2015

Examining the Social Interactions of Young Adults with Autism Spectrum Disorders in a Virtual Environment

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EXAMINING THE SOCIAL INTERACTIONS OF YOUNG ADULTS WITH AUTISM SPECTRUM DISORDERS IN A VIRTUAL ENVIRONMENT

by

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A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in the College of Education and Human Performance
at the University of Central Florida
Orlando, Florida

Summer Term
2015

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ABSTRACT

This phenomenological study examined the social interactions during online game play in a virtual environment for five young adults with an autism spectrum disorder (ASD) who attended a large metropolitan university, enrolled in the first 60 credits of a science, technology, engineering, or mathematics (STEM) field of study. Given the evolution of technology and opportunities to socialize in virtual communities, it is becoming increasingly important to understand how young adults with ASD assimilate into new social opportunities that provide supports for extraneous variables such as face-to-face situations. As research begins to emerge on virtual environments there is little research addressed specific to socialization and the development of interpersonal relationships. Further, there is a distinct lack of research specific to young adults with ASD who engage socially in virtual environments. A phenomenological research method was used to explain the social activities as they occurred for this specific group of individuals. Structured and unstructured interviews, observations, document analysis, and a self-reporting survey were conducted and collected. Analysis used emergent coding following Moustakas' modified Van Kaam method (1994). Common themes were identified and reported through lists and tables. In summary, this study described how young adults with ASD socialized within a virtual community. This study provided findings that individuals with ASD actively seek friendships, recognize emotions, understand roles within the game and real life use skills necessary for success in postsecondary education and STEM related careers, and lays the foundation for continuing research using virtual environments to support interpersonal relationships that may support greater postsecondary outcomes.

ACKNOWLEDGMENTS

Many people have helped me complete this dissertation successfully. I owe my gratitude to all the people who have made this dissertation possible and because of them, my graduate experience has been one that I will treasure forever. Writing a dissertation is, in some ways, comparable to the process of constructing identities. It is not a solitary pursuit, but rather involves many relationships. Therefore, I have many people to thank for their endless support along the way. First, I am incredibly grateful to the participants in the study who so graciously allowed me into their lives. Their willingness to tell stories, patience, and continuous feedback on the data made completing the research for this dissertation a remarkably meaningful experience for me. I have learned a tremendous amount and gained new friends along the way.

My deepest gratitude is to my advisor and committee chair, Dr. Mary Little. I have been fortunate to have Dr. Little as my advisor since my initial attendance at the University of Central Florida for my master's degree in 2009. Dr. Little has been a strong and supportive advisor through my graduate school career. Her patience and support helped me overcome many crisis situations and finish this dissertation. I am also thankful to her care in reading and commenting on countless iterations of this manuscript. I have learned a great deal about what it means to be a scholar.

I am deeply grateful to my other committee members Dr. Cynthia Pearl, Dr. Lisa Dieker, and Dr. Malcolm Butler. I would like to express my gratitude for all the long discussions that guided, clarified, and enriched my thoughts. My committee provided brilliant suggestions throughout the design, data collection process, and completion of this dissertation. They taught me how to question ideas and express thoughts. Their insightful comments and constructive

criticisms at different stages of my research helped me elucidate my research area. I am also thankful to them for their continuous encouragement and guidance.

I am particularly grateful to Dr. Suzanne Martin for her friendship and wise words and continuous support and Dr. David Boote for the initial support and guidance in qualitative research. Dr. Boote always inspired and challenged me to "stretch" my ways of thinking. My thanks to Christine Duff and Jennifer Holbrook, colleagues from my doctoral program who provided me continuous support and selflessly offered to read all of my transcriptions and tirelessly discuss coding with me. Also, thanks to my mother-in-law, Theresa Gallup, for always being there to support me, and tirelessly reading and editing my dissertation. I could not have completed this process without their support.

My husband deserves more gratitude than I can ever express. Adam patiently listened, challenged me to think more deeply, willingly read my work repeatedly, and most importantly, helped me stay on course when I was unsure of my path. He ungrudgingly allowed me time and built an office space dedicated to my commitment to complete this research. He provided gentle reminders of the importance of my many identities throughout this process; most importantly, he devoted his time to our children Tristen, Jadea, and Aden to help them understand the importance of this work. He provided his undivided attention, love, and support for the children during those times when mommy had to write, go to campus, or travel to complete this research. He is an amazing father and husband and without his unrelenting support this process would be nearly impossible.

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CHAPTER ONE

Introduction

Young adults with an autism spectrum disorder (ASD) are chronically underrepresented in postsecondary settings. Under current circumstances, young adults with ASD hold the third lowest matriculation rate to college when compared to other disability categories and typically developing peers (National Center for Education Statistics, 2012). In addition, Shattuck (2013) reported that just over half (53.4%) of the young adults with ASD had worked for pay outside the home within the first eight years after leaving high school. Furthermore, Shattuck noted that only one in five (20.9%) [of] young adults with ASD worked full-time at a current or most-recent job. Ultimately, young adults with ASD held the lowest wage per hour at $8.90 when compared to the average wage of other disability categories at $10.44/hr (NLTS2, 2009; Newman, Wagner, Cameto, & Knockey, 2009; Shattuck, 2013). Several researchers stated the under representation of young adults with ASD transitioning to independent living through employment and postsecondary education has been attributed to their lack of social skills and ability to develop interpersonal relationships (Alpern & Zager, 2007; Baron-Cohen, Wheelwright, Burtenshaw, & Hobson, 2007; Durkin, Boyle, Hunter, & Conti-Ramsden, 2013; Muller, Schuler, Burton, & Yates, 2003; Rao, Beidel, & Murray, 2008; Wei Yu, Shattuck, McCracken, Blackorby, 2013).

Social situations within employment and postsecondary settings are dynamic and multifaceted, and become more complex as individuals enter adolescence and transition to postsecondary situations. Unspoken social "rules" vary within different environments, situations, and cultures, making it increasingly difficult for a person with high functioning autism

(HFA) to understand these social rules (Myles & Simpson, 2001). These challenges remain problematic throughout life and directly affect postsecondary transitions and outcomes, specifically college participation (Schall & McDonough, 2010).

According to Noel-Levitz, (2011), friendship interactions were identified as one of the most salient factors of success in postsecondary education for college-level students. Researchers noted that soft skills are a prominent personal trait required for development of sustained friendships, building the foundation for supports in postsecondary education, specifically within careers in science, technology, engineering, and mathematics (STEM) (Ducheneaut & Moore, 2005; Robles, 2012).

The authors of the Next Generation Science Standards (NGSS) created standards to strive for quality science education that are rich in content and practice, with aligned curricula, pedagogy, assessment, and teacher preparation and development (NGSS, 2015). Most state standards are based off of the National Research Council and the American Association for Advancement in Science. Major advances have been made in understanding how students learn science (NGSS, 2015). Major advancements in understanding student learning have led to the NGSS. The NGSS considered global competition for US students and noted that to be competitive in the 21st century; American students must have the knowledge and skills to succeed in college and in the knowledge-based economy (NGSS, 2015). The National Research Council developed a framework that comprised each standard. The framework includes: (a) scientific and engineering practices, (b) disciplinary core ideas, and (c) crosscutting concepts (ideas that apply across all areas of science). Many of the science standards require students in grades K-12 to work in groups, communicate ideas, and conceptualize solutions to complex

problems by using the scientific method within teams. Individuals on the autism spectrum have persistent challenges with communicating, working in groups, and developing the relationships necessary to work on a team (Parsons, Charman, Faulkner, Ragan, Wallace, & Wittemeyer, 2013). A core part of working on a team is the ability to develop interpersonal relationships and work collaboratively by sustaining a high level of communication which is directly related to success in postsecondary education (Parsons et al., 2013). Additionally, the Common Core State Standards (CCSS) include mathematics and science standards that refer to college, career, and life readiness (CCSS, 2010). "The CCSS standards define the knowledge and skills students should gain throughout their K-12 education in order to graduate high school prepared to succeed in entry-level careers, introductory academic college courses, and workforce training programs." (CCSS, 2010, para. 1) The CCSS are aligned with the expectations for postsecondary education and career success. Many of the standards include objectives such as work within a group, collaborate with peers, these skills are focused on interpersonal communication and relationships.

Emerging research has begun to focus on interpersonal relationships and friendships for individuals considered to have high functioning ASD. Researchers have noted that young adults with ASD possess a desire to establish friendships (Bauminger & Kasari, 2000); however, they fail to recognize and accurately interpret social cues to include verbal and nonverbal behavior (Iovannone, Dunlap, Huber, & Kincaid, 2003).

Feelings of exclusion associated with a persistent challenge with social skills contribute to the dropout rate in a postsecondary setting and job loss in a business/employment environment, especially for young adults with ASD (Fessenden, 2013). However, given the

changes in communication and socialization that occur with the use of digital virtual communication, it may be possible to integrate young adults with ASD into a virtual community that may support greater communication (Cheng, 2005) and persistence in postsecondary education. Advancements in virtual environments and accessibility through portable devices may offer a medium that is comfortable for those with ASD to communicate and develop interpersonal relationships (Parsons et al., 2013).

Virtual environments potentially remove extraneous variables often experienced in a face-to-face situation such as additional noises, movement of people, and body language (Yee, 2006). Mitchell, Parsons, and Leonard (2007) and Parsons et al., (2013) noted that virtual environments afford young adults with ASD a controlled and safe environment within which it is comfortable to communicate and to learn interpersonal communication skills. The skills learned in a virtual environment may be generalizable to a real-world situation (Prensky, 2007; Yee, 2006). Virtual environments include any medium that is a digital format in which individuals represented as avatars interact with other avatars or the computer (Fox, Ahn, Janssen, Yeykelis Segovia, & Bailenson, 2014). A precise in-depth understanding of the prevalence and correlates of social participation among adolescents and young adults with ASD can support postsecondary transitions (Bellini & Akullian, 2007). As seen in the literature review, there is a scarcity of research in regard to efficacious interventions to teach and support social skills to adolescents and young adult students with ASD. Many studies mention the potential of virtual environments; however, few study the impacts on social skills acquisition, and to date, no study describes social interactions and better explains why young adults with ASD successfully interact in a virtual environment.

Guiding Theoretical Framework

This study relied on seminal, as well as emerging, theories. Emerging theories are a necessary extension of seminal theories, given the technology that participants used and interactions that were explored in this study of social interactions and perceptions of interactions were constructed within virtual environments.

This study incorporated multiple learning theories to include seminal and modern theories that applied to the complexity of gaming. First, constructivism (Piaget, 1952) was used to describe the progression of knowledge development. Constructivism is a theory often attributed to Jean Piaget (1952); constructivism is defined as the learner acquiring knowledge by linking it to their current knowledge or schema, and creating their own subjective depiction of the objective experiences (Resnick, 1987). Vygotsky (1962) contributed to the constructivist theory with the social development theory. Vygotsky's work emphasized connections between people and social cultural contexts in which they utilize shared experiences in order to interact with each other. Constructivism is considered an active process, constructing knowledge derived from experiential learning (Wu, Hsiao, Wu, Lin, & Huang, 2011). During game play, individuals are constantly modifying their behavior in the game in response to the continuous feedback from the game and social interaction with other people (Prensky, 2007).

Bandura proposed the social learning theory in 1965. The social learning theory suggests that individuals learn from one another via observations. Observations, or the learned behaviors, as described by Bandura, are then imitated and modeled. During social interactions in a massively multiplayer online role playing game (MMORPG) or virtual environment, individuals socially engage and interact within their defined roles. Each person constructs their knowledge

based on continuous feedback from other avatars and non-player characters or computer agents, as well as learning how to respond in the game by observing other avatars.

Building on the constructivist theory and social learning theory, Latour (1987a) proposed the Actor-Network theory, attempting to understand the processes of technology and innovation combined with scientific knowledge creations that influence learning. The Actor-network Theory (Latour, 1987a; 2005) is designed to examine the infrastructure of actor-networks to include the development of skills and is focused on how human and non-human objects support interactions using technology. The actor-network theory incorporates the principle of generalized symmetry. The principle of generalized symmetry integrates a theoretical framework to understand how human and non-human (e.g. artifacts, organizational structures) computer agents should be integrated into the same conceptual framework and assigned equal amounts of agency. Giddings (2005) stated that incorporation of agents into the same framework provides a rich description of the tools that hold the network together. The actor-network theory posits that learning to interact socially is achieved through activities such as those mediated through computer agents, avatars, and tools that guide the development of the ability to learn social interaction.

When considering the inclusionary criteria of technology-mediated learning, the actor-network theory can be applied to develop meaning from the social interactions occurring in the virtual environment. Finally, game-based learning theory (Van Eck, 2007) described learning as it occurs through a rich environment that unintentionally facilities the acquisition of new skills by constructing higher-level learning through uncertain and exigent trial-and-error opportunities using virtual environments. These exigent trials in the game are often not possible to replicate

using face-to-face interactions; thus, making the virtual environment the ideal place to acquire complex social skills through repeated trials. Repeated trials are a natural, common part of gaming. A player is always trying to improve, which inadvertently requires the use of soft skills and acquisition of these skills building upon previous trials (Granic, Lobel, Rutger, & Engels, 2014; Van Eck, 2007).

A virtual environment provides an opportunity to socially engage in a virtual community with several young adults without the constraints of real-world variables, such as anxiety about face-to-face interactions (Prensky, 2007; Yee, 2006). The researcher theorized that learning takes place through the virtual environment based on the social learning theory and constructivism given the continual feedback within the virtual environments of gaming.

Young adults with ASD are attracted to technology as digital virtual environments appeal to them to socially engage (Bricker & Bell, 2012). For example, engagements in social interactions are supported by the game's requirement to interact in social groups or guilds. Social groups are formed that support interactions among players to conquer tasks in the game, which are socially constructed in the context of the virtual environment (Wu et al., 2011). The tasks in the game or virtual environment support learning through continued social interactions. Vygotsky (1962) noted that learning is a social process and not limited to the individual. Within the context of the virtual environment, applying the social learning theory, activity-network theory, and constructivist theory, learning is not stimulation and reinforcement, but a progression of the development of social skills used to mediate the virtual environment. However, as suggested by Hirumi, Appelman, Rieber, and Van Eck (2010), connections between learning

theories and game-based learning are still vague (p. 268). See Figure 1 for an image of intersecting theories.

