen/herrington.pdf.

Herrington, J., Reeves, T. C., & Oliver, R. (2007). Immersive learning technologies: Realism and online authentic learning. *Journal of Computing in Higher Education, 19*(1), 80-99.

Herrington, J., Oliver, R., & Reeves, T. C. (2003). Patterns of engagement in authentic online learning environments. *Australian Journal of Educational Technology, 19*(1), 59-71.

Herrington, J., Reeves, T., Oliver, R., & Woo, Y. (2004). Designing authentic activities in web-based courses. *Journal of Computing and Higher Education, 16*(1), 3-29.

Herrington, J., & Oliver, R. (2000). An instructional design framework for authentic learning environments. *Educational Technology Research and Development, 48*(3), 23-48.

Holmes, G., & Abington-Cooper, M. (2000). Pedagogy vs. andragogy: A false dichotomy? *The Journal of Technology Studies,* 50-55.

Holmes, B., & Gardner, J. (2006). *E-learning: Concepts and practice*. London: Sage.

Howell, S. L., Williams, P. B., & Lindsay, N. K. (2003). Thirty-two trends affecting distance education: An informed foundation for strategic planning. *Online Journal of Distance Learning Administration, 6*(3), Retrieved August 15, 2008, from http://www.westga.edu/~distance/ojdla/fall63/howell63.html

Huang, H. (2002). Toward constructivism for adult learners in online learning environments. *British Journal of Educational Technology, 33*(1), 27-37.

Jarmon, L., Traphagen, T., Mayrath, M., & Trivedi, A. (2009). Virtual world teaching, experiential learning, and assessment: An interdisciplinary communication course in Second Life. *Computers and Education*, 53, 169-182.

Jenkins, H. (2005). Getting Into the Game. Educational Leadership, April 2005, 51-48.

Johnson, C. (2008). Drawing a roadmap: Barriers and challenges to designing the ideal virtual world for higher education. *Educause Review, September/October 2008*.

Johnson, D. (2007). Head for the edge get a MUVE on. *Library Media Connection, 26*(2), 98.

Jonassen, D. (1991). Evaluating constructivist learning. *Educational Technology, 31*(9), 28-33.

Jonassen, D. (2004). *Learning to solve problems: An instructional design guide*. San Francisco: Pfeiffer.

Ju, A. (2007). *Students get a "Second life" in first "metanomics" course.* Retrieved November 1, 2007, from www.news.cornell.edu/stories/Oct07/TL.secondlife.aj.html

Karagiorgi, Y., & Symeou, L. (2005). Translating constructivism into instructional design: Potential and limitations. *Educational Technology & Society, 8*(1), 17-27.

Kelton, A. (2008). Virtual worlds? outlook good. *Educause Review, September/October 2008*, 15-22.

Kelton, A. (2007). *Second life: Reaching into the virtual world for real-world learning.* Retrieved December 1, 2007, from www.educause.edu/ecar

Kent, S. (2003). *Alternate reality.* Retrieved December 7, 2007, from http://archive.gamespy.com/amdmmog/week1/index.shtml

Kharif, O. (2007). The Virtual Meeting Room. *BusinessWeek*, Retrieved October 1, 2008, from http://www.businessweek.com/technology/content/ apr2007/tc20070416_445840.htm

Kiely, R., Sandmann, L. R., & Truluck, J. (2004). Adult learning theory and the pursuit of adult degrees. *New Directions for Adult & Continuing Education, 103*, 17-30.

Kirkley, S. E., & Kirkley, J. R. (2005). Creating next generation blended learning environments using mixed reality, video games and simulations. *TechTrends: Linking Research & Practice to Improve Learning, 49*(3), 42-89.

Kluge, S., & Riley, L. (2008). Teaching in virtual worlds: Opportunities and challenges. *Issues in Informing Science and Information Technology, 5*, 127-135. Retrieved November 5, 2008, from http://proceedings.informingscience.org/InSITE2008/IISITv5p127-135Kluge459.pdf

Knowles, M. S., Holton, E. F., & Swanson, R. A. (1998). *The adult learner: The definitive classic in adult education and human resource development* (5th ed.). Houston, Tex.: Gulf Pub. Co.

Kushner, D. (2004). My avatar, myself. *Technology Review, April 2005*, 50-55.

Lamb, G. M. (2006). Real learning in a virtual world. *Christian Science Monitor,* (October 5, 2006). Retrieved August 15, 2008, from

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press.

Lean, J., Moizer, J., Towler, M., & Abbey, C. (2006). Simulations and games: Use and barriers in higher education. *Active Learning in Higher Education, 7*(3), 227-242.

Leveckis, A., & DiRomualdo, T. (February 2008). Video game nation: The rise of gaming and its impact on learning. *Chief Learning Officer,* Retrieved February 19, 2008, from www.clomedia.com

Lombardi, M., M. (2007). *Authentic learning for the 21st century: An overview* No. ELI Paper 1: Retrieved August 15, 2008, from http://www.edna.edu.au/edna/referral/rss/http://www.educause.edu/ir/library/pdf/ELI3009.pdf

Macpherson, A., Elliot, M., Harris, I., & Homan, G. (2004). E-learning: Reflections and evaluation of corporate programmes. *Human Resource Development International, 7*(3), 295.