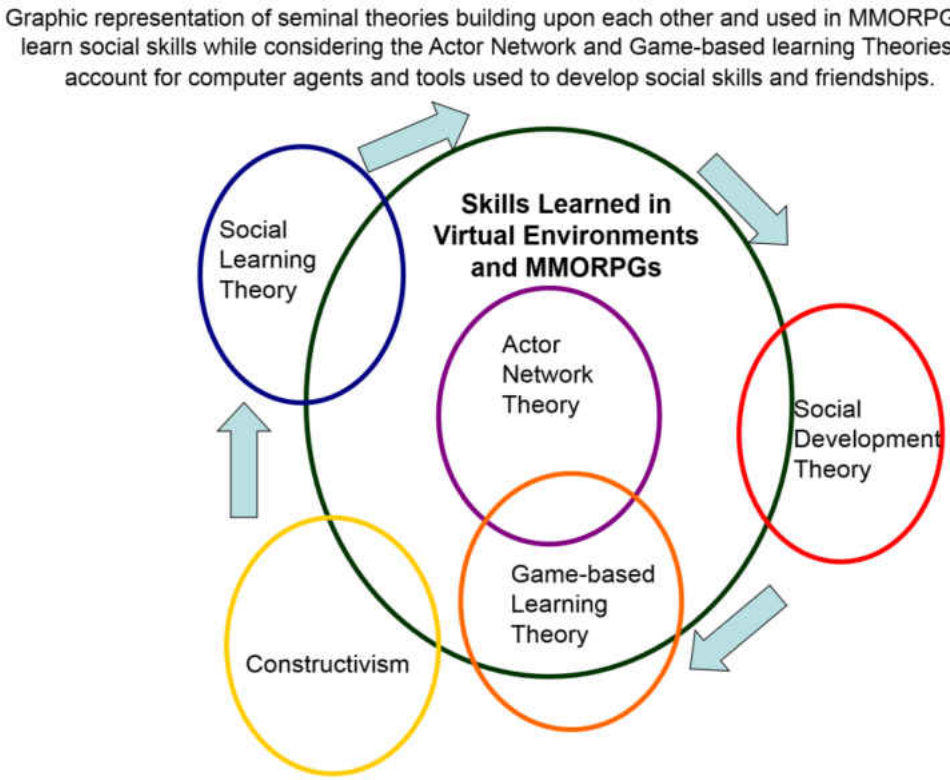


Figure 1: Intersection of seminal and emerging theories

Background and Context

Young adults with ASD are a population that often possesses unique attributes for success within postsecondary education in STEM fields, including the ability to: (a) maintain hyper focus on a specific analytic task, (b) think systematically and solve problems objectively without social bias, and (c) conceptualize innovative solutions to complex problems (Baron-Cohen, Wheelwright, Burtenshaw, & Hobson, 2007; Fessenden, 2013; Grandin, 2012; Hart & Whalon, 2010; Wei et al., 2013). Additionally, young adults with ASD are often high-ability

learners in the areas of STEM (Fessenden, 2013; Grandin, 2012; Hart & Whalon, 2010; Wei et al., 2013). When reflecting on the strengths that young adults with ASD possess, they would be ideal candidates for many positions in a STEM-related career (Baron-Cohen et al., 2007).

Social challenges precipitated by ASD directly contribute to a lack of social networks and friendships. This lack of social networks can be correlated to challenges experienced during postsecondary transitions, such as success and persistence in college (Newman et al., 2009; Shattuck, Orsmond, Wagner, & Cooper, 2011). A paradigm shift is occurring in the way in which people communicate and develop social relationships (Boyd & Ellison, 2008). More people are communicating in virtual environments, such as through email, Face time, and Skype. Additionally, the skills used in a virtual gaming environment such as complex communication, advanced digital literacy, collaboration and communication within a team, time management, and task completion (Gee, 2007; Prensky, 2006; Granic et al., 2014; Yee, 2006) are hypothesized to be parallel to the soft-skills required in postsecondary STEM education and employment in a STEM career (ABET, 2013; Robles, 2012). These virtual modes of communication can provide an opportunity for young adults with ASD to engage socially without the stress or anxiety associated with face-to-face communication (Cheng, 2005). One such method to learn these skills could be a massively multiplayer online role-playing game (MMORPG).

Massively multiplayer online role-playing games provide a highly social virtual environment in which several individuals can interact within an evolving virtual community (Gee, 2006; Yee, 2006). Online role-playing games allow thousands of gamers to play in the game's developing virtual world at the same time via the Internet (Yee, 2006). A small but significant body of research has begun to emerge, documenting the benefits of gaming utilizing a

complex, diverse, realistic, and social medium (Granic, Lobel, Rutger, & Engels, 2014). Further, Granic and colleagues (2014) stated that video games may foster real-world psychosocial benefits. The pilot study to this dissertation noted a phenomenon in which young adults with ASD were actively socializing and developing friendships with multiple people in virtual communities such as a MMORPG (See chapter 3).

Statement of the Problem

The most persistent challenge for young adults with ASD is related to social interactions (DSM-V, 2014). Social challenges permeate every aspect of their adult life leading to poor secondary outcomes. In addition, challenges with social connections can also be observed for typically developing young adults in postsecondary settings (Noel-Levitz, 2011). Noel-Levitz (2011) stated that not recognizing and interpreting social cues directly affects a person's ability to interact socially and, to develop friendships, which ultimately will affect participation in postsecondary education (Noel-Levitz, 2011).

Young adults with ASD continue to experience challenges with employment, independent living, communication, and relationships (Petrewskyj, Shakespeare-Finch, & Thorp, 2013). Additionally, these challenges compound the increasing the number of young adults with ASD not enrolled in or finishing a secondary (46%) and postsecondary education (71%), and remaining unemployed (80%) (Baron-Cohen et al., 2007). It has been reported that individuals with ASD choose majors in STEM at a much higher rate than all other disability categories and their typically developing peers; yet, remain chronically underrepresented in the STEM fields (Autism Society of America, 2013; Baron-Cohen et al., 2007; Shattuck et al., 2014; Wei et al.,

2013). A chronic under representation can be directly linked to low social insolvent, poor social skills, and challenges interacting within a group (Shattuck et al., 2014). Innovations with technology and digital communication may offer solutions to increase postsecondary education successes for young adults with ASD.

Purpose

This study is built upon extant research for young adults with high functioning ASD currently identified by the DSM-V level 1 criteria. This study examined the social experiences of a specific group of individuals through purposeful sampling. Each participant was enrolled as a freshman or sophomore in a STEM track and also played in a MMORPG. Particular attention was devoted to interpersonal relationship development and social skills used in a virtual environment that are parallel to skills required for postsecondary education and STEM-related careers. The purpose of this study was to describe the social interactions of young adults with ASD in the context of a virtual environment and identify if they are using social skills that are parallel to the soft-skills required in STEM. Society needs the unique abilities of those with ASD to contribute to future science breakthroughs, without appropriate supports young adults with ASD will fail to achieve their potential (Grandin, 2012).

Research Question

One primary research question was addressed during this research:

1. What are the social experiences of young adult college students with ASD, enrolled in a STEM track as they participate in an online gaming environment (MMORPG)?

Research Design Overview

After receiving the approval of the university's institutional review board, the researcher studied experiences and perceptions of four young adults with ASD using a phenomenological approach. A phenomenological study describes the common meaning for several individuals specific to their experiences of a concept (Creswell, 2013). A phenomenological study also explores a phenomenon with a targeted group of individuals who all experience the phenomenon and may vary in size from three to four individuals or more depending on the amount of information shared to reach saturation levels (Bloomberg & Volp, 2012; Creswell, 2013; Hayes, 2011). Data collected were intended to reflect the multiple realities that exist for participants, as well as to thoroughly reflect participants' perspectives that were contextually relevant to the research question (Hays, 2011). The research goals of a phenomenological study were to describe the meaning or essence of a phenomenon as it exists for the participants (Creswell, 2013; Hays, 2011).

The researcher focused on describing experiences and themes that all participants shared as they socialized within the context of an MMORPG by using a phenomenological approach. Participants were asked a series of open-ended and in-depth interview questions (see Appendix A) to describe their social experiences and the primary reasons for gaming. Additionally, self-report surveys were collected (see Appendix B) and document analyses of related blogs and forums were conducted to triangulate the findings. This study was based on the pilot study (see chapter 3) and findings from Cheng (2005), Parsons and Cobb (2011), and Parsons, Charman, Faulkner, Ragan, Wallace, and Wittemeyer, (2013).

Research Approach and Methods

The qualitative design included participants enrolled in a large metropolitan university setting. All participants actively participated in online videogame play using virtual environments 3+ hours a week (Granic et al., 2014; Yee, 2006) in a MMORPG. In-depth interviews were the primary method of data collection. The interview process began with the researcher conducting a series of open-ended and structured interview questions. The focus of the questions was intended to describe the social experiences of gaming and the correlates to social relationships for young adults with ASD. The data subsequently formed the themes for the overall findings of the study. To support the findings from the in-depth interviews, participants completed a review of the transcripts through member-checking and confirmed the transcripts and initial codes with the researcher. Coding categories were developed and refined on an ongoing basis, guided by the study's conceptual framework. In addition, various strategies were employed, including a search for discrepant evidence, inter-coder reliability in the coding process, as the study progressed.

Setting

Research for this proposed study took place on the campus of a large metropolitan university. Interviews were held in the university library and public library. The observation of a gaming event was held in a public library conference room.

Procedure

Following data collection and transcription of the interviews, participants reviewed the transcriptions, initial codes, and margin notes to verify accuracy. The primary source of data collected was gathered through interviews, self-reporting surveys, and document analyses as described in detail in chapter three (Creswell, 2013; Hayes, 2011).

Assumptions

Based on the researcher's experience and background as a parent of a child with ASD, as well as a teacher, two primary assumptions were made regarding this proposed phenomenological study. As a teacher who taught within a secondary school, the researcher used virtual environments and games to build relationships with students. This idea was generated using data gathered from individual student interest sheets. The researcher noticed that more than 90% of the most recent students taught in her 9-12-grade classes played videogames, interacted online, or had their own YouTube Channel. The researcher also identified that her students frequently posted informational videos that were commentated to detail specific information about how to play the games they played. The researcher noticed that virtual environments were a frequent medium used by students with ASD to interact. In addition, students were more likely to email and/or text for help or to share information. The students seemed to be more comfortable communicating when they were not face-to-face. Based on the aforementioned observations, the researcher hypothesized that using an avatar may increase the comfort level of interactions and support greater social interactions. This assumption was based on the challenges young adults with ASD experience when socializing in

a face-to-face setting which result in an increase in anxiety level, challenges interpreting social cues, and difficulty contending with extraneous factors such as noise.

The second assumption was developed based on the common interest in gaming shared by the researcher's previous students. Young adults with ASD actively sought out social interactions that refine their social skills based on the continuous feedback from the game and the demands of the game to interact. This assumption is based on the work completed by Gee (2006) and Yee (2007). Gee (2006) stated that learning is a byproduct of gaming. Gaming provides constant feedback that will modify interactions within the game. Further, Yee (2007) postulated that skills learned during the gaming experiences may generalize to real world situations and social skills are a required part of virtual interactions.

Role of the Researcher

The researcher acted as an instrument of data collection and analyses: data were mediated through the human instrument rather than through inventories (Bloomberg & Volp, 2012; Denzin & Lincoln, 2003). Questions asked to the participants and decisions about the research may be influenced based on experiences as a parent of a child with ASD and the extensive use of videogames and MMORPG's with her son. Given the propensity of young adults to engage in MMORPGs and use technology, it is a bias that the researcher feels strongly that these unique virtual environments may serve as a naturalistic environment to help support post-high school transition to STEM degrees and ultimately careers.

The researcher developed a rapport with the participants by discussing relevant aspects of self, including biases and assumptions, and experiences that qualify the researcher's ability to

conduct the study (Greenback, 2003). The researcher described her role to the participants as taking an etic role; an etic role is described as taking an outside perspective (Bloomberg & Volp, 2013). The researcher interviewed participants using a series of probing questions that were reflected upon during the interview to include further probing questions in order to elicit detailed information for the study. Qualitative researchers become immersed in the situation they are studying (Bloomberg & Volp, 2012; Denzin & Lincoln, 2003; Tufford & Newman, 2010).

Researcher bias was recorded through a bracketing interview with the second coder. Bracketing is a method used in qualitative research to mitigate the potentially deleterious effects of preconceptions that may taint the research process (Tufford & Newman, 2010). Experiences as a parent of a child with ASD that include extensive use of video games and MMORPGs will influence decisions, questions asked to the participants, and findings. The researcher used videogames, virtual environments, and MMORPGs to develop relationships, build social skills, and integrate her child with ASD into the community. As an exemplar to the study, the researcher's son, "Tal", was introduced to videogames at age six. Tal instantly became interested in the game and began interacting with other players and people to show his progress in the game. Tal began to show interest with social interaction when the focus was the videogames. Based on his progress, the researcher sought out community events that supported greater socialization such as videogame tournaments held in local malls and gaming conventions such as *Mega-Con.* As Tal aged into adolescence, he began to develop friendships in the virtual environment and has since acted upon them to begin developing the friendship in a face-to-face situation.

Virtual environments are easily accessible on any portable device, handheld tablet, or computer provided that access to the Internet is possible. This access allows Tal and other young adults with ASD the ability to remain connected to their online peers. Additionally, games such as *Hearthstone* require face-to-face interactions and active gaming to achieve some accolades in the game. Virtual environments are a space where parents, teachers, and community members can interact with young adults with ASD and build a relationship using the soft-skills required to interact that then can be supported in a face-to-face environment.

Given the propensity of young adults to engage in the use of technology, specifically virtual environments and MMORPGs, the researcher acknowledges a preexisting bias and opinion that these unique virtual environments may serve as an environment to help support postsecondary education transition to independent living, postsecondary education, STEM degrees, and ultimately, careers.

Based on the description of the qualitative research process, it can be noted that qualitative data are closely connected to the researcher and adds another aspect to the researcher's role (Bloomberg & Volp, 2012). First, data were collected during interactions between respondent and researcher, which pointed to dependence between data and the researcher. Second, the researcher collected a large amount of data from a limited number of respondents. This data material consisted of five interviews, field notes, and "recollection."

Rationale

The rationale for this study originates from the researcher's aspiration to identify practices to improve the social skills of students with ASD and their successful transition to

postsecondary settings. Developing an increased understanding of opportunities to socialize, engage in social situations, and develop relationships may increase in the process and development of skills needed to sustain postsecondary education. Increased social opportunities may not only afford the participants more career options and personal gratification, but also has the potential to benefit society at large.

Considering the immersive social contexts that include social and pro-social activities as part of the gaming experience, gamers rapidly learn social skills that could generalize to social relationships outside of the gaming environment (Gentile & Gentile, 2008; Gentile et al., 2009; Vitelli, 2014; Yee, 2006). For example, games such as *World of Warcraft* and *Farmville* have millions of users, actively engaged in socialization in online communities that support communications with fellow gamers. Online video games are an exceedingly social activity (Gee, 2007; Prensky, 2006; Yee, 2006). The stereotypical gamer was thought of as a person who used video games to shun social contact; however, today over 80 percent of gamers play with friends, whether as part of a team or in direct competition (Moore, 2009; Vitelli, 2014). Given that, interactions in the gaming environment must first be explored to explain the social phenomenon and how it relates to those with ASD.

Parsons and colleagues (2011) stated that the effectiveness of provisions for children with ASD tends to be measured by quantitative data, leaving an absence of qualitative research evidence. Kemp, Petrewskyj, Shakespeare-Finch, and Thorp (2013) suggested that researchers must examine the contextual relevance of social processes and strategies that occur in naturalistic settings in order to increase the level at which young adults with ASD generalize and maintain learned social skills. Through the proposed study, the researcher considered a virtual

environment as a naturalistic setting whereby communication was often exchanged across social media platforms and in virtual gaming environments (Gee, 2007). These social exchanges are more commonplace today than even 10 years ago (Granicet et al., 2014). Additionally, people often spend multiple hours per day in virtual environments communicating, developing friendships, and working together on projects (Granic et al., 2014). Parsons and colleagues (2011) stated that qualitative findings could offer insights into the contextual influences on outcomes for young adults with ASD.

The rich data collected through qualitative inquiry allowed the researcher to understand the social influences and interactions, implications, and cultural experiences that exist for young adults with ASD while participating in virtual gaming environments. Granic and colleagues (2014) argued that a more balanced perspective on gaming is needed to include the benefits of social development, problem solving, communication skills, and the complex, diverse environment provided by an evolving virtual environment.

To date, no researchers have systematically investigated the impact of virtual environments or MMORPG-initiated friendships on the postsecondary education experiences of students with ASD. Additionally, there is a gap in the research related to the reasons why adolescents and adults with high-functioning ASD engage in online gaming and other digital social environments. According to Demetriou & Schmitz-Sciborski (2010), the majority of extant research has focused on why students fail to persist rather than why they succeed. They proposed research that takes a strength-based approach, studying student success and social interactions in a virtual environment. This may elucidate aspects of experiences that lead to success postsecondary and may be applied to support other students. Finally, there is a distinct

deficit of research and supports for adolescents and adults with ASD to facilitate postsecondary transitions. This research sought to understand the social interactions of young adults with high functioning ASD as they socialize in the context of a virtual environment.

Significance

A number of researchers have highlighted the importance of soft skills for success in STEM professions and suggest that greater efforts should be placed on teaching soft skills to individuals in science and engineering professions (Harris & Rogers, 2008; Pellerin, 2009). Soft skills include: (a) the ability to communicate effectively, (b) cooperative and listening skills, (c) leadership skills, and (d) organizational skills. It is believed that direct intervention of soft skills development among young adults with disabilities could lead to greater rates of employment, thus increasing the number of STEM professionals with disabilities (Harris & Rogers, 2008). The basic principles of cooperative work in an MMORPG require the active use of soft skills and the ability to develop interpersonal relationships. Students with ASD need skills that will support their desire to be in STEM careers. As noted, many of the required soft skills are used in a MMORPG.

This study examined the phenomenon of gaming to better explain the social interactions of young adults with ASD as they socialize and develop relationships through the context of an MMORPG or virtual environment. This study explored the social phenomenon specific to young adults with ASD by employing a phenomenological design. The information from this study described and supported literature related to the identification of alternate modes to develop

social skills and interpersonal relationships of adolescents with ASD by exploring the social implications of virtual environments and MMORPGs.

Definitions and Key Terminology

Alports Nephritus

Is defined by the National Institute of Health is a syndrome that is an inherited form of kidney inflammation (**nephritis**). It is caused by a mutation in a gene for a protein in the connective tissue, called collagen. The disorder is uncommon. It most often affects males.

Attention Deficit (Hyperactive) Disorder (AD [H] D)

Is defined by the American Psychological Association and Diagnostic and Statistical Manuel – V (2014) ADHD is described as "a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with development, has symptoms presenting in two or more settings (e.g. at home, school, or work), and negatively impacts directly on social, academic or occupational functioning". The symptoms must be present before age 12.

Autism Spectrum Disorder (ASD)

Is defined by the American Psychological Association and Diagnostic and Statistical Manuel – V (2014).

Autism Spectrum Disorder 299.00 (F84.0)

Diagnostic Criteria

A. Persistent deficits in social communication and social interaction across multiple contexts, as manifested by the following, currently or by history (examples are illustrative, not exhaustive, see text):

1. Deficits in social-emotional reciprocity, ranging, for example, from abnormal social approach and failure of normal back-and-forth conversation; to reduced sharing of interests, emotions, or affect; to failure to initiate or respond to social interactions.

2. Deficits in nonverbal communicative behaviors used for social interaction, ranging, for example, from poorly integrated verbal and nonverbal communication; to abnormalities in eye contact and body language or deficits in understanding and use of gestures; to a total lack of facial expressions and nonverbal communication.

3. Deficits in developing, maintaining, and understanding relationships, ranging, for example, from difficulties adjusting behavior to suit various social contexts; to difficulties in sharing imaginative play or in making friends; to absence of interest in peers.

Specify current severity:

Severity is based on social communication impairments and restricted repetitive patterns of behavior (see Table 1).

B. Restricted, repetitive patterns of behavior, interests, or activities, as manifested by at least two of the following, currently or by history (examples are illustrative, not exhaustive; see text):

1. Stereotyped or repetitive motor movements, use of objects, or speech (e.g., simple motor stereotypes, lining up toys or flipping objects, echolalia, idiosyncratic phrases).

2. Insistence on sameness, inflexible adherence to routines, or ritualized patterns or verbal nonverbal behavior (e.g., extreme distress at small changes, difficulties with transitions, rigid thinking patterns, greeting rituals, need to take same route or eat food every day).

3. Highly restricted, fixated interests that are abnormal in intensity or focus (e.g., strong attachment to or preoccupation with unusual objects, excessively circumscribed or preservative interest).

4. Hyper- or hypo-reactivity to sensory input or unusual interests in sensory aspects of the environment (e.g., apparent indifference to pain/temperature, adverse response to specific sounds or textures, excessive smelling or touching of objects, visual fascination with lights or movement).

C. Symptoms must be present in the early developmental period (but may not become fully manifest until social demands exceed limited capacities, or may be masked by learned strategies in later life).

D. Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning.

E. These disturbances are not better explained by intellectual disability (intellectual developmental disorder) or global developmental delay. Intellectual disability and autism spectrum disorder frequently co-occur; to make co morbid diagnoses of autism spectrum disorder and intellectual disability, social communication should be below that expected for general developmental level.

Note: Individuals with a well-established DSM-IV diagnosis of autistic disorder, Asperger's disorder, or pervasive developmental disorder not otherwise specified should be given the

diagnosis of autism spectrum disorder. Individuals who have marked deficits in social communication, but whose symptoms do not otherwise meet criteria for autism spectrum disorder, should be evaluated for social (pragmatic) communication disorder.

Specify if;

With or without accompanying intellectual impairment

With or without accompanying language impairment

Associated with a known medical or genetic condition or environmental factor

(Coding note: Use additional code to identify the associated medical or genetic condition.)

Associated with another neurodevelopment, mental, or behavioral disorder

(Coding note: Use additional code[s] to identify the associated neurodevelopment, mental, or behavioral disorder[s].)

With catatonia (refer to the criteria for catatonia associated with another mental disorder, pp. 119-120, for definition) (Coding note: Use additional code 293.89 [F06.1] catatonia associated with autism spectrum disorder to indicate the presence of the co morbid catatonia.)

Table 1
Severity Levels for Autism Spectrum Disorder

Severity level	Social communication	Restricted, repetitive behaviors
Level 3 "Requiring very substantial support"	Severe deficits in verbal and nonverbal social communication skills cause severe impairments in functioning, very limited initiation of social interactions, and minimal response to social overtures from others. For example, a person with few words of intelligible speech who rarely initiates interaction and, when he or she does, makes unusual approaches to meet needs only and responds to only very direct social approaches	Inflexibility of behavior, extreme difficulty coping with change, or other restricted/repetitive behaviors markedly interferes with functioning in all spheres. Great distress/difficulty changing focus or action.
Level 2 "Requiring substantial support"	Marked deficits in verbal and nonverbal social communication skills; social impairments apparent even with supports in place; limited initiation of social interactions; and reduced or abnormal responses to social overtures from others. For example, a person who speaks simple sentences, whose interaction is limited to narrow special interests, and how has markedly odd nonverbal communication.	Inflexibility of behavior, difficulty coping with change or other restricted/repetitive behaviors appears frequently enough to be obvious to the casual observer and interfere with functioning in a variety of contexts. Distress and/or difficulty changing focus or action.
Level 1 "Requiring support"	Without supports in place, deficits in social communication cause noticeable impairments. Difficulty initiating social interactions, and clear examples of atypical or unsuccessful response to social overtures of others. May appear to have decreased interest in social interactions. For example, a person who is able to speak in full sentences and engages in communication but to- and-from conversation with others fails, and whose attempts to make friends are odd and typically unsuccessful	

Diagnostic and Statistical Manual – Severity Level and Criterion

Autism Spectrum Disorder is classified by persistent deficits in social communication and social interaction across multiple contexts, as manifested by the following, currently or by history (APA, 2014).

1. Additionally, deficits in using communication for social purposes, such as greeting and sharing information, in a manner that is appropriate for the social context is a persistent challenge.

2. Impairment of the ability to change communication to match context or the needs of the listener, such as speaking differently in a classroom than on the playground, talking differently to a child than to an adult, and avoiding use of overly formal language.

3. Difficulties following rules for conversation and storytelling, such as taking turns in conversation, rephrasing when misunderstood, and knowing how to use verbal and nonverbal signals to regulate interaction.

4. Difficulties understanding what is not explicitly stated (e.g., making inferences) and non-literal or ambiguous meanings of language (e.g., idioms, humor, metaphors, multiple meanings that depend on the context for interpretation).

B. The deficits result in functional limitations in effective communication, social participation, social relationships, academic achievement, or occupational performance, individually or in combination.

C. The onset of the symptoms is in the early developmental period (but deficits may not become fully manifest until social communication demands exceed limited capacities).

D. The symptoms are not attributable to another medical or neurological condition or to low abilities in the domains or word structure and grammar, and are not better explained by autism

spectrum disorder, intellectual disability (intellectual developmental disorder), global developmental delay, or another mental disorder.

Chat Rooms

Are an area on the Internet or other computer network where users can communicate, typically limiting communication to a particular topic.

Computer Agent

A computer agent is a digital character that is mediated through the computer programming (Fox et al., 2014; Granic et al., 2014).

Guild or Clan

Many MMORPGs offer support for in-game guilds or clans; most MMORPGs require some level of teamwork for parts of the game. These tasks usually require players to take on roles in the group. Each role is important to the success of the team (guild) and often tasks in the game cannot be completed without a guild that is comprised of each of the defined roles in the game.

Massive Multiplayer Online Role-playing Game (MMORPG)

Massive multiplayer, online, role-playing game (MMORPG) is a mix of the genres of role-playing video games and massively multiplayer online games, possibly in the form of web browser-based games. A MMORPG is a virtual environment in which a single player or a large number of players interact with one another. The majority of MMORPGs have tools to facilitate

communication between players. These tools can include chat boxes, webcam rooms, voice chats, and any form of video-chat as a web based tool used to connect.

Soft-Skills

Soft skills are a term for a complex system of traits and habits commonly required by employers. They are the abilities and traits that pertain to an individual's behavior rather than the technical knowledge (Moss & Tilly, 2001). Some examples of soft skills can include integrity, taking another's perspective, daily pleasantries, the ability to compromise and communicate effectively, and collaboration within a group.

Role Identity

Some roles in the game may include avatars designed to protect other players from damage such as a "tank" also referred to as tanking. Another example of a protection role is a "healer". A healer will use their specific attributes to repair damage done to other players during guild activities (Safko & Brake, 2009).

Situated Learning

Situated learning emphasizes the idea that the majority of what is learned is specific to the situation in which it is learned (for more information see: Greeno, Smith, & Moore, 1992; Lave, 1988; Lave & Wenger, 1991).

Technology-mediated Learning

Is an 'umbrella' term, incorporating different approaches to using computers in learning and teaching: computer-aided/assisted learning (CAL), computer-mediated communication (CMC), generic computer-based production and presentation tools and computer-supported research tools. Increasingly, these tools are incorporated (in different combinations) into 'Managed Learning Environments' (MLEs) in which educators can define an environment where learners can access resources, drills, other learners and tutors, research and assessment tools.

Online Blog

Website containing a writer's or group of writers' own experiences, observations, and other personal ideas and opinions, often containing images and links to other websites.

Troll

A person represented as an avatar in a virtual environment that deliberately harasses other players in order to get them to quit the game. A Troll can also be a person in a chat-room who harasses other members of the chat with the intent on causing them to quit the chat-room or elicit a negative response. According to Urban Dictionary (2009) a Troll is defined as: "An Internet troll, or simply troll in Internet slang, is someone who posts controversial, inflammatory, irrelevant or off-topic messages in an online community, such as an online discussion forum or chat-room, with the primary intent of provoking other users into an emotional response or to generally disrupt normal on-topic discussion."

Virtual Environment

Virtual environments are digital replications or generations of environments that people can interact within. Interactions may be through the use of an avatar which allows a human to embody themselves in a character-like presence. Avatars can be used to interact with other avatars or agents.

Virtual environments also include many social platforms such as Facebook, Myspace, Second Life, and LinkedIn; social platforms are used to build connections and help stay in touch with friends (Rybas & Gajjala, 2007). The purpose of social platforms and virtual environments that support interactions with others is to network, establish and maintain friendships (virtually), go on dates, meet new friends, find jobs, and exchange recommendations and news all in the context of a virtual environment (Granic et al., 2014; Rybas & Gijjala, 2007).

CHAPTER TWO

This chapter presents a literature review that will frame the goals and questions of this study within the context of current research on autism spectrum disorder (ASD), related to social skills interventions, postsecondary success, and interpersonal relationships that support postsecondary transitions. The literature search aimed to identify, assimilate, summarize, and synthesize studies that report on the association between adolescents and adults with ASD, social skills, and interpersonal relationship development that incorporate virtual environments and massively multiplayer online role-playing game (MMORPG) environments.

Additionally, this literature review considered the most salient aspects of transition and persistence to complete a college degree. First, a guiding theoretical framework will be discussed, and then research on social skill deficits of children and young adults with ASD will be reviewed. Next, a review of the research on social skills interventions that are evidence-based will specifically be included. A review of research that used virtual environments, and is game based, or uses simulations to teach complex verbal communication, interpersonal relationships and postsecondary transitions will follow. A discussion of the intervention research will follow, specifically highlighting the results and effectiveness of previous interventions for social skill challenges. Finally, a focus on the communication needs for adolescents and adults with ASD will be reviewed specific to STEM-related careers.

A database search was conducted incorporating author, title, and keywords using criteria to include: autism, autism and adolescents, adults with autism, communication challenges, virtual environments, autism and social interactions in virtual environments, autism and STEM, postsecondary transitions and autism. The electronic databases EBSCO-Host, PsychInfo,

Science-Direct, and Dissertations, were searched. Finally, a hand search of non-electronic articles in the University of Central Florida Library was conducted to ensure no pertinent articles were omitted.