Malaby, T. (2006). Parlaying value: Capital in and beyond virtual worlds. *Games and Culture, 1*, 141-162.

Marshall, C., & Rossman, G. B. (2006). *Designing qualitative research* (4th ed.). Thousand Oaks, CA: Sage.

Martens, R., Bastiaens, T., & Kirschner, P. A. (2007). New learning design in distance education: The impact on student perception and motivation. *Distance Education, 28*(1), 81-93.

Maxwell, J. A. (2005). *Qualitative research design: An interactive approach* (2nd ed.). Thousand Oaks, CA: Sage Publications.

McWhorter, R. R., Mancuso, D. S., & Hurt, A. C. (2008). Adult learning in virtual environments. Paper presented at the *Academy of Human Resource Development,* Panama City, FL.

Meall, L. (2007). Brave new world. *Accountancy, 139*(1361), 74-75.

Merrill, M.D. (2002). First Principles of Instruction. *ETR&D*, 50 (3) 43-59.

Merriam, S. B. (2001). Andragogy and self-directed learning: pillars of adult learning theory. *New Directions for Adult and Continuing Education, 89*(Spring 2001), 3-13.

Merriam, S. B. (1998). *Qualitative research and case study applications in education* (2nd rev. and expanded). San Francisco: Jossey-Bass.

Merriam, S. & associates (2002). Qualitative research in practice: Examples for discussion and analysis. San Francisco: Jossey-Bass.

Merriam, S. B. & Caffarella, R. S. (1999). *Learning in Adulthood*. San Francisco: Jossey-Bass.

Merriam, S. B., Caffarella, R. S., & Baumgartner, L. M. (2007). *Learning in adulthood* (3rd ed.). San Francisco: John Wiley & Sons.

Messinger, P. R., Stroulia, E., & Lyons, K. (2008). A typology of virtual worlds: Historical overview and future directions. *Journal of Virtual Worlds Research, 1*(1), 2-18. Retrieved October 10, 2008, from jvwresearch.org

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). Thousand Oaks: Sage Publications.

Miller, N. (2000). Learning from experience in adult education. In A. L. Wilson, & E. Hayes (Eds.), *Handbook of adult and continuing education* (pp. 71-86). San Francisco: Jossey-Bass.

Moilanen, P. (2000). Interpretation, Truth, and Correspondence. *Journal for the Theory Of Social Behavio*r, 30 (4), 378 – 390.

NMC. (2008). *The horizon report. A collaboration between the new media consortium and the EDUCAUSE learning initiative.* Retrieved October 1, 2008, from http://www.nmc.org/pdf/2008-Horizon-Report.pdf

Oblinger, D. (2004). *The next generation of educational engagement*. *Journal of Interactive Media in Education, 8*, 1-18.

Oblinger, D., & Oblinger, J. (Eds.). (2005). *Educating the net generation*. Boulder, CO: EDUCAUSE.

Oliver M. & Carr, D. (2009). Learning in virtual worlds: Using communities of practice to explain how people learn from play. British Journal of Educational Technology, 40(3), 444-457.

Herrington, J., Oliver, R., Herrington, T., Sparrow, H. (2000). Towards a New Tradition of Online Instruction: Using Situated Learning Theory to Design Web-Based Units.

Retrieved September 1, 2008, from http://ascilite.org.au/conferences/coffs00/papers/jan_herrington.pdf

Peshkin, A. (1993). The goodness of qualitative research. *Educational Researcher, 22*(2), 23-29.

Pimentel, J. R. (1999). Design of net-learning systems based on experiential learning. *JALN, 3*(2), 64-90.

Prensky, M (2009). H. Sapiens Digital: From digital immigrants and digital natives to digital wisdom. *Innovate.* Retrieved May 1, 2009 from http://www.innovateonline.info/index.php?view=article&id=705&action=synopsis

Richardson, J., & Swan, K. (2003). Examining social presence in online courses in relation to students' perceived learning and satisfaction. *Journal of Asynchronous Learning Networks, 7*(1), 68-88.

Robson, C. (2002). *Real world research: A resource for social scientists and practitioner-researchers* (2nd ed.). Oxford, UK; Madden, Mass.: Blackwell Publishers.

Rogers, A. (2002). *Teaching adults* (3rd ed.). Buckingham: Open University Press.

Rogers, J. (2001). *Adults learning* (4th ed.). Buckingham: Open University Press.

Rosenberg, M. J. (2006). *Beyond E-learning: Approaches and technologies to enhance organizational knowledge, learning and performance*. San Francisco: Pfeiffer.

Sandlin, J. A. (2005). Andragogy and its discontents: An analysis of andragogy from three critical perspectives. *PAACE Journal of Lifelong Learning, 14*, 25-42.

Savery, J., & Duffy, T. M. (1996). Problem-based learning: An instructional model and its constructivist framework. In B. G. Wilson (Ed.), *Constructivist learning environments:*

Case studies in instructional design (pp. 135-148). Englewood Cliffs: NJ: Educational Technology Publications.