Prevalence of Autism

An increasing number of individuals are being diagnosed with an autism spectrum disorder (ASD). In an effort to evaluate prevalence of ASD over time, the Center for Disease Control (CDC) established the Autism and Developmental Disabilities Monitoring (ADDM) network. On April 9, 2014, the CDC released results estimating United States' 2010 prevalence rate at an average of one in 68 children representing an increase of 29% from 2008, 64% from 2006, and 123% from 2002. Autism is a developmental disorder of the human nervous system (Mintz, Branch, March, & Lerman, 2012) that affects 1% of the global population (CDC, 2014). Autism has considerable variety and is characterized by the following: (a) persistent deficits in social communication and social interaction across multiple contexts, (b) inability to understand nonverbal communicative behaviors used for social interaction, (c) difficulty developing, maintaining, and understanding relationships, and (d) restricted, repetitive patterns of behavior, interests, or activities (ADDM, 2010; CDC, 2014). Symptoms associated with an ASD must be present in the early development period, clinically significant in affecting social, occupational, and other areas of social functioning, and not explained by an intellectual disability (DSM-V, 2014).

Three levels of severity have been defined by the DSM-V (2014); level one includes those individuals that require minimum support, level two includes individuals that require

substantial support, and level three includes individuals that require very substantial support for social interactions. Individuals considered high functioning would be defined as those that fall into level one as defined by the DSM-V (2014).

Impact

A large population of individuals with ASD is maturing into adolescence and adulthood, however, a paucity of research focused on postsecondary supports exists (Shattuck et al., 2011). A shortage of research currently exists focused on the transition needs of young adults with ASD to postsecondary education, specifically related to social skills required to develop friendships that may define support networks and communication skills for employment (Demetrion & Schmitz-Sciborski, 2011). Young adults with ASD face a number of challenges related to their persistent deficit in social skills that increase challenges with postsecondary transitions (Bauminger & Kasari, 2000) and specifically transitions to careers in STEM (Wei et al., 2013).

Researchers posit that the underrepresentation of young adults with ASD transitioning to independent living, postsecondary education, and secondary STEM fields has been attributed to a persistent lack of social skills and ability to develop relationships (Alpern & Zager, 2007; Durkin, Boyle, Hunter, & Conti-Ramsden, 2013; Muller et al., 2003; Wei et al., 2013). These socialization factors contribute to a lower rate of participation by young adults with ASD in postsecondary education than their peers without ASD (Shattuck, Orsmond, Wagner, & Cooper, 2011). According to the most recent college graduation data, 71 % of young adults with disabilities do not finish college with a degree (Shattuck et al., 2011). Graduation data are not disaggregated by disability categories. However, current statistics show individuals with ASD

hold the third lowest matriculation rate to college when compared to all disability categories; they hold the lowest wage per/hour, and the lowest rate of independent living (National Center for Education Statistics, 2012). Additionally, only 54% of individuals with ASD graduate high school and less than 20% sustain even part time work (Shattuck, 2014).

The benefits and obstacles of post-high school education and independent living for those with and without disabilities have been investigated and reported. Young adults with ASD are the most likely to live at home than any other disability category and have the lowest average wage of all disability categories (National Longitudinal Study Wave – 5, 2009; National Center for Education Statistics, 2006). Challenges associated with independent living and matriculation have been associated with social skill and communication challenges (Autism Society of America, 2013; Baron-Cohen, Wheelwright, Burtenshaw, & Hobson, 2007; Bellini & Akullian; 2007; Fessenden, 2013; Rao, Beidel, & Murray, 2008; Wei et al., 2013). Ultimately a lack of social skills increases the gap between postsecondary transitions for young adults with disabilities (Duden-Street et al., 2012; Durkin et al., 2013; Marino, 2009; Murray et al., 2008; Webb et al., 2006).

ASD and STEM-related Careers

Young adults with ASD choose majors in STEM at a much higher rate than even their typically developing peers without a documented disability (Wei et al., 2013). They often possess unique attributes for success within postsecondary education in STEM fields, such as the ability to: (a) maintain hyper focus on a specific analytic task, (b) think systematically and solve problems objectively without social bias, and (c) conceptualize innovative solutions to complex

problems (Baron-Cohen, Wheelwright, Burtenshaw, & Hobson 2007; Fessenden, 2013; Grandin, 2012; Hart & Whalon, 2010; Wei et al., 2013). Additionally, young adults with ASD are often high-ability learners in the areas of STEM (Fessenden, 2013; Grandin, 2012; Hart & Whalon, 2010; Wei et al., 2013). When reflecting on the strengths that young adults with ASD possess, they would be ideal candidates for many positions in a STEM-related career (Baron-Cohen et al., 2007). Unfortunately, according to Grandin (2012), young adults with ASD are missing the opportunity to continue on to postsecondary education experiences and realize their potential to contribute to future science breakthroughs.

Need for Soft Skills for STEM Careers

Soft skills are a term for a complex system of traits and habits commonly required by employers. They are the abilities and traits that pertain to an individual's behavior rather than the technical knowledge (Moss & Tilly, 2001). Some examples of soft skills can include integrity, taking another's perspective, daily pleasantries, the ability to compromise and communicate effectively, and collaboration within a group. Robles (2012) stated that the most sought after soft skill is the ability to work productively on a diverse team. In addition, when reflecting on skills needed for individuals entering a STEM career, Accreditation Board for Engineering and Technology, Inc. (ABET) accreditation for engineers stated graduates must demonstrate the following skills (**bold identifies the soft-skills**):

- an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines,

- an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering, and technology,
- an ability to conduct, analyze, and interpret experiments and apply experimental results to improve processes,
- an ability to **apply creativity in the design of systems, components, or processes appropriate to program objectives**,
- **an ability to function effectively on teams,**
- an ability to identify, analyze, and solve technical problems,
- **an ability to communicate effectively**,
- a recognition of the need for, and an ability to engage in lifelong learning,
- an ability to understand professional, ethical, and social responsibilities,
- **a respect for diversity and a knowledge of contemporary professional, societal, and global issues, and**
- **a commitment to quality, timeliness, and continuous improvement.**

The skills required by ABET accreditation demand content proficiency, also known as "hard-skills", as well as competency in soft skills also known as social skills. There are 11 standards and of the 11, four that are emphasized above in bold are identified as soft skills and support an individual's ability to work and communicate with others in a social situation (ABET, 2013). Ultimately, Robles (2012) noted that individuals can be taught the soft skills; however, employers want individuals ready to work with both soft and hard skills.

Challenges for Young Adults with ASD

According to the American Psychological Association, Diagnostic and Statistical Manual (DSM-V) (2014), the primary challenge for young adults with ASD relates to their social interactions (5th ed.; DSM–5, 2014). For example, students with ASD often have limited friendship interactions with peers (Locke, Ishijima, Kasari, & London, 2010) and little to no community involvement (Bellini & Akullian, 2007; Cihak, 2004). These socialization factors contribute to a lower rate of participation by young adults with ASD in postsecondary education than their peers without ASD (Shattuck et al., 2011).

Many adolescents with ASD have average to above average cognitive ability (Barnhill, Hagiwara, Smith Myles, & Simpson, 2000; Baron-Cohen et al., 2007). Although many young adults with ASD possess the skills to thrive academically, most adolescents with ASD struggle to form positive relationships within the general education classroom (Humphrey, 2008). Challenges with interpersonal relationship development enhance challenges related to group work and building social and professional relationships (Barnhill et al., 2000).

In many secondary education settings, students have multiple teachers for each of their classes. It is common for teachers to seek out information on ways to establish communication in different contexts for students with ASD (Odom, Cox, & Brock, 2013). The change with multiple classes presents unique opportunities to interact. These interactions can be challenging for people with ASD and are directly related to their social deficit and ability to develop meaningful relationships (Rao et al., 2008). Therefore, it is possible that social challenges experienced by a student with ASD could contribute to low academic achievement, low/high school graduation, and matriculation rate, (Rao et al., 2008). Without the necessary social skills,

it becomes difficult for students to work successfully with others, adhere to classroom behavioral expectations, request help from others, and transition to post-secondary settings (Barnhill et al., 2000; Cihak, 2004).

Language and Vocational Success

Conversation, social rules, and social skills need to be included in a skill-based intervention that focuses on the analytical, critical thinking, and objective problem solving skills that are strengths of those with ASD (Ingersoll, Lewis, & Kroman, 2006). For example, Charlop-Christy and Carpenter (2000) and Ingersol et al., (2006) noted using a naturalistic behavioral approach to keep young adults with ASD engaged, combined with stimulus variation and varied prompts in the context of a preferred activity has the potential to generalize to other settings.

Language functioning is a contributing factor in the development of friendships and other interpersonal relationships and seen as one of the least improved challenges for people with ASD (Muller et al., 2003). Communication and social challenges can be pervasive in vocational settings, resulting in communicative misunderstandings with co-workers (Alpern & Zager, 2007; Hurlbutt & Chalmers, 2004). Perceptions with variations in speech and understanding of language can cause significant obstacles to social integration and vocational acceptance. For example, Muller et al., (2003) found that people with ASD struggled with vocational success, and were frequently fired because of social communicative difficulties rather than because of poor performance on the job. Improvement was seen in language functioning for adolescents and adults with ASD when compared with their earlier language functioning; however, it still

remained problematic and presented significant obstacles to social and vocational successes (Muller et al., 2003).

Key characteristics of adolescent and young adult conversations is the rapid, abstract, figurative, and can be non-literal with references that depend on the ability to take another's perspective, which is a constant challenge for people with ASD (Alpern & Zager, 2007). Paul and Sutherland (2003) noted, to support necessary communication skills for postsecondary settings, interventions need to have a focus on pragmatics. Pragmatics is the use of appropriate language in social situations; such as understanding the rules for social language. Further, Paul and Sutherland (2003) discussed an emphasis on conversation skills, narrative skills, social rules of the classroom or work environment, and nonverbal communication such as facial expressions and gaze as a persistent problem in vocational settings.

Current Social Skills Interventions

Several researchers have identified common themes in the meaning of social skills (see Cihak, 2004; Cronin, 1996; Wing & Gould, 1979; Zager & Alpern, 2007). The definition of social skills relating to the facility of interacting with other individuals, exhibiting appropriate communication related to the topic, learning social norms, regulating one's own behavior and understanding the impact on others, anger management, group collaboration, and interaction that directly relate to interpersonal relationships and social supports will be used. Current research related to social skills interventions largely focuses on early childhood and the majority of interventions take place in a face-to-face context (Parsons et al., 2011). Group and single-case studies have demonstrated positive effects through individual, peer-mediated, and group social

skills interventions for various age groups with more complex and severe communication challenges (Baker, Parks-Savage, & Rehfuss, 2009; Cheng & Huang, 2012; Zager & Alpern, 2007). Various interventions have been used with individuals who have an ASD to remediate social difficulties.

In 2005, the National Autism Center initiated a project to complete a comprehensive analysis of interventions for children and young adults at that time. "The National Standards Project serves as a single, authoritative source of guidance for parents, caregivers, educators, and service providers as they make informed intervention decisions." (National Standards Project, 2015, para. 7) The National Standards Project considered the myriad of interventions and evidence based practices (EBP) available to address specific social skills challenges. The project addressed the need for EBP standards and provided guidelines about how to make determinations about specific interventions. An analysis of interventions was conducted from 2007 to 2012 and a report was generated to present empirical intervention literature to include interventions for adults 22+. Up to this point a systematic review had not been conducted for this age group. The National Standards Project identified 22 EBP for individuals on the autism spectrum. In addition they examined interventions for adults with ASD and outlined a guide for selection of specific interventions. Up to this point, a review of this magnitude had not been conducted.

The National Professional Development Center on Autism Spectrum Disorders (NPDC) (2014) identified twenty-seven evidence-based practices EBP used to support social and behavioral challenges for individuals with ASD. Of the twenty-seven nineteen have been evidence based for adolescents and 19 for adolescents and/or young adults with ASD up to the

age of 22 years (see Appendix C). These 19 EBPs include: Antecedent-Based Intervention; Cognitive Behavioral Intervention; Differential Reinforcement of Alternative, Incompatible, or Other Behavior; Extinction; Functional Behavioral Assessment; Functional Communication Training; Modeling; Peer-mediated instruction; Prompting; Reinforcement; Response Interruption/Redirection; Scripting; Self-management; Social Narratives; Social Skills Training; Technology-Aided Instruction and Intervention; Time Delay; Video Modeling; and Visual Supports. These EBP can be used to target social skills requirements specific to postsecondary education for individuals with ASD.

Cognitive Behavioral Training (CBT) is one of the few EBP approved for individuals considered high functioning and older children (Solomon, Goodlin, & Anders, 2004). CBT has been used to address anger, aggressive behavior, and self-management of aggressive behavior. Several researchers have studied and reported the positive effects of CBT (e.g., Singh, Lancioni, Manikam, Winton, Singh, Singh, & Singh, 2011; Sofronoff, Attwood, & Hinton, 2005; Sofronoff, Attwood, Hinton, & Levin, 2007). Sofronoff, Atwood, and Hinton (2005) conducted a study with 71 children diagnosed with Aspergers Syndrome to evaluate the effectiveness of a CBT intervention on reduction of anxiety. Children were randomly assigned to one of three conditions: intervention for child only, intervention for child and parent, and wait-list control. Data were gathered from parent perspectives and the Spence Children's Anxiety Scale. Of the three groups, the two groups receiving the CBT intervention reported a significant decrease in anxiety while the waitlist did not report a decrease in anxiety

Modeling involves the demonstration of a desired target behavior that results in imitation of the behavior by the learner and that leads to the acquisition of the imitated behavior.

Modeling can be implemented using videos, virtual environments (Cheng, 2005), or using video-self modeling (Schrandt, Townsend, & Poulson, 2009). A variation of modeling is Video modeling, a mode of teaching that uses a video recording to provide a visual model of the targeted behavior or skill such as a greeting. Types of video modeling include basic video modeling, video self-modeling, point-of-view video modeling, and video prompting. Video modeling is an evidence-based practice and has been reported in pre-school through middle school (Franzone & Collet-Klingenberg, 2008). A study by McCoy, Mathur and Czoka (2010) used video modeling paired with visual cue cards to support morning transitions. The children viewed an entire transition routine upon entering the room including preparing to work, greeting others, and space management. The purpose of the cue card was to remind the students of classroom expectations and socially appropriate behaviors. Data were collected using a time sampling procedure during the five minute transition period to identify the extent to which the students followed the transition routine in the morning. The researchers reported positive results using a daily video paired with visual cue cards; however, noted that two weeks of intervention was not enough for this particular group of individuals with ASD.

Peer-mediated instruction and intervention (PMI) is used to teach typically developing peers ways to interact with and help learners with ASD acquire new social skills by increasing social opportunities within natural environments (Neitzel, 2008). Social networking strategies are more appropriate for older learners (i.e., 9 to 18 years of age). Researchers note that PMII has been shown to have positive effects on academic, interpersonal, and personal-social development, and has been the most supported intervention for individuals with ASD (Neitzel, 2008).