Schon, D. A. (1983). *The reflective practitioner: How professionals think in action.* United States of America: Basic Books.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, *22*, 63-75.

Shroeder, R. (2008). Defining virtual worlds and virtual environments. *Journal of Virtual Worlds Research, 1*(1), 2-3. Retrieved November 1, 2008, from jvwresearch.org

Skiba, D. J. (2007). Nursing education 2.0: Second life. *Nursing Education Perspectives, 28*(3), 156-157.

St. Clair, R. (2002). Andragogy revisited: Theory for the 21st century? Myths and realities. *Retrieved October 1, 2008, from* http://eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/1a/64/70.pdf

Stake, R. E. (1995). *The art of case study research*. Thousand Oaks: Sage Publications.

Steinkuehler, C. A. (2004). Learning in massively multiplayer online games. Paper presented at the *Proceedings of the Sixth International Conference of the Learning Sciences,* 521-528.

Steinkuehler, C. A. (2006). Massively multiplayer online video gaming as participation in a discourse. *Mind, Culture, and Activity, 13*(1), 38-52.

Steinkuehler, C. (2006). *Virtual worlds, learning & the new pop cosmopolitanism.* Retrieved November 18, 2007, from www.tcrecord.org

Swan, K., & Shea, P. (2005). The development of virtual learning communities, chapter 11. In S. R. Hiltz, & R. Goldman (Eds.), *Learning together online: Research on asynchronous learning networks* (pp. 239-260). Mahwah, New Jersey: Lawrence Erlbaum Associates.

Taylor, K. C., & Chyung, S. Y. (2008). Would you adopt second life as a training and development tool? *Performance Improvement, 47*(8), 17-25.

Tellis, W. (1997, July). Introduction to case study. *The Qualitative Report*, *3*(2). Retrieved October 10, 2008, from http://www.nova.edu/ssss/QR/QR3-2/tellis1.html

Tennant, M., & Pogson, P. (1995). *Learning and change in the adult years*. San Francisco: Jossey-Bass.

Van Eck, R. (2006). Digital game-based learning: It's not just the digital natives who are restless. *EDUCAUSE Review, 41*(2), 1-16.

Watson, A. J., Grant, R. W., Bello, H., & Hoch, D. B. (July 2008). Brave new worlds: How virtual environments can augment traditional care in the management of diabetes. *Journal of Diabetes Science and Technology, 2*(4), 697-702.

Williams, M. (2007). Avatar watching: Participant observation in graphical online environments. *Qualitative Research, 7*(2), 5-24.

Willyerd, K. (2008). *Learn to be open.* Unpublished manuscript. HRD Conference 2008.

Wilson. (1993). The promise of situated cognition. In An Update on Adult Learning Theory [Special Issue]. *New Directions for Adult and Continuing Education*. Merriam, S. (ed.) Spring 1993, no. 57.

Wlodkowski, R. J. (1999). *Enhancing adult motivation to learn: A comprehensive guide for teaching all adults*. San Francisco: Jossey-Bass.

Woo, Y., Herrington, J., Agostinho, S., & Reeves, T. C. (2007). Implementing authentic tasks in web-based learning environments. *EDUCAUSE Quarterly, 30*(3), 36-43.

Yee, N. (2006). The Psychology of Massively Multi-User Online Role-Playing Game. In R. Schroeder and A.S. Axelsson (Eds.), Avatars at Work and Play (pp. 187–207). Netherlands: Springer.

Yin, R. (2003). *Case study research: Design and methods*. Thousand Oaks: Sage.

APPENDICES

APPENDIX A: INTERVIEW GUIDE (INSTRUCTOR)

Background questions

Discipline

- Describe your discipline area.

Course

- Describe your course.

Virtual world

- What virtual world(s) do you use?
- How long you have you used virtual worlds in your teaching?
- Are you using a virtual world this semester in your course and if so, what virtual world are you currently using?
- Is the virtual world used as a supplement to instruction or is your entire class delivered in the virtual world?

Prior online teaching experience

- Have you taught online before, and if so, what platform did you use?

Adult Learners (Students)

- Describe your students.
- How many students are enrolled in your course?
- What percentage of students completes your course?

Part A:

1. What is the appeal of these environments for faculty in your discipline area?
2. How do you use virtual worlds in your teaching?
3. What type of educational experience did you implement, in the virtual world?
4. Tell me how your virtual world course/project was developed.
5. How did you deliver instruction in the virtual world?
6. Describe your students' reactions to this learning environment.
7. What did your students do in the virtual world?
8. What was your role, as instructor, in the virtual world?
9. What did you hope your students would learn from this experience?
10. Why did you decide to deliver the educational experience in the virtual world, rather than F2F, or in another online learning environment?

Part B:

1. What do you believe is the appeal of these environments for adult learners?
2. What are the benefits of using virtual worlds to teach adult learners?
3. How did students benefit from the educational experience?
4. What challenges did you encounter delivering this educational experience to adult learners?
5. How did you address those challenges?
6. Would you use a virtual world as the primary way of delivering instruction in your discipline?

7. Do you believe there is potential for virtual worlds as primary learning spaces for teaching adults?

Part C:

1. Compare and contrast you teaching experience in several asynchronous environments.
2. How prepared were you, to use this technology in your teaching?
3. How has teaching in a virtual world influenced you, as an instructor?
4. What did you learn about your students from this teaching experience?
5. Have your teaching and philosophical assumptions about teaching adult learners changed as a result of using virtual worlds?
6. Are you planning to continue using virtual worlds in your discipline area?
7. Do you plan to continue using virtual worlds in your teaching?
8. Have any of your teaching practices changed as a result of using a virtual world for instruction?
9. Has your teaching philosophy changed as a result of using this technology?
10. How prepared do you feel your institution, college, and/or department are for using these types of learning environments?

Part D:

1. What appears to be distinctive about using 3D virtual worlds for your discipline that other online learning environments do not offer?
2. How do you evaluate student learning in a virtual world?

3. What are you able to do in the virtual world to capture student learning that you cannot do in another synchronous online environment, or f2f?

4. How do you assess your own teaching, in a virtual world?

5. How successful do you feel the application of this technology has been in your course/project?

APPENDIX B: INTERVIEW GUIDE (TECHNOLOGY SUPPORT)

1. Describe the virtual world course/project you implemented.
2. Describe your role implementing the virtual world course/project.
3. Describe the educational experience this technology made possible.
4. Tell me about the development process – were there other support staff associated with the development process and how much time was devoted to building this course/project?
5. What were the major issues you encountered in implementing this project?
6. What Usability issues (navigation, accessibility etc.) were encountered?
    a. Follow up: What methods to address usability issues were implemented?
7. What technical issues did you encounter?
    a. Follow up: What technical issues did students, and instructor encounter?
8. What are the sustainability issues with this type of technology?
9. Were there any integration issues encountered with other distance delivery formats?
10. Tell me about the digital artifacts designed for this course.
11. What instructional tools were made available in this learning space?
12. What do you believe are the major challenges to implementing virtual worlds?
13. What strategies have you implemented to successfully deal with those challenges?

APPENDIX C: DOCUMENT SUMMARY SHEET

Name or description of document:

Event or contact, if any, with which document is associated:

Significance or importance of document:

Brief Summary of contents:

Site:
Document:
Date received or picked up:

Today's date:

APPENDIX D: CONTACT SUMMARY SHEET

Contact Type:
Visit:
Phone:
Site:
Contact date:
Today's date:
Written by:

What were the main issues or themes that struck you in this contact?

Summarize the information that you got (or failed to get) on each of the target questions you had for this contact.

Anything else that struck you as salient, interesting, illuminating or important in this contact?

What new (or remaining) target questions do you have in considering the next contact with this site?

APPENDIX E: IRB APPLICATION

North Carolina State University
Institutional Review Board for the Use of Human Subjects in Research
REQUEST FOR EXEMPTION (Administrative Review)

GENERAL INFORMATION

1. **Date Submitted** [redacted]
Title of Project: Faculty Perceptions of Three-Dimensional (3D) Virtual Worlds: Instructional Use, Implementation and Benefits for Adult Learners
2. **Principal Investigator** [redacted]
3. **Department:** *Adult and Higher Education*
4. **Campus Box Number:** *7801*
5. **Email:** [redacted]
6. **Phone Number:** [redacted]
7. **Fax Number:** [redacted]
8. **Faculty Sponsor Name and Email Address if Student Submission:** [redacted]
9. **Source of Funding? (required information):** *none*
10. **Is this research receiving federal funding?:** *no*
11. **If Externally funded, include sponsor name and university account number:** *N/A*
12. **RANK:** ☐ Faculty ☒ Student: ☐Undergraduate; ☐ Masters; or ☐PhD ☒ Other (specify): *Ed.D student*

As the principal investigator, my signature testifies that I have read and understood the University Policy and Procedures for the Use of Human Subjects in Research. I assure the Committee that all procedures performed under this project will be conducted exactly as outlined in the Proposal Narrative and that any modification to this protocol will be submitted to the Committee in the form of an amendment for its approval prior to implementation.

Principal Investigator:

[redacted] [redacted]
(typed/printed name) (signature)

As the faculty sponsor, my signature testifies that I have reviewed this application thoroughly and will oversee the research in its entirety. I hereby acknowledge my role as the ***principal investigator of record****.*

Faculty Sponsor:

[redacted] _____

(typed/printed name) (signature)

***Electronic submissions to the IRB are considered signed via an electronic signature**

PLEASE COMPLETE AND DELIVER TO:

joe_rabiega@ncsu.edu or Institutional Review Board, Box 7514, NCSU Campus (Administrative Services III, Room 245)

For SPARCS office use only

Regulatory Compliance Office Disposition

☐ Exemption Granted ☐ Not Exempt, Submit a full protocol

Exempt Under: ☐ b.1 ☐ b.2 ☐ b.3 ☐ b.4 ☐ b.6

_____ _____

IRB Office Representative Date

Project Description: *(Describe your project by providing a brief summary and answering the requests for information below).*

1. Project Summary. Please make sure to include the purpose and rationale for your study as well as all study activities:

   The purpose of this study is to explore the innovative uses and implementation of three dimensional virtual worlds for instruction. *This research proposal is for a qualitative case study dissertation research project, to begin* [redacted]*. The purpose of this dissertation study is to select five - six faculty members for interview at area* [redacted] *institutions and* [redacted] *institutions that are using three dimensional (3D) virtual worlds for instruction, to document the instructional use and implementation of the virtual world course/project, and the strengths, limitations, and potential educational benefits for adult learners.*

   A virtual world is a multimedia, three dimensional virtual environment, delivered over the Internet, where multiple users can interact (in the form of avatars, a virtual

representation of themselves) in real-time, talking (via online chat or audio, or instant messaging), performing simulated tasks and problem solving activities, in a context that appears virtually real. There are many popular virtual worlds in use, but two are widespread in higher education (Second Life and Active Worlds). For example, in Second Life, avatars can log into NC State's virtual campus, tour the campus, and attend classes and seminars, as if they were interacting in the physical world. Two popular virtual worlds used in higher education are Second Life: www.secondlife.com and Active Worlds, www.activeworlds.com.

2. Description of participant population, including age range, inclusion/exclusion criteria, and any vulnerable populations that will be targeted for enrollment.

   Participant population will be from institutions of higher education in [redacted]. No vulnerable populations will be used.

   Criteria that will guide case selection

   a. *A variety of academic disciplines are represented.*
   b. *Faculty member has implemented or is currently implementing an educational experience within a 3D virtual world.*
   c. *Virtual world course/project is targeted to an adult learner student population.*
   d. *The faculty member is willing to spend up to two hours in face-to-face interview time.*
   e. *The faculty member is willing to allow a virtual observation of course/project in the virtual world.*
   f. *The faculty member is willing to grant researcher access to the virtual world site and will allow examination of digital artifacts created in the virtual world.*
   g. *The faculty member teaches in Second Life and/or Active Worlds (two widely accessible and a popular virtual worlds in education); although teaching in other virtual worlds will be considered, as this will enrich the study.*

3. Description of how potential participants will be approached about the research, and how informed consent will be obtained. Alternatively, provide an explanation of why informed consent will not be obtained.

   While there will be a set of selection criteria, provided above (purposeful sampling), to identify participants, I will depend on convenience, accessibility of the participants-[redacted], and availability. The convenience sample will focus on participants who use a virtual world in their teaching. Participants will be contacted

via email (text of email attached), and once they have indicated a willingness to participate, I will send a second email to confirm their participation, along with the emailed consent form (attached). Once the informed consent has been received (with signature to indicate consent), a face-to-face interview will be conducted.

4. Description of how identifying information will be recorded and associated with data (e.g. code numbers used that are linked via a master list to subjects' names). Alternatively, provide details on how study data will be collected and stored anonymously ("anonymously" means that there is no link whatsoever between participant identities and data).

   Handwritten notes will be taken during the face-to-face interviews, and these notes will be stored in my home office. The face-to-face interviews will also be audio recorded, with permission, and securely stored in my home office. Data will be kept strictly confidential. Case study code numbers in the form of 00X will be used to link to participant names, which will be kept in a separate master list. Audio tapes will be destroyed after seven years.

5. Description of all study procedures, including topics that will be discussed in interviews and/or survey instruments.

   Participants will be interviewed face-to-face for up to two hours (interview questions attached). Participants who use the virtual world Second Life or Active Worlds will be asked to give me a tour, and to agree to allow an observation session during their course/project, if they are currently using the virtual world in their teaching. I will observe them(and/or their class) in the virtual space, to get a more indepth look at their course/project. The virtual observations will take anywhere from one to two hours.These virtual observations will include all individuals associated with the virtual world implementation. Study participants in addition to the faculty member, may include virtual world "builders", instructional designers, and technology support staff. During observation of the faculty members' virtual space, with their prior permission, I will take screen shots of their virtual space, and use text/audio chat to communicate in the virtual world with participants. If the virtual world has recording capabilities I will use those recording capabilities, with permission, to download the conversations (either text chat or audio), for further reference. With the particpants' permission, I will download course digital artifacts, such as online notecards (textual information about the virtual objects), online inventory (files and images contained in an avatar's .folder), and print screen captures of chat logs. Any digital items the faculty member has used in his/her course will be requested as digital artifacts and as part of the data collection procedures for the study.

6. Will minors (participants under the age of 18) be recruited for this study:
   No

7. Is this study funded? *no* If yes, please provide the grant proposal or any other

   supporting documents.

8. Is this study receiving federal funding? *no*

9. Do you have a significant financial interest or other conflict of interest in the sponsor of this project? *none*

10. Does your current conflicts of interest management plan include this relationship and is it being properly followed? *N/A*

11. HUMAN SUBJECT ETHICS TRAINING
    *Please consider taking the Collaborative Institutional Training Initiative (CITI), a free, comprehensive ethics training program for researchers conducting research with human subjects. Just click on the underlined link.