Social skills groups are another approach used to teach individuals with ASD ways to appropriately interact with typically developing peers. Social skills groups are often small groups of two to eight individuals with disabilities led by a teacher or adult facilitator. Social skills groups can include instruction, role-playing or practice, and feedback to help individuals with ASD acquire and practice skills to promote positive social interactions with peers (Collet-Klingenberg, 2009).

Barriers to Effective Social Skills Interventions

Current evidence-based interventions such as video-based modeling, face-to-face supports, and one-to-one programs currently have many challenges, including development of individualized programs and access to resources (Cheng & Huang, 2012). A reoccurring problem for many current interventions such as Social Skills Training Groups, Structured Play Group, Video Modeling, and Functional Communication Training require multiple opportunities to learn the behavior. Coordination of people, time, and situations can be challenging if not impossible. Additionally, a compounding challenge is a lack of funding to support repeated trials in an environment that is safe and allows for the individual with ASD to practice managing a schedule, interacting with others, and developing complex communication skills. The impact of current interventions is clear; the field of special education must look at new interventions for older populations.

Limited resources impact current interventions. Availability of videos, funding, equipment, and individual time are a continuing problem (Parsons, 2006). In addition, a substantial amount of time is needed to target a specific behavior, provide constant supervision,

and support to shape the desired behavior (Cheng, 2005). Many programs have demonstrated some success as measured by the acquisition of basic mands or functional communication (Parsons et al., 2011; Zager & Alpern, 2007). However, in many cases, it is difficult to attribute cause to the intervention rather than other external factors, such as increased opportunities for peer interaction, participant buy-in, the uniqueness of each individual, and parent or teacher bias (Durkin et al., 2013; Zager & Alpern, 2007). Finally, social skills typically taught to young children and adolescents with ASD and are not sufficient to meet the social demands of postsecondary education for young adults with high functioning ASD.

Potential of Virtual Environments/Gaming

An array of objectives for communication and socialization underlie current interventions for social skills acquisition, such as facial recognition, emotional recognition, reciprocal communication, and appropriate behavior. Recently virtual environments have generated interest as a medium that may be a promising practice to support social skills acquisition (Parsons & Cobb, 2011; Parsons et al., 2010).

Virtual environments today are diverse and entail sophisticated forms of thinking that include: (a) understanding complex systems, (b) creative expression with digital tools, and (c) the development of social networks used to communicate and collaborate (Gee, 2004; Gee, 2007; Prensky, 2006; Squire, 2005). Virtual environments may circumvent face-to-face challenges for young adults with ASD; experiences in a controlled environment can allow for increased comfort supporting greater access to postsecondary education. Advancements in virtual environments

hold the potential to support social skills acquisition and friendship development that will ultimately increase successful transitions.

Digital technology is rapidly expanding and permeates many aspects of life with the use of computers, handheld tablets, mobile phones, game devices, and other technology, with the majority easily portable (Fullan, 2012). Incorporating technology into daily living allows a user to postulate questions and explore scenarios; connections can be seen in virtual communities with people around the world (Craft, 2012). Virtual environments also include many social platforms such as Facebook, Myspace, Second Life, and LinkedIn; social platforms are used to build connections and help stay in touch with friends (Rybas & Gajjala, 2007). The purpose of social platforms and virtual environments that support interactions with others is to network, establish and maintain friendships (virtually), go on dates, meet new friends, find jobs, and exchange recommendations and news all in the context of a virtual environment (Granic et al., 2014; Rybas & Gijjala, 2007). Individuals can create a profile that is representative of their life or what they would like life to be, they may choose to create an avatar or virtual representation of themselves in some virtual environments or use an actual photograph of themselves. To support sustained communication, virtual environments and social platforms have interactive tools used to build and maintain friendships connecting people from all over the world. These tools allow users to become connected using blogs, forums, notes, message tools, virtual chats, and other digital tools using any computer or portable device.

Young people are dexterous collaborators, navigating digital gaming and social networking with ease; they are capable of generating and manipulating content and experimenting virtually with online social sites and games (Craft, 2012; Durkin et al., 2013).

Levering the attraction of young adults with ASD to technology, a digital virtual environment presents a unique opportunity to explicate social communication skills in terms that young adults with ASD can directly relate to through authentic interactions (Bricker & Bell, 2012; Durkin, 2010; Durkin et al., 2013). Applying the historic lens of social learning theory (Vygotsky, 1978), a videogame can be used to increase social skills in heterogeneous groups. Videogames can be used outside of school as a way to connect academic content and interests in the lives of young adults with ASD and their community; a practice shown to increase learning and engagement (Bricker & Bell, 2012).

Simulations and virtual training are frequently used in multiple professional fields (Carlson, Min, & Bridges, 2009). An integral part of training for the military, the medical field, and businesses is the use of virtual environments and simulations. Practice in simulated settings can be an effective mechanism for developing individual and team skills (Carlson et al., 2009). Simulation activities can occur in a wide array of settings—e.g. in simulation centers, in virtual settings such as *Second Life* or techniques including immersive simulations, as well as single and multiplayer games. Finally, Carlson and colleagues (2009) note that regardless of location and format, simulation is increasingly being viewed as an enabling technology that transcends traditional educational boundaries and allows individuals to acquire the competencies needed for inter-professional practice. This provides support for the need to explore in depth the potential of virtual environments in the education field and specifically for young adults with ASD.

Digital Technology/Gaming

Over the past several decades, researchers show that young adults with ASD are more apt to acquire skills successfully when instruction occurs in community-based and/or naturalistic settings (Alpern & Zager, 2007). With the evolution of technology and digital communication, virtual environments serve as communities that support increased socialization. Emerging literature discusses using virtual environments to teach specific social skills (Cheng, 2005; Parsons & Cobb, 2012).

Researchers show that young adults with ASD are attracted to digital technology including virtual environments, simulations, and videogames (Bricker & Bell, 2012; Durkin et al., 2013; Parsons & Cobb, 2010; Parsons et al., 2011). Digital technology includes social platforms such as social media (Facebook, Twitter, etc.) and other virtual environments (e.g., *Minecraft, Roblox, Second Life, and World of Warcraft*). A virtual environment refers to a digital environment accessed by a computer or portable hand-held device in which multiple people interact. Given the rapid changes in technology-supported communication such as Skype, Facetime, and MMORPGS all provide opportunities to engage in alternative social situations are readily available. These alternative communications include virtual environments that open up a whole new opportunity for young adults with ASD to become engaged in the community.

A MMORPG, one type of virtual environment, can provide multiple opportunities to engage in social conversations. MMORPGs have been researched in terms of the social aspect for typically developing individuals. Videogames and simulations also have a long history of being used for education and training. Some games for specific education content include *Filament Games* which are designed to be specific to science and mathematics, games for

therapy can include *The Self-Esteem Games Project* at McGill University, and games for training can include *Microsoft's Flight Simulator*. The primary objective of MMORPGs is to entertain; however, researchers have noted that social learning is a part of the online gaming experience (Fullen, 2012; Gee, 2006; Granic et al., 2014; Jacobson & Taylor, 2003; Prensky, 2007). Decheneaut and Moore (2005) postulated that the social experiences occurring, and learned in a game, can be applied to other contexts.

To help young adults with ASD transition and be successful in postsecondary education, innovative virtual environments, specifically MMORPGs, hold the potential to support social skills acquisition and interpersonal relationships that may increase college participation and completion. A virtual environment can tie theory and practice, while identifying learning and social skills in a context that may generalize to related careers that rely on virtual interactions (Bricken & Bell, 2012; Craft, 2012; Moore, McGrath, & Thorpe, 2000; Odom et al., 2013; Yee, 2006).

Gee (2007) described gaming as a highly social interaction between player, game, and other participants. Yee (2006) theorized through his qualitative research that every MMORPG player is multi-faceted, experiencing unique social interactions that intersect and influence each other. His examinations of MMORPG psychology included: (a) friendships, (b) relationship development, (c) loneliness, (d) social skills and communication, and (e) demographics. Yee (2006) describes gaming as an opportunity to learn to interact and generalize those skills to a face-to-face setting.

Currently, multitudes of virtual environments are available and many have attributes that are parallel to communication needs for individuals in postsecondary settings, and STEM-related

careers. A plethora of opportunities for social interactions with other players exist, and through these virtual encounters, "situated learning" occurs. Situated learning in the MMORPG include: (a) in game context discussion using the communication infrastructure, this information is on-demand and occurs during the context of the gaming interactions, (b) forums and blogs that are produced and maintained by both the game designer and the players, (c) observations during the game that support social learning, and (d) social opportunities between guilds and players that support exchange of information or direct instruction of skills needed for game play (Prensky, 2001; 2007). The discussions support greater social interactions and exchange of information and gaming strategies that improve group cohesion and build friendships (Ducheneaut & Moore, 2005).

Cihak, Alberto, Kessler, and Taber (2004) noted virtual environments allow teachers to provide individualized instructional opportunities. Numerous iterations for students to experience situations related to functional skills is a specific benefit of a virtual environment, while maximizing time and reducing cost on instructional materials (e.g. food, consumable products) or travel (to appropriate locations in the community or school). Furthermore, access to a virtual environment can be accomplished on portable digital devices or computers and is potentially more scalable than those dependent on additional funding and face-to-face interventions.

Evidence Supporting Virtual Environments/Gaming for Social Skills Development of Individuals with ASD

Gaming demands participants possess certain social tendencies such as self-organization, team work, and sociability; sociability brings humor to the game through "small-talk" on and off line that strengthens the social cohesion of the guild playing together. Parsons, Mitchel, and Leonard (2004) investigated the use of a virtual environment and the acquisition of social skills focused on task completion for students with ASD (n = 12) and students that are typically developing (n = 24). All participants range in age from 15 to 18 years old and had an IQ measured on the Wechsler IQ test of 70 or greater. Participants were shown how to use the virtual environment and complete tasks in another virtual environment before starting the experiment with the *Virtual Café*. Researchers looked at task completion, errors made, basic understanding of the representational quality of a virtual environment, and social appropriateness of performance when managing body space in the virtual environment. In the context of the virtual environment, participants with ASD were able to complete tasks similar to their typically developing peers; however, participants with ASD were more likely to "bump" into others in the virtual environment when compared to the group with typically developing participants.

The researchers noted that participants with ASD may have difficulty navigating through a virtual environment and it would be important to include general measures of navigational abilities. Navigating abilities and challenges may be associated with familiarity with the virtual environment, familiarity with computer or device controls to navigate, or the understanding of the appropriate social space required when interacting with others. The researchers stated there

might be a correlation to social challenges experienced in real world situations and further research is warranted.

Using the *Virtual Café,* Mitchell, Parsons, and Leonard (2007) looked at perception judgments of appropriate body placement in the virtual environment with participants $n = 6$ between the ages of 14-16. All participants had a mean verbal IQ of 81.6, performance IQ of 87.1, and a Full-Scale IQ of 83.1. Participants were asked to review their video and refrain from making the same social errors when completing tasks in four different levels in the *virtual café*. No differences between sessions were found. The researchers noted this was not a unique study to teach social skills, and mentioned that Hadwin, Baron-Cohen, Howlin, and Hill (1996) taught rules about emotion and belief to children with ASD. They identified that learning was confined to the specific domain in which the skills were taught. Several researchers noted it is possible young adults with ASD are simply learning how to pass tasks in the virtual environment given the specific directions and rules (Hadwin et al., 1996; Parsons et al., 2007). Additionally they stated further contextual understanding is necessary.

Nefdt, Koegel, Singer, and Gerber (2010) used a virtual environment to teach self-directed learning in a study with 27 adults caring for young adults with ASD under the age of 60 months. Using a randomized control trial Nefdt et al., (2010) noted a virtual environment would bring the external environment into a safe setting where skills can be learned and generalized to naturalistic settings. Four dependent measures were collected: (a) parent implementation of skills, (b) parent language opportunities, (c) parent confidence, and (d) child communicative improvement. Nefdt and colleagues (2010) reported a statistically significant increase $F = 16.37$ and $p < .001$ with an effect size of 1.28 in communication when using a virtual environment to

teach functional communication skills. A virtual environment potentially increases motivation, understanding of complex and interrelated concepts, and self-regulation because of the immediate and consistent feedback based on gaming principles (Gee, 2007; Prensky, 2006).

In an ethnographic study conducted within an inclusive classroom (grades 4 and 5), Bricker and Bell (2012) reported findings to indicate students (n=20), including those with disabilities, were more interested in learning through digital media, and were more likely to sustain learning time when it was presented in a videogame setting. The researchers discussed using videogames as a tool to teach STEM concepts such as core content, mathematical concepts, and use of technology, as well as time on task in the classroom. Finally, they noted videogame instruction increased motivation to learn new concepts for all students in their study.

Using computer-based video instruction (CBVI), Ayres and colleagues (2009) taught chained tasks without direct teacher support to three elementary aged students with ASD in grades four and five. A multiple-baseline design was used to test the effectiveness of learning tasks in the context of a virtual environment and how they generalized to a home situation. Students with ASD were taught how to microwave a meal in a virtual environment and then were asked to complete the task in a face-to-face setting. Students were exposed to the CBVI for reinforcement and skills practice on the specific task. Prior to moving on to the next specific task, students were required to achieve 90% on task completion when given a task list over three separate trials. All participants showed an increase with task completion for tasks that would be traditionally carried out in a community based or home setting. Due to the nature of single-subject designs generalizability and further statistical analysis were not possible.

Pilot Findings

This study was based on a pilot project conducted by the principal investigator that included three individuals, ages 16-21, with high functioning ASD. High functioning ASD was defined as a person who may fit the criteria of level 1 in the DSM-V of attending general education classes and transitioning to a college setting with minimal support (as defined by the DSM-V, 2014), and having a formal diagnosis of ASD. The pilot study addressed the following research question: What are the social interactions among young adults with ASD aged 16-21 years of age in a virtual environment?

Students in the project had an Individual Education Program (IEP) or Section 504 plan during high school. Participants were male, one Hispanic and two White. All participants used a "gamer"/alias and identified themselves as having ASD or being an "Aspie". An "Aspie" as defined by the participants is an individual with a diagnosis of Asperger's Syndrome. Asperger's Syndrome was considered a more mild form of ASD that has since been removed from the Diagnostic and Statistical Manual – 5 (DSM-V, 2014).

After the transcripts were completed and the coding was verified, three major themes emerged: (1) participants had a large network of friends in an online virtual environment, (2) participants had active engagement in social interactions within teams, (3) participants understood the difference between social rules, as applied to a virtual environment, and face-to-face environment. The three participants Auden, Austin, and Taylor all described socially interacting with friends after school. For example, Auden a 16-year-old White male in grade 10 with an IQ of 112 and ASD spends time after school playing video games and enjoys talking on Skype with people he met while playing the video game *Minecraft*. Auden discussed his friends

and informed the researcher that he had never met the majority of the people he interacted with in *Minecraft* or *World of Warcraft*. Auden noted that he enjoys working with others to complete quests, raids, and battles. Auden, like Austin (participant two), does not like to talk to people face-to-face, and finds it easier to talk to people over a virtual medium.