12. ADDITIONAL INFORMATION:

    a) If a questionnaire, survey or interview instrument is to be used, attach a copy to this proposal.
    **Attached interview questions (for both faculty member and support staff)

    b) Attach a copy of the informed consent form to this proposal.
    **Attached informed consent form (for both faculty member and support staff)

    c) Please provide any additional materials (i.e., recruitment materials) that may aid the IRB in making its decision.

    **Attached: email text to potential participants (faculty member and support personnel use same email text for recruitment purposes

**If a survey instrument or other documents such as a consent form that will be used in the study are available, attach them to this request. If informed consent is not necessary, an information or fact sheet should be considered in order to provide subjects with information about the study. The informed consent form template on the IRB website could be modified into an information or fact sheet.*

The Following are categories the IRB office uses to determine if your project qualifies for exemption *(a review of the categories below may provide guidance about what sort of information is necessary for the IRB office to verify that your research is exempt)*:

Exemption Category: *(Choose only one of the following that specifically matches the characteristics of your study that make this project exempt)*

☒ 1. Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

☐ 2. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.

Please Note- this exemption for research involving survey or interview procedures or observations of public behavior does not apply to research conducted with minors, except for research that involves observation of public behavior when the investigator(s) do not participate in the activities being observed.

☐ 3. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

☐ 4. Research, involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly

available, or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

5. Not applicable

☐ 6. Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration, or approved by the Environmental Protection Agency, or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

Sophia J. Stone

Adult and Higher Education

Training & Development

Box 7801

Raleigh, NC 27695

I am writing to request your participation in a dissertation case study exploring three-dimensional (3D) virtual worlds, an innovative technology and its application for teaching adult learners. The purpose of this dissertation study is to explore the educational application of 3D virtual worlds in a variety of academic discipline areas and to critically assess the strengths and limitations this virtual learning environment presents for teaching adult learners. By interviewing instructors such as you, who are teaching in virtual worlds, I hope to learn more about the barriers and challenges these environments present for teaching adult learners.

This dissertation study will reflect a variety of academic disciplines, and examine the types of learning and educational experiences instructors deliver in virtual worlds for adult learners. This dissertation is chaired by Dr. Brad Mehlenbacher and Dr. Diane Chapman, Department of Adult and Higher Education at NC State. My full committee includes Dr. Len Annetta, Department of Math, Science and Technology Education, and Dr. Colleen Wiessner, Department of Adult and Higher Education, both at NC State.

If you agree to participate, you will be asked to contribute two hours of your time for a face-to-face interview and you will be asked to give me a tour of your virtual space,

for a more indepth look at your instructional use of virtual worlds. All procedures for the interview and observation are detailed in the attached informed consent form.

To participate in the study, please sign the informed consent form and fax or email a PDF to [redacted]. If you have further questions, please contact me or either of my dissertation co-chairs.

Thank you in advance for your time and consideration, and I look forward to hearing from you.

[redacted]

Appendix F: INFORMED CONSENT (FACULTY)

North Carolina State University
INFORMED CONSENT FORM for RESEARCH

Title of Study *Faculty Perceptions of Three Dimensional Virtual Worlds: Instructional Use, Implementation and Benefits for Adult Learners*

Principal Investigator [redacted]
Faculty Sponsor (if applicable) [redacted]

What are some general things you should know about research studies?
You are being asked to take part in a research study. Your participation in this study is voluntary. You have the right to be a part of this study, to choose not to participate or to stop participating at any time. The purpose of research studies is to gain a better understanding of a certain topic or issue. You are not guaranteed any personal benefits from being in a study. Research studies also may pose risks to those that participate. In this consent form you will find specific details about the research in which you are being asked to participate. If you do not understand something in this form it is your right to ask the researcher for clarification or more information. A copy of this consent form will be provided to you. If at any time you have questions about your participation, do not hesitate to contact the researcher(s) named above.

What is the purpose of this study?
The purpose of this study is to explore the innovative uses and implementation of three-dimensional virtual worlds for instruction, and the strengths and limitations this virtual learning environment presents for teaching adult learners. This research proposal is for a qualitative case study dissertation research project, to being [redacted]. The purpose of this dissertation study is to select five - six faculty members for interview [redacted] that are using three dimensional (3D) virtual worlds for instruction, to document the instructional use and implementation of the virtual world course/project, and the strengths, limitations, and potential educational benefits for adult learners.

What will happen if you take part in the study?
If you agree to participate in this study, you will be asked to participate in up to a 2-hour face-to-face interview, and if you have a virtual space, you will be asked to give me a tour of your course/project, and allow me to take screenshots of your space. For the face-to-face interview, I will take hand written notes, as well as audiotape the interview, with your permission. For the virtual world observation, you will describe your project/course, illustrating how instruction was delivered in the virtual word, and with your permission, allow me to audio record the virtual world session. The interview will take no more than 2 hours and the virtual world observation approximately one hour.

Risks
There are no risks associated with this study.

Benefits
This research will contribute to the literature in adult education and training and development, and help to advance further research on the potential benefits of 3D virtual worlds as a virtual space for teaching and learning. Faculty who are responsible for administering and developing virtual world courses and projects will benefit from the research. In addition, instructional designers, and instructional technologists, and other educators who seek to use 3D virtual worlds for teaching and learning will benefit from the study findings. Students and faculty seeking to learn more about the challenges of teaching adult learners in 3D virtual worlds, and the strategies that can be effective in addressing these challenges, will benefit from this research.

Confidentiality
Data will be stored at the researcher's home computer. No reference will be made in oral or written reports, which could link you to the study. Audiotapes will be destroyed after 7 years.

Compensation
You will not receive anything for participating.

What if you have questions about this study?
If you have questions at any time about the study or the procedures, you may contact the researcher, [redacted].

What if you have questions about your rights as a research participant?
If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Deb Paxton, Regulatory Compliance Administrator, Box 7514, NCSU Campus (919/515-4514), or Joe Rabiega, IRB Coordinator, Box 7514, NCSU Campus (919/515-7515).

Consent To Participate
"I have read and understand the above information. I have received a copy of this form. I agree to participate in this study with the understanding that I may withdraw at any time."

Subject's signature_____ Date _____
Investigator's signature_____ Date _____

Appendix G: INFORMED CONSENT FORM (SUPPORT STAFF)

North Carolina State University

INFORMED CONSENT FORM for RESEARCH

Title of Study *Faculty Perceptions of Three Dimensional Virtual Worlds: Instructional Use, Implementation and Benefits for Adult Learners*

Principal Investigator [redacted]
Faculty Sponsor (if applicable) [redacted]

What are some general things you should know about research studies?
You are being asked to take part in a research study. Your participation in this study is voluntary. You have the right to be a part of this study, to choose not to participate or to stop participating at any time. The purpose of research studies is to gain a better understanding of a certain topic or issue. You are not guaranteed any personal benefits from being in a study. Research studies also may pose risks to those that participate. In this consent form you will find specific details about the research in which you are being asked to participate. If you do not understand something in this form it is your right to ask the researcher for clarification or more information. A copy of this consent form will be provided to you. If at any time you have questions about your participation, do not hesitate to contact the researcher(s) named above.

What is the purpose of this study?
The purpose of this study is to explore the innovative uses and implementation of three dimensional virtual worlds for instruction in education. This research proposal is for a qualitative case study dissertation research project, to being [redacted]. The purpose of this dissertation study is to select five - six faculty members for interview [redacted] who are using three dimensional (3D) virtual worlds for instruction, to document the instructional use and implementation of the virtual world course/project, and the strengths, limitations, and potential educational benefits for adult learners.

What will happen if you take part in the study?
If you agree to participate in this study, you will be asked to participate in a one hour face to face interview or an interview in the virtual world to describe the technology issues involved in designing and implementing a virtual world project. For the face to face interview, I will take hand written notes, as well as audio tape the interview, with your permission. If the interview occurs in a virtual world, with your permission I will record the interview.

Risks
There are no risks associated with this study.

Benefits
This research will contribute to the literature in adult education and training and development, and help to advance further research on the potential benefits of 3D virtual worlds as a virtual space for teaching and learning. Faculty who are responsible for administering and developing virtual world courses and projects will benefit from the research. In addition, instructional designers, and instructional technologists, and other educators who seek to use 3D virtual worlds for teaching and learning will benefit from the study findings. Students and faculty seeking to learn more about the challenges of teaching adult learners in 3D virtual worlds, and the strategies that can be effective in addressing these challenges, will benefit from this research.

Confidentiality
Data will be stored at the researcher's home computer. No reference will be made in oral or written reports, which could link you to the study. Audiotapes will be destroyed after 7 years.

Compensation
You will not receive anything for participating.

What if you have questions about this study?
If you have questions at any time about the study or the procedures, you may contact the researcher, [redacted]

What if you have questions about your rights as a research participant?
If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Deb Paxton, Regulatory Compliance Administrator, Box 7514, NCSU Campus (919/515-4514), or Joe Rabiega, IRB Coordinator, Box 7514, NCSU Campus (919/515-7515).

Consent To Participate
"I have read and understand the above information. I have received a copy of this form. I agree to participate in this study with the understanding that I may withdraw at any time."

Subject's signature_____ **Date** _____
Investigator's signature_____**Date**_____

APPENDIX H: START CODES MASTER LIST

Descriptive Label	Codes	Research Question
EDUCATIONAL EXPERIENCE	EDEXP	RQ1
EDEXP-IMMERSIVE	EDEXP-IM	RQ1
EDEXP-AUTHENTIC	EDEXP-AU	RQ1
EDEXP-EXPERIENTIAL LEARNING	EDEXP-EL	RQ1
EDEXP-SITUATED LEARNING	EDEXP-SL	RQ1
EDEXP-CONSTRUCTIVISM	EDEXP-CON	RQ1
EDEXP-PRESENCE	EDEXP-PRES	RQ1
EDEXP-COMMUNITY	EDEXP-COMM	RQ1
EDEXP-VISUALIZATION	EDEXP-VIS	RQ1
FACILITATE ADULT LEARNING	FAL	RQ2
FAL-READINESS	FAL-READ	RQ2
FAL-SELF-DIRECTED	FAL-SELF	RQ2
FAL-PRIOR-EXPERIENCE	FAL-PEXP	RQ2
FAL-RELEVANCE	FAL-REL	RQ2
FAL-CONTEXTUAL	FAL-CONTEXT	RQ2
FAL-MOTIVATION	FAL-MOTIV	RQ2
TAL-TEACHING ADULT LEARNERS	TAL	RQ3
TAL-ADULT LEARNER NEEDS	TAL-ALN	RQ3
TAL-CHALLENGES	TAL-CHAL	RQ3
TAL-ROLE INSTRUCTOR	TAL-ROLE	RQ3
SUCCESSFUL IMMERSIVE EDUCATIONAL EXPERIENCE	SUCVW	RQ4
SUCVW-EVALUATE	SUCVW-EVAL	RQ4