Austin, participant two a 17-year-old White-Hispanic male in grade 11 with an IQ of 109 and ASD, stated, "I have twenty or thirty friends; but, maybe only three or four and only actually one if you count my face-to-face school friends." He explained that many people know him and he enjoys talking to them; however, they find him annoying. Austin's mother hopes he will live independently but is unsure of his ability to socialize and maintain appropriate conversations with people in a face-to-face environment. Austin is capable of holding virtual conversations through Skype, Facebook, Facetime, or ooVoo; however, he is not comfortable using the telephone and struggles with group and individual face-to-face conversations.

Taylor (participant three) a 19-year-old White male in grade 12 with and IQ of 134 and ASD, stated that people do not understand him well enough to talk to him so it has stopped him from getting a job, finishing high school, or continuing on to college. Taylor said his only friends are gamers, and he frequently speaks to people all over the world in the context of his MMORPG *World of Warcraft*. He has recently started spending time at a game shop and interacting face-to-face with some of his friends from his local guild. A guild as defined in the medieval times is an association of craftsmen or merchants, often having considerable power (On-line Merriam-Webster Dictionary, 2014). A guild as developed in a MMORPG is often an association of people with similar interests or pursuits. Guilds are formed to make grouping and raiding easier and more rewarding, as well as to form a social atmosphere in which

to enjoy the game (*World of Warcraft* WIKI, ND). Many forums and blogs are available for individuals to become part of a guild to complete specified goals in the game. Taylor has been able to develop friendships online within the game and now feels comfortable to go to the game shop and attend gaming events including *Megacon* held in Orlando. Taylor does not use the telephone often and prefers to talk to people over Skype, Facebook, Facetime, or through the game in a chat-room.

Summary of Chapter Two

The Internet can be a useful tool and serve as a mode of service delivery that is meaningful, appropriate, and motivating for students with ASD. Additionally, it has been suggested that using computers may create an environment for learning that appeals to young adults with ASD in order to learn functional and social communication (Sansosti, Powell-Smith & Cowan, 2010; Parsons, 2011). Many of the skills needed to be successful in postsecondary settings and STEM careers are parallel to social skills used in a virtual environment. These skills can include socialization, working in groups and recognizing cultures, and active communication.

Several studies have addressed communication disorders and needs of young children with ASD, few have addressed communication needs of adolescents and young adults with ASD (Mintz et al., 2012; Schall, Cortojo-Doval, Targett, & Wehman, 2006). Persistent language deficits make it difficult for adolescents and young adults with ASD to participate in peer conversations, take another's perspective, and engage in collaborative academic exercises (Alpern & Zager, 2007; Marino & Beecher, 2010; Seltzer, Krauss, Shattuck, Orsmond, Swe, & Lord, 2003). However, virtual environments remove barriers and allow a potential increase in

communication that may support relationship development. Two primary challenges for young adults with high functioning ASD are advanced social communication skills and the ability to develop interpersonal relationships (Brinlon, Robinson, & Fujiki, 2004; Kemp et al., 2013). The challenges with advanced language skills and lack of relationship development can be seen in vocational settings for those holding employment (Alpern & Zager, 2007). Building social skills in an environment that young adults with ASD are comfortable with and are motivated to communicate will allow the development of communication and relationships that may generalize to outside of the virtual world.

To date, no researchers have systematically investigated the impact of virtual environment-initiated friendships on the postsecondary education experiences of students with ASD. Further, there is a gap in the research related to the reasons why adolescents and adults with high-functioning ASD engage in online gaming, MMORPGs, and other digital social environments as it relates to postsecondary education transitions. Additionally there is a distinct lack of research and supports for adolescents and adults with ASD that support interpersonal relationships, postsecondary transitions specifically in the area of STEM, and social skills acquisition. And finally, there are no studies exploring how virtual environments and the social skills used in the gaming community can be used to support postsecondary transitions specific to STEM education and careers for young adults with ASD.

CHAPTER THREE

The purpose of this chapter is to describe in detail the methods that were used in this research. This study proposed a phenomenological design to explain the social experiences of young adults with ASD as they engage in virtual environments or massive multiplayer online role-playing games (MMORPG). Five participants with high functioning autism (HFA) between the ages of 18-24 were selected from a large urban university based on their enrollment in a science, technology, engineering, or mathematics (STEM) track and enrollment with the Student Disabilities Services. One participant was recruited from each of the following undergraduate programs: science, technology, engineering, and mathematics. A series of structured and unstructured interviews were conducted lasting between 30-65 minutes with each of the participants. Observations of online gaming events were conducted and analyses of relevant online websites and forums recommended by participants were completed. Analyses of the data were conducted using emergent coding and presented through identification of common themes found during the social experiences. This study builds on the results from a pilot study with three individuals aged 16-21 years not yet attending college or living independently. This adds to the current body of knowledge to support the needs related to post-high school transitions for young adults with ASD. The chapter concludes with a discussion of issues related to trustworthiness and limitations of the study.

Theoretical Support for the Proposed Study

The researcher employed a phenomenological research design. The primary objective of a phenomenological study is to explicate the meaning, structure, and essence of the experiences

of a person or group of people related to a specific phenomenon (Christensen, Johnson, & Turner, 2010; Creswell, 2013). Data collected were designed to encourage participants to identify multiple, contextually-relevant perspectives of their experiences (Hayes, 2011). Group sizes in phenomenological research vary from 3 to 25 individuals, depending on the amount of information required to reach saturation levels (Bloomberg & Volp, 2012; Creswell, 2013; Hayes, 2011). Saturation was met with five participants within this study when no new information was presented, and common themes emerged among all the participants (Creswell, 2013).

The phenomenologist attempts to understand human behavior through the eyes of study participants, referred to as *verstehen* (Bloomberg & Volp, 2013). *Verstehen* is German for the interpretive understanding of human interaction (Bloomberg & Volp, 2013). This study used the transcendental phenomenology approach, which required that the researcher set aside prejudgments through bracketing and systematic procedures for analyzing data. This particular study required an exploratory design in nature to describe in depth the social experiences of a specific group of young adults with ASD attending a large urban university enrolled in a STEM track that also played MMORPGs.

Qualitative Design using a Phenomenological Approach

The study focused on describing experiences and themes that all participants shared as they socialized in the context of an MMORPG. Other experiences included face-to-face socialization during interviews, observations during gaming sessions, and analyses of websites the participants used to support their gaming and social interactions. Participants were asked to

discuss social interactions when they are not playing the game including the primary reasons for involvement with online games. Back-and-forth dialogue during gaming sessions was described in the form of chat boxes or a headset to interact using a calling feature in the game during group game play. These multiple sources of data were analyzed to explain social interaction within MMORPG settings specific to young adults with ASD.

Sampling Procedures

For the purposes of this study, high-functioning autism was defined following the SDS guidelines as an individual with a standard high school diploma, capable of obtaining a college degree, with an IQ of 70 or greater, and with a formal diagnosis of ASD. No two individuals with ASD are alike, and currently there is no consensus as to the definition of high functioning ASD (Lai, Lombardo, Pasco, Ruigrok, Wheelwright et al., 2011; Ozonoff, South, & Miller, 2000). The DSM provides a categorical approach to low and high-functioning and several explanatory models for symptoms exist, yet they do not provide a full explanation for the multiplicity of clinical presentations for ASD or for all the core symptoms (Tyson & Cruess, 2011). Prior to the revisions of the DSM –V, Asperger's syndrome was recognized as a more mild form of ASD and often considered "high-functioning" ASD; however, Asperger's Syndrome has since been removed.

Participants for this study were identified through the Student Disability Services (SDS) office on the campus of a large urban university. The researcher contacted this office after the Institutional Review Board (IRB) (see Appendix E) approved the research. The inclusionary criteria for student participation in the study were: (a) student must have a diagnosis of ASD, as

confirmed by registration with the SDS, (b) student must play a MMORPG, (c) student must be enrolled in a STEM track as defined by the university's catalog, and (d) student must be in the first two years of their program (3-60 credits). For the purposes of this study, students with high-functioning autism as reported in the literature have an average cognitive ability, or an IQ of 70 or greater. (Tyson & Cruess, 2011).

The researcher contacted potential participants via electronic mail that met these criteria and offered a $25.00 Visa Debit Gift Card for participation. One attempt was made and nine potential participants responded. Five were selected from the initial nine, because the other four stated that their schedule did not allow for interviews and observations during the spring semester. The selected five participants completed all components of the research.

Participants

The five participants selected from the initial pool were three males and two females between the ages of 19-24. The five selected represented the criteria established and had maximum differences among characteristics. Each was assigned a pseudonym. In addition, the five selected participants appeared to have the maximum time and gaming opportunities for this research. All participants lived in a dorm setting with roommates at the university. In addition, there was one participant from each major: science, technology, engineering, and mathematics (see Table 2). Potential tracks could have included biology majors, mechanical engineering, biomedical sciences, computer science, mathematical science, modeling and simulation, physics, data mining, or a STEM educational program such as K-8 mathematics and science Master's in Education (M.Ed.) programs.

Spruce P-1

Spruce P-1 is a 23-year-old Caucasian male diagnosed with Autism and Attention Deficit Disorder (ADD). He graduated from high school with a standard diploma and with an IEP which required services for social and emotional skills and functional living skills. Spruce P-1 is a third year college student enrolled as a sophomore. Spruce P-1 lives in a dormitory setting with one other roommate. He is currently enrolled in two classes, Zoology and Biology.

Sequoia P-2

Sequoia P-2 is a 24-year-old Caucasian male diagnosed with Asperger's Syndrome, Autism, and ADD. He graduated from high school with a standard diploma and completed two advanced courses. His IEP in high school required services for social and emotional skills and functional living skills. Sequoia P-2 is a second year college student enrolled in applied mathematics with a focus on statistical analysis. Sequoia P-2 lives in a dormitory setting with one other roommate. He is enrolled in two classes, Calculus with Analytic Geometry I and History of Mathematics.

Redwood P-3

Redwood P-3 is a 22-year-old Caucasian female, diagnosed with ASD, ADHD, a hearing impairment, and Alports Nephritis. Redwood P-3 completed high school with a standard diploma. She had an IEP which required services for social skills, medical care for Alports

Nephritis, and services such as an in-class note taker. She is in her first year of college and lives in the dorms. She is enrolled in Biology and English I.

Aspen P-4

Aspen P-4 is a 19-year-old Caucasian female diagnosed with Autism and ADHD. Aspen P-4 completed a General Education Diploma (GED) after being removed from public school for violent behavior (e.g. repeatedly throwing chairs at people and teachers). Aspen P-4 spent one month in the juvenile detention and rehabilitation center in New Mexico where she worked on her GED. While in the public school setting, Aspen P-4 received services for emotional and social behavior, executive functioning, and reading comprehension. She is in her first year of college pursuing a degree in computer technology. Aspen P-4 is enrolled in two courses, a computer design class and English I.

Maple P-5

Maple P-5 is a 19-year-old Caucasian male diagnosed with ASD and ADHD. He is enrolled as a second year freshman in computer engineering major. Maple P-5 finished high school with a standard diploma with an IEP containing goals focused on social and emotional skills. In high school, he was enrolled in all advanced or honors courses for mathematics, science, and history. He is enrolled in two courses, pre-Calculus and a computer design class.

Table 2
Participant Demographics

Participant Code	Pseudonym	Years in College	Declared Major	Gender	Age	Diagnosis	Ethnicity
P-1	Spruce	3	Biology focus: Zoology	Male	21	Autism, ADD	Caucasian
P-2	Sequoia	2	Mathematics focus: Statistical Analysis	Male	24	Autism, ADD	Caucasian
P-3	Redwood	1	Biology focus: Biological Engineering	Female	22	Autism, ADHD Alports Nephritis	Caucasian
P-4	Aspen	1	Technology focus: Computer Design	Female	19	Autism, ADHD	Caucasian
P-5	Maple	2	Computer Engineering	Male	19	Autism	Caucasian

Research Design

The researcher used a phenomenological approach. Interviews, observations, field notes, analytic memos, and document analysis as described below were used to identify codes and common themes (Creswell, 2013; Hayes, 2011). All participants were assigned a pseudonym and a letter-number code to maintain confidentiality and to allow more in-depth disclosure of feelings and attitudes (Creswell, 2013; Hayes; 2011; Simon & Goes, 2012). Data analyses were conducted through bracket assumptions that identify non-repetitive and non-overlapping statements with interviews and transcripts. The transcripts reflected textural and structural descriptions of the experiences (Creswell, 2013; Hayes, 2011). Trustworthiness was developed

through member-checking, triangulation of data sources, the researcher's journaling, and thick descriptions of the participants and the setting (Bloomberg & Volp, 2012; Creswell, 2013). Triangulation included comparing interview transcripts, document analysis, and observational notes to identify reoccurring themes. The resulting data are presented through a list or model of constructs that relate to textural and structural descriptions in Chapter Four.

Data Sources

The collected data reflect the multiple realities that exist and thoroughly reflect participant perspectives in contextually relevant ways (Hayes, 2011). As mentioned, data sources included interviews, observations, document analyses, and a self-reporting survey related to social interactions within online interactions.

Interviews

Semi-structured, in-depth interviews were conducted with five participants on an individual basis using the protocols in Appendix A. The researcher had an interview protocol. However, follow-up questioning with each participant was conducted by asking clarifying questions, seeking details, and asking for stories or examples related to the question (Seidman, 2006). Interviews lasted between 30 and 65 minutes and were conducted in a conference room at the university or public library. All interviews were audio recorded and transcribed verbatim.

Observations

Observations are an essential part of qualitative research and include collecting data to note a phenomenon in the physical setting by the researcher. Observations may include broad data and focused on the specific research question (Creswell, 2013). Finally, observations serve as a method of collecting data to describe in detail the phenomenon occurring (Hayes, 2014).

Observations were completed for online gaming events that the researcher attended. There were multiple observations completed by the researcher of the actual gaming experiences by the participants. The initial gaming quest lasted approximately 13 minutes. This specific battle was a weekly battle against the in-game boss. After the guild completed the battle against the initial boss, they proceeded through the game to complete other quests related to each individual's specific goals in the game lasting 94 minutes. Finally, the guild transferred over to their game development project for their specific guild which lasted an additional 62 minutes. The team or guild worked together to complete an animation for the game. The animation is part of another in-game project that requires collaboration of a guild.

Data collected from the observation included:

- Thick description of the setting and social interactions
- Chat boxes with conversations depicting social interactions
- Descriptions of what participants' conversations while gaming included descriptions of gaming events and non-gaming events such as personal social conversations see Appendix B for the observation protocol.

Information about the technical infrastructure was included and a description of how it is made accessible to participants and the physical, material conditions under which they access the Internet was included.

Self-reporting

Additional data were collected through a self-reporting questionnaire to document the number of hours played each week and the number of social interactions (e.g., phone calls, text messages, Skype or Google+ hangouts, or meetings/social interactions outside of the game). The information included initiated and reciprocal communication. This information was solicited using one weekly prompt from the researcher, which was delivered through email and verbally verified over Skype. The researcher analyzed the data collected from the self-report surveys in order to determine the number of hours each participant played to establish a pattern of interaction for those in the study. See Appendix D for more information on the self-reporting tool.

Document Analysis

In addition to interviews, self-reports, and observations, document analyses of online blogs relevant to the phenomena as suggested by the participants were analyzed. The researcher asked participants to provide relevant websites to their gaming and socialization within gaming. The sites included blogs and forums such as: (a) http://www.meetup.com/WOWorlando/, (b) http://www.liquidhearth.com/gatherings/681-orlando-fireside-gathering-echo-at-canvs, and (c) http://www.liquidhearth.com/gatherings/

Setting of the Research

Three interviews took place in a small conference room inside the library (see Figure 2a for a drawing of the setting) of a large urban university and two took place at the local public library inside a conference room (see Figure 2b for a drawing of the setting). Both settings were quiet and allowed the researcher and participant to focus without distractions.

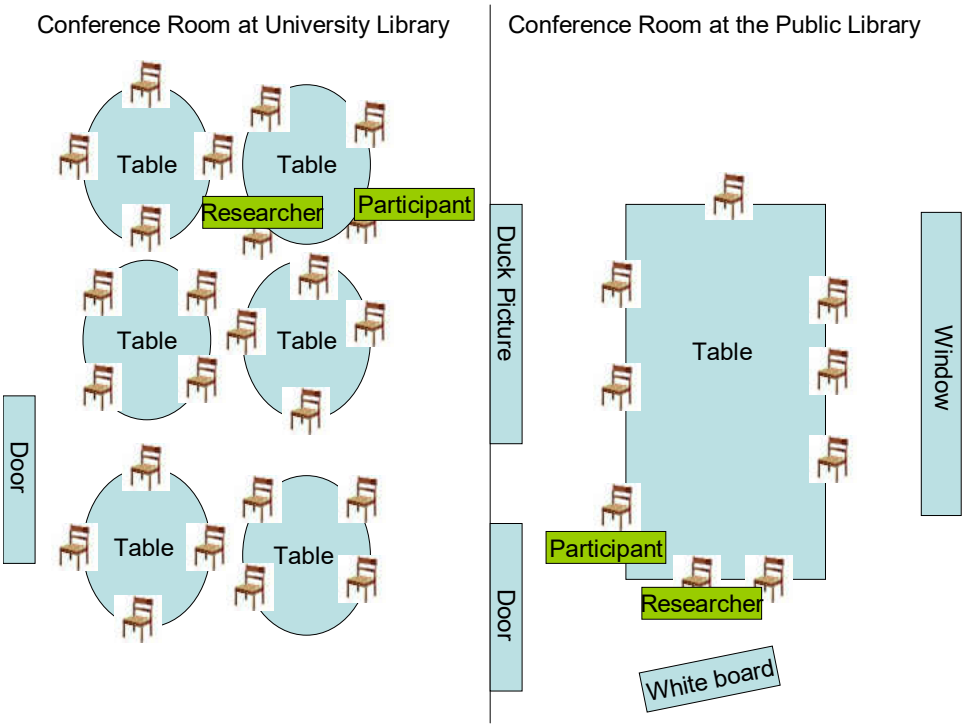


Figure 2: Interview room furniture setup

Data Analysis

Data were collected, transcribed, and coded from the interviews. The data from the observations were collected by recording the verbal exchanges through Skype. The observations were recorded by having the researcher log in to the computer which allowed for audio recording to be collected through a microphone and iPad. All interviews were recorded using an

application on the iPad called *Recorder.* All interviews and observations were then coded following the Modified Van Kaam method (Moustakas, 1994).

Data analyses began after the first data were collected from the interviews. Analyses consisted of bracket assumptions that identify non-repetitive and non-overlapping statements with interviews and transcripts. Margin notes were taken to interpret the social experiences of the participants. Margin notes depicted different types of information that were used for coding data (see Appendix G). Transcripts reflected textural and structural descriptions of the experiences (Creswell, 2013; Hayes, 2013). Reduction and analysis of specific statements was used to tease out overarching themes (Simon & Goes, 2012).

Throughout these processes of data analyses, the researcher conducted member checking and an audit trail in order to ensure that no misinterpretation of the participants' views or comments had taken place. Member checking is a process whereby participants are provided with transcripts or summaries of interviews to allow them to correct any inaccuracies (Creswell, 2013; Hayes, 2013). Participants reviewed the notes, analysis and interpretation, and transcriptions to ensure accuracy and trustworthiness. All interviews were transcribed verbatim. The transcripts, along with the researcher's comments, were sent via email to the participants. Participants were given time to read the transcription and provide any additional feedback or reflections based on the comments of the researcher. Participants were also given the opportunity to correct any of the transcriptions to reflect what they intended to say in the event that a word or phrase was missed in the transcription process. All five participants reviewed the transcripts and comments and verified any changes with the researcher.

An audit trail is used to document events, influences, and actions of the researcher throughout the research process allowing others to assess the significance of the research (Creswell, 2013; Pereira, 2012). An audit trail makes the key decisions transparent and is used to assess the trustworthiness of qualitative studies throughout the research process (Creswell, 2013).

Data Reduction, Organization, and Analyses

Once the interviews were transcribed and reviewed by the participants, analysis was conducted using Moustakas' modified Van Kaam method (Moustakas, 1994). Moustakas' analysis method was used in conjunction with emergent coding to organize and code text gathered from all young adults with ASD through interviews (see Appendix F for a description of Moustakas' steps). Moustakas (1994) transcendental or psychological phenomenology is focused less on the interpretations of the researcher and more on a description of the experiences of participants. Each statement made by the participants was listed and considered as having equal value. Moustakas refers to assigning equal value as horizontalization (Moustakas, 1994). Once all transcripts are listed, the statements were read again to eliminate any repetitive or vague language.

Reduction and Elimination

The central phenomenon in this study was social experiences in virtual environments specific to young adults with ASD. Moustakas' suggested next step in the analysis process was used to determine if a statement was pertinent to the research question and the experience of

socialization in the context of a virtual environment. If the statement contained relevant social information pertaining to the experience and could be abstracted and labeled or coded, the statement was considered an invariant constituent. If the statement did not reflect the social experience or was irrelevant to the research question, it was not included in the analysis. For example, one participant expressed her inability to stay on target during interviews or conversations due to a tendency to provide comments and information prior to presentation of a question and a desire to read the chat log before moving forward. These data were not included in the data set for analyses.

Descriptive codes were given to each constituent. Similar constituents were merged or new labels given to more accurately reflect the specific social experiences in a virtual environment. Labels used were verified against each participant's transcript to check for accuracy and relevancy to the experience. This process produced a total of 15 codes that reflected the experiences of social interaction in a virtual environment. After identifying invariant constituents and generating labels for each line of text, an external check by an outside source was used to review decisions about codes and groupings.

Clustering and Thematizing

Clustering the invariant constituents was the next step in the analysis process suggested by Moustakas (1994). Clusters were formed from the similarities between descriptive labels for each invariant constituent as they related to the research question. The identified labels were combined to form final themes in the research. Emergent coding was used to help identify and confirm themes. Five main themes emerged from the thematic codes: (a) seeking social

interaction and defining friendship and overcoming challenges to include barriers to friendship, (b) comfort in socializing through a virtual environment, (c) roles in life, increased socialization and friendships, (d) emotional awareness, and (e) skills learned and generalized. (See appendix H) The themes from codes listed, and Table 3 describing the coding relationships depict the relationship between the research question, clusters of thematic labels, and development of the final themes.

Table 3
Coding Relationships

Color	Initial Codes Identified
Blue	Comfort and safety of socialization
Puke Green	Barriers to socialization and interaction
Red	Challenges with the game socialization
Pink	Socialization in the game
Yellow	Friendships
Grey	Self-perceptions of interaction
Teal	Skills Learned
Purple	Management of frustration
Underlined & Bold	**Personal perception of videogames**
Rust	**Socialization and life roles/rules**
Yellow with Blue	Friendship perceptions
Pink and Blue	**Perceptions of social communication and technology to communicate**
Blue bold	**Perceptions of social communication**
Purple and black	Friendships and interactions outside the game
Green	Emotional Recognition

Validation of Invariant Constituents and Themes

Final identification of themes was validated against the interview text of each participant to ensure they were comparable to the experiences of the participants and validated with a

second researcher. A second researcher read the researchers field notes and asked questions to help the researcher examine assumptions and consider alternative ways of looking at the data through a process called peer debriefing (Bloomberg & Volp, 2013). To further validate the findings, the researcher had a colleague code several interviews to establish inter-rater reliability. "Inter-rater reliability is the process of checking on the consistency between raters which reduces the potential bias of a single researcher collecting and analyzing data." (Bloomberg & Volp, 2013 p. 113). Each invariant constituent was explicitly expressed within the text or found attuned with the social experiences described by the participants (see appendix H for identification of themes).

Individual Structural Descriptions

Structural descriptions are interpretations of the underlying dynamics of the social experience. The structural descriptions provide an interpretation of each participant's thoughts, feelings, and emotions regarding the social experiences in a virtual environment. The essence and deeper meaning of the experience for each participant is a synthesis of textual data and observational field notes, interviews, and other non-verbal cues during each interview (see Appendix G).

Textual-structural Descriptions

Developing composite descriptions is the last step in Moustakas' modified Van Kaam data analysis procedure. These descriptions provide a synthesis of the textual and structural meaning and create a common understanding about the essence of the phenomenon associated

with the participants and their social experiences in a virtual environment. For this study, the composite descriptions provide the essence of socialization in the context of a virtual environment (see Appendix H).

Trustworthiness Process

Emergent coding was used due to the ambiguity of the data collected (Creswell, 2013). The study was exploratory in nature and yielded challenges to predict the type of information that was gathered. Therefore, findings were coded using emergent coding by following Moustakas' modified Van Kaam's model (see Appendix F). Codes and themes were reported in lists and tables. Direct quotes were used to ensure trustworthiness of information presented. All data sources are confidential, with pseudonyms and letter-number assignments.

In qualitative research, trustworthiness is developed through efforts put in place by the researcher to assess the degree to which the information is measured and describes the phenomenon under study (Bloomberg & Volp, 2012). An audit trail, member checking, and verifications by a second researcher support trustworthiness and triangulation (Bloomberg & Volp, 2012; Creswell, 2013) of this research. Member checking was completed to ensure that accurate representations of findings were reported in chapters four and five. Participants reviewed their transcripts and interpretations with the researcher via email and Skype to ensure trustworthiness and accurate representation of experiences.

Coding was verified with a second researcher supporting the research to ensure trustworthiness. Coding was discussed and reviewed, and differences in interpretations were reconciled through discussion of the transcripts, margin notes, and the researcher's audit trail

(Bloomberg & Volp, 2012; Creswell, 2013). Inter-rater reliability refers to the stability of responses to multiple coders of data sets and "refers to the extent to which two or more independent coders agree on the coding of the content with the same coding scheme." (Creswell, 2013, p. 253). The researcher worked with a colleague to discuss codes based on the main idea of the statement. The codes were then discussed in relation to the research question and assumptions defined for this research. Inter-coder reliability was met for 100% of all the codes and themes. Finally, the data are presented through lists and tables of constructs that relate to textural and structural descriptions and direct quotes from participants are included in chapter four to further establish trustworthiness.

Ethical Considerations

The Ethical Standards of the *American Educational Research Association* (2011) were adopted in 1992 and revised in 2011 to provide guidance to education researchers in their research, teaching, service, and related professional work. Permission for this research was obtained by the Institutional Review Board from the University of Central Florida in March 2014 (see Appendix E), for the pilot study to this dissertation and was amended to support the current research. An amendment was filed to add additional participants and locations after approval by the dissertation committee (see Appendix E).

Ethical considerations specific to this study included: (a) confidentiality of participants, names, gaming names, and other identifiable information in the virtual environment, and (b) participants ability to answer questions appropriately given their social-communication challenges related to having an autism spectrum disorder. The researcher is a parent of an

adolescent with ASD and in the event that the researcher felt the participant could not answer the question or felt uncomfortable with the question, the question was modified or eliminated.

Limitations

The limitations of the study involved participant sampling and lack of theoretical construct saturation. Research quality is heavily dependent on the individual skills of the researcher and more easily influenced by the researcher's personal biases and idiosyncrasies (Creswell, 2013). Rigor is more difficult to maintain, assess, and demonstrate and issues of anonymity and confidentiality can be problematic when presenting findings as findings are specific to each individual and collectively as one group. Finally, qualitative research includes a large volume of data making analysis and interpretation that can be time consuming (Creswell, 2013).

Also, phenomenological studies are highly involved and paint a rich picture of the phenomenon occurring. Therefore, participants were selected using purposeful sampling to ensure that participants accurately represent the studied phenomenon (Creswell, 2013). Participant sampling yielded a homogeneous group which limits diverse perspectives. Also, challenges can arise with the amount of information that individuals are willing to share. Lastly, the biases from the researcher can be potentially challenging. However, bracketing procedures during interviews were completed to identify biases (Creswell, 2013).

Chapter Three Summary

This chapter explained the methodology used in this study. Emergent coding was used with Moustakas' modified Van Kaam's method. Coding and clustering were used to identify four major themes. Trustworthiness is discussed through triangulation of data. Finally, ethical considerations and limitations to qualitative research and this specific study were discussed.

CHAPTER FOUR

Introduction

The purpose of this phenomenological study was to describe the social experiences of young adults with ASD related to their interactions in a virtual environment. This chapter is organized in terms of the specific research question posed in this study:

1. What are the social experiences of young adult college students with ASD, enrolled in a STEM track, who participate in online gaming environments (MMORPG)?

The central phenomenon of this study was the social interactions of young adults communicating with multiple people and developing relationships in a virtual environment related to social skills necessary for future employment opportunities, specific to careers within the STEM professions. The researcher first reports definitions of friends as defined by the participants. Next, specific barriers to friendship are discussed along with overcoming barriers to socializing by using a virtual environment. Then, emotional recognition is discussed as it relates to the participants perceptions of social interactions, and finally, roles in life are discussed as they relate to the participants perceptions of social interactions in the MMORPG and generalization to real life. Not all five participants discussed and contributed specific data within each of the codes that comprised the five themes. See Appendix H for a sample that indicates the number of times a sentence was coded for each participant.

Data Analysis Results

Based on the fifteen codes that were identified (see Table 3 in chapter three), five main themes were identified (See Appendix H): (a) seeking social interactions and defining friendship

through overcoming challenges and barriers to friendship; (b) comfort in socializing; (c) emotional recognition; (d) identifying roles in life; and (e) skills learned and generalized.