APPENDIX I: Codes

Table 1: Barriers and Limitations using virtual worlds to teach adult learners

DESCRIPTIVE LABEL	CODES	Definition
BARRIERS *	TAL-BAR	
ASSESSMENT	-ASSMT	Assess student learning
ACCOUNTABILITY	-ACCT	Data collection in a virtual world; security and reliability of student data
LEARNING ENVIRONMENT	-LENV	-Harassment; -Cyber shootings -Immoral behavior
CONTENT	-CONT	-Transferability; -Reuse -Ownership; -Content protection; -quality standards
COPYRIGHT AND INTELLECTUAL PROPERTY RIGHTS	-PROP	-institutional terms of service vs. faculty member rights
DISCIPLINARY	-DISC	-inappropriate use; -griefing; -plagarism
FUNDING	-FUND	Development of virtual world project; Sustainability
POLICY	-POL	-Student privacy -intellectual property ownership -student services infrastructure
PRIVACY	-PRIV	-FERPA/-COPA -a multi-age environment presents safety concerns for under 18 years of age students
SKILLS	-COMP	MASTERY/COMPETENCIES -resident; -learner; -educator; -developer/builder
STANDARDS FOR USE	-STAND	-Standard virtual world for instructional purposes not identified at most institutions -Institutional policies and guidelines for use
TEACHING FUNCTIONALITY	-FUNCT	-Grade book; -Document storage; -Security features
TECHNICAL	-TECH	-Processing speed; -Graphics; -Bandwidth; -Server site shutdown, -firewall issues; -
TRAINING	-TRNFAC -TRNSTUD	(faculty and students; development) -learning curve
USABILITY	-USABIL	-navigation;-accessibility; -adaptive technology

Table 2: Educational Benefits with Assigned Codes

Benefits	**Assigned Code**
Immersive learning	IMMERSE
Authentic learning environment	AUTHEN
Presence	PRESENC
Visualization	VISUALIZE
Interaction	INTERACT
Flexible access	FLEX
Synchronous	SYNCH
Formal learning	FORMAL
Informal learning	INFORMAL
Socially situated context	SOCSIT
Net gen learning styles	NETGEN
Distributed knowledge creation	DISTRIB
Assessment of learning in context (projects etc)	ASSMT CONT
Collaborative	COLLAB
Learner centered environments	LRNCTR
User-created learning objects	USERCRT
Problem-centered learning	PBL
Adult learning theories:	
Experiential learning	EXPLRN
Situated learning	SITLRN
Constructivism	CONSTRUCTV
Self-directed learning	SLFDIR
Andragogy	ANDRAG

Table 3: List of Authentic Activities Codes

Descriptive Label **AUTHENTIC – [LABEL]**	**Code** **AU**	**Authenticity Indicator**	**Characteristics/Description**
REAL	AU-RW	Real–world relevance	Authentic activities have real-world relevance
ILLDEFINED	AU-ILLDEF	Ill-defined problems	Authentic activities are Ill-defined, problems are open to multiple interpretations
COMPLEX TASKS	AU-COMP	Sustained, complex tasks	Complex tasks that require sustained investigation over a period of time
PERSPECTIVES	AU-PERSPECT	Multiple perspectives	Authentic activities provide opportunities for students to examine the task from multiple perspectives, using many resources; students must determine relevancy of information
COLLABORATE	AU-COLLAB	Collaboration	Collaboration is an important part of the task
REFLECTION	AU-REFLECT	Reflection	Authentic activities provide opportunities for reflection; they enable learners to make choices and reflect on their learning
INTERDISCIPLINARY	AU-INTERD	Interdisciplinary	Authentic activities have an Interdisciplinary perspective
ASSESSMENT	AU-ASSMT	Assessment	Authentic activities offer integrated assessment
PROD	AU-PROD	Product	Create finished products
INTERPRET	AU-INTER	Interpretation	Allow multiple interpretations/outcomes

APPENDIX J: ABBREVIATIONS

Active Worlds (AW)

Massive multi-user online role-playing games (MMORGPs)

Massively multiplayer online games (MMOGs)

Multi-user virtual environments (MUVEs)

Multi-User Domain (MUD)

Multiuser Object-Oriented environment (MOOs)

Multi-user virtual environments (MUVEs)

Multiplayer online games (MMOs)

Second Life (SL)

Social networking site (SSN)

Social virtual world (SVW)

Three-dimensional (3-D)

Virtual learning environment (VLE)

Virtual World (VW)