Theme One

Seeking Social Interactions and Defining Friendship

One of the themes, when examining the social interactions of young adults with ASD in virtual environments, was defining an essential meaning (Creswell, 2013) of friendship through seeking out social situations in a virtual environment. All of the participants described a desire to socially interact and engage in friendships primarily through virtual environments. Of the 703 coded sentences that comprise the themes, friendship was discussed 182 times. An overwhelming 26% of the coded sentences from all five participants were focused on friendships. The primary and overriding finding of this study is that friendships are an important part of daily activities and through friendships and interactions in a virtual environment, young adults with ASD described friendship as not only important, but a necessary part of their daily interactions. This finding is highly significant in terms of 100% of the participant's defined friendship, actively sought out friendship, and actively sought social interactions that increased their friendships. When compared to the literature, emerging research only states some individuals with ASD seek a friend.

Based on participant descriptions, there appear to be a strong connection between virtual environments and social interactions in a virtual environment that support friendships both in and out of the virtual environment. Through gathering a definition of friendship from each participant, friends were defined as:

> "Friendship is probably a mutually beneficial interaction between two people where they care and there is a mutual feeling of trust. There has to be overlap. Ideally friendship has to benefit both parties, has to have some shared core values, and some degree of trust involved." (Sequoia P-2)

Collectively, friendship was described as a community of interactions and socialization that primarily occurred within the context of a virtual gaming environment, but also carried over to a face-to-face setting. Qualities of friendship were discussed in terms of support, trust, humor, and reliability.

All participants described using the virtual environment as a way to bolster friendships, to get to know people better, and to develop a level of trust that was easier for them than in a face-to-face setting.

> "Well, I think that some of them I realize would be quite nice people, amazing, and I would consider them friends and would want to meet them. Meeting face-to-face is a different kind of friendship. But once you go online, it is a different way to make friends and a different way to communicate and be friends. Sometimes you have friends in ways that you would never consider. A friend to me is the same in any other way. So, I meet this guy. We have some sentences together like, "oh hey". We bump into each other in the hall, which is like an acquaintance. But online, that becomes a blossoming friendship." (Redwood P-3)

All participants described friendship as sharing core values that were important to maintaining a friendship as well as having it be mutually beneficial. In addition, they discussed

using the MMORPG as a platform to buttress communication from. They were able to quickly identify common interests and felt encouraged to socialize within the game to complete specific tasks requiring more than one player. Descriptions included a level of familiarity and enjoyment with consistently "seeing" the person online as consistency of the interactions, whether in the same room virtually or face-to-face without verbal exchange, was described as important. The multiple interactions within the game allowed the participants repeated opportunities to engage that ultimately gave them the time they needed to learn how much they enjoyed interacting with others. In addition to learning how they enjoyed socializing, all participants also described learning how they wanted to be treated within the gaming environment and real life.

As participants painted a rich picture of socialization in an MMORPG they described engaging in several interactions over a period of time that allowed them to develop trust, learn to express their emotions, and recognize when their friend was feeling a variety of emotions. Participants described being able to quickly identify common interests and felt encouraged to socialize within the game to complete specific tasks requiring more than one player.

Based upon how participants perceived their daily interactions, they would use the environment to socialization and appropriately react to their day. For example, online social interactions could help the participants relieve frustration, engage in more positive thoughts, and socially interact. Online friendships also supported daily interactions outside of the game, such as managing stress, anxiety, and comfort interacting in a face-to-face setting. One participant stated:

> "Like, I feel that socialization is really important to allow you to consistently reframe and cope with new experiences. And I can tell you from personal

> experience that the impact [lack of social interaction] on my personal psyche and my mental health and wellbeing was disastrous: like it was not good." (Sequoia P-2)

These were described as learning to cope with different emotions throughout the day to include their moods, success in their transitions to independent living, and other face-to-face interactions. Friendships were described as a support mechanism. Based on their descriptions of friendship, the participants illuminated the importance of reciprocal communication, support, and interactions that may be important to the other person.

Barriers to Friendship and Socialization

The definitions of friendship provided by all the participants led to an identification of how the participants socialized in the context of the virtual environment, the importance of virtual interactions for them, and barriers associated to socialization. All five participants (100%) expressed barriers to developing friendships and socialization. Forty times during the interviews, participants described having challenges interacting. However, to resolve the barriers, they followed up by discussing comfort with social interactions in an online environment. Comfort with virtual interactions was supported by interactions through their avatar. The avatar provided a level of anonymity that allowed them to feel more comfortable with themselves, socializing and overcoming barriers in a virtual environment. Challenges with interactions included anxiety, challenges interpreting social cues, travel, and conversational nuances. Even though only 7% of the coded interviews were dedicated to comfort using virtual environments,

data support the overall barriers to socialization. Twelve percent of the coded interview data were dedicated to barriers with socialization and friendships.

Several barriers to friendships exist. All participants identified obstacles that impeded their social interactions within a face-to-face setting. Participants described having anxiety with travel, weather conditions, understanding direction, and interaction with people in public, specifically on the public bus, interacting with large groups or navigating through large groups and struggling with understanding facial expressions. These challenges hindered their willingness to socially engage in a face-to-face setting.

> ”I have a lot of discomfort with traveling, and I have issues with directions and that. So I have a GPS and that but traveling from point A to point B is something that can cause me a lot of anxiety” (Sequoia P-2)

Another barrier to and challenge faced by all participants was a distinct distain for using a hand-held phone or cellular phone. All participants described using virtual environments, Skype, Ventrilo, Google+ hangouts, or chat room associated with videogames to get to know other people in place of communicating over the phone. When describing a web of social interactions and development of friends, participants were able to speak freely, connect with others, and learn to accept themselves for who they are which had been a barrier to face-to-face socialization.

Participants were able to identify barriers to interactions within face-to-face settings and described overcoming them with Skype, Google + hangouts, Ventrilo, or another online communication platform. Two of the five participants use Skype, one of the five used Google+ hangouts and two of the five participants used Ventrilo or Face Time.

Discomfort with Real World Interactions

Each participant described, at length, barriers they faced when attempting to interact in a face-to-face setting. These barriers included self-perceptions, travel, and anxiety that prohibited them from seeking additional face-to-face interactions. Forty-six times participants described wanting to socialize, but struggled due to the identified barriers such as anxiety, stress, travel on public transportation, independent driving, interacting within large crowds, not understanding social cues, and being bullied, or called names such as weird. One specific example was, Maple P-5 mentioned many times that he perceived himself as weird.

> "People think I am weird, and I don't speak up often about things I think are bad or could be modified. Because when they say mean things in a virtual game, you don't get punched so it's ok to say how you feel. But in real life, people can be mean, so why should I talk to them?" (Maple P-5)

Redwood P-3 described herself as a potato. Each participant had a description based off of a face-to-face interaction they had that had increased their resistance to socially interacting unless they had the chance to get to know the other person in a virtual environment.

Finally, the participants described challenges interacting with peers and other people in a face-to-face environment because of their perceived perceptions. All participants were hesitant to speak out in their college classes.

The participants described repeated interactions that had failed in a face-to-face environment that had augmented their lack of desire to interact. The specific challenges discussed were an increased level of anxiety when interacting with a large group of people, traveling from point A to B, and then managing social conventions in group conversations.

Overcoming Barriers to Socialize Using Virtual Environments

Participants used MMORPGs and virtual environments as a way to overcome barriers to travel. In place of travel, they meet up virtually and engaged in game play and saw each other by using Skype or Google+ hangouts. The virtual environment was described as a realm of interactions that is similar to face-to-face interactions; however, as described by the participants, a virtual environment presented an opportunity to socialize, develop and maintain friendships, and create a support network that allows them to overcome challenges often associated with socialization for individuals with ASD.

The ability to make friends in a virtual environment was repeatedly discussed by all participants. All participants noted that it was easier to interact in a virtual environment rather than in a face-to-face setting. Participants felt as if they could sustain a friendship without ever meeting the person face-to-face.

> "Uh no, I would say not, especially in the digital age I would not say it is a necessary requirement. I mean we see people face-to-face now without even meeting them in real life. We have Skype, Google+ hangouts, and things like that." (Sequoia P-2)

Friendships built in a virtual environment, as a result of the social interactions in the MMORPG, were described as opportunities to develop a stronger more intimate relationship because each person within the guild or clan had multiple opportunities each week to interact with each other. Participants described periods of their life when they had limited social interactions that negatively affected their mental health. Friendship was described as a very important part of life for the group of individuals. They described actively seeking out friends and social interactions through the MMORPG. The Internet was a conduit to active social

interactions, development and maintenance of friendships, and support networks. Long term friends were developed and sustained without meeting face-to-face. Participants interacted with people from several countries around the world.

Redwood P-3 described social interactions using Skype and chat rooms during gaming to develop a friendship easier for her to develop than meeting a new person in a face-to-face setting. The Internet, online gaming, Skype, and other options to connect virtually provided relief from extraneous variables for individuals with ASD. The virtual environment is a place that can be used to simulate real-world face-to-face situations that allow an individual to practice social conventions often expected in a face-to-face environment. For example, one participant described interacting as:

> "In face-to-face, you can pretty much tell that they are doing it. But online it's hard to tell if the: Oh, I'm so sorry, [emphasized with sarcasim] is sarcastic or sincere, perhaps, it's a little bit of both." (Redwood P-3)

However, barriers to sustained friendships, socialization, and connections do exist in the context of the virtual environment. The size of the online community can play a role in how people, including students with ASD, interact. All of the participants described having to learn to deal with trolls (see definitions) in the context of a MMORPG or chat room. Four of the five participants or 80% discussed deleting or blocking the troll, one of the five participants described reporting the trolling to the gaming company to have the gaming company block the user to prevent further harassment to other players.

> "Discussions online can turn verbally abusive and unfriendly and deter further interactions. Internet interactions can be similar to social cliques or a bullying situation in a face-to-face environment." (Aspen P-4)

Social cliques or bullying events are referred to as trolling. Trolling situations can allow the user to practice emotional recognition, self-awareness, and problem solving skills as well as understand the broader interactions within the virtual community.

One way that the participants overcame the barriers was always interacting within a guild or clan, a group of people that would support their interactions and help guide them through the game. At times, the participants described losing a desire to interact online with people they did not know virtually or in a face-to-face because they can be unfriendly at times. In summary, a MMORPG is focused on a player possessing the right social skills to overcome barriers to socializing and friendships.

Theme Two

Comfort Level of Interacting in a Virtual Environment

An overwhelming theme that emerged was the comfort of a virtual environment as a way to overcome face-to-face barriers and actively socialize and engage in friendships. All participants described being more comfortable developing a friendship online, because they can behave in a way that is representative of their personality. During the interviews, participants mentioned being comfortable with socializing in a MMORPG in 86 of the 703 coded sentence. Additionally, four of the five participants would rather enjoy a quiet game online or lunch with a

friend through the virtual environment or MMORPG, while one of the five participants would either enjoy the social interaction online or face-to-face equally.

The virtual environment allowed them to interact, develop trust with others, learn to communicate and socialize to ultimately develop friendships (as defined by the participants). As evidenced by the many connections built in the virtual environment by the participants, there is an increased comfort with the level of anonymity provided by interacting in a world in which they have greater control over. Participants described how they could choose to interact, and when, and with whom.

> "I feel there is a courtesy of the wonderful world of the Internet. I feel like I have come into contact with a wider section of humanity um because the gaming community these are people, a lot of them do feel uncomfortable in social spaces because they are marginalized maybe for their beliefs or their orientation, things and that was a safer space for me as well in that respect. I was actually able to come to terms and accept myself for who I was. Like I mean, to make it very personal I was able to kind of come out and be able to, I was, interested, I'm bi, I did not realize this until I interacted with a bunch of people in the gaming space, it was ok and much more acceptable." (Sequoia P-2)

All of the participants recognized that the connections provided by the Internet had increased their social connections and has helped them develop a way to interact with people, develop relationships, and define a support network while managing the challenges of having ASD. For example when a participant described his interactions as a person with ASD he said,

"If it weren't for the Internet and online gaming, I wouldn't be as comfortable in social situations as I am right now." (Sequoia P-2).

By using a virtual environment they were able to become part of a community and engage in social interactions and have friendships that they define as meaningful. Ultimately, the participants described using the gaming environment to practice their interactions prior to face-to-face interactions and to develop a comfort level that supports their social interactions outside the gaming environment.

Theme Three

Emotional Recognition

As individuals with ASD develop and age into adulthood, social demands become more complex, intensifying the social challenges they experience (Rao et al., 2008). There is limited research in the area of emotional awareness for individuals with ASD (Stichter, O'Connor, Herzog, & Lierheimer, 2011). Participants described emotions 145 times throughout the interviews. This significant finding indicates that within the interviews 20% of the coded sentences included an emotional recognition. Emotions are internal feelings attributable to some causes that are recognizable to others through emotional behaviors, particularly facial expressions (e.g., Ekman, 1992). Emotions can encompass feelings of happiness, sadness, enthusiasm, anxiety, love, or anger (see Figure 3 for a representation of the emotions discussed by participants).

During game play, participants were able to identify what emotion they were feeling, such as frustration, happiness, excitement, trust, and relate those feelings to face-to-face interactions that might cause them anger, anxiety, frustration, or fear (see Figure 3). Figure 3 represents the feelings, definition of feelings, and synonyms discussed by participants. Participants described using the environment as a way to recognize their emotions and express them appropriately in relation to the specific gaming experience.

Prior to becoming an online gamer, all participants discuss a level of frustration that was directly related to their struggle with emotional and social connections in a face-to-face setting. Participants described feeling happy and excited to engage in daily battles in the MMORPG. They described a feeling of being able to be themselves and reveal their true identity. For example, one participant discussed how he had learned that it is acceptable to feel frustrated, scared, or overwhelmed and asking for help was a natural occurrence. "I don't have to do everything on my own: I learned that it was ok to ask for help on things I needed help with, from my friends online or face-to-face. I could be frustrated, it became OK." (Spruce P-1)

In addition to recognizing emotions, participants described using emoticons in the game to fill in verbal discussion; often inserting an "emoticon" into a chat box to emphasize feelings in the game. The participants were equally familiar with emoticons and used them to express their emotion during game play or discussions in a chat room.

> "It is really hard to pick up sarcasm over text. But if someone has a smiley face with its tongue sticking out or something like that, is a little bit of a red flag that something is going on." (Sequoia P-2)

All participants used tools within the game or chat rooms to express their emotions. Additionally, they described using the emoticons and online conversations to identify emotions that others may have been feeling based on their interpretation of the text. Other social interactions that were used to glean emotional awareness in the game were described through other players the level of "trolling" that a person may engage in during game-play, or voice-chats supported by in-game text.

Finally, all participants identified when a lack of social interaction, both inside the virtual environment and face-to-face environment, negatively affected their psyche. Participants noted they experience increased feelings of loneliness and depression when they had little to no social interaction.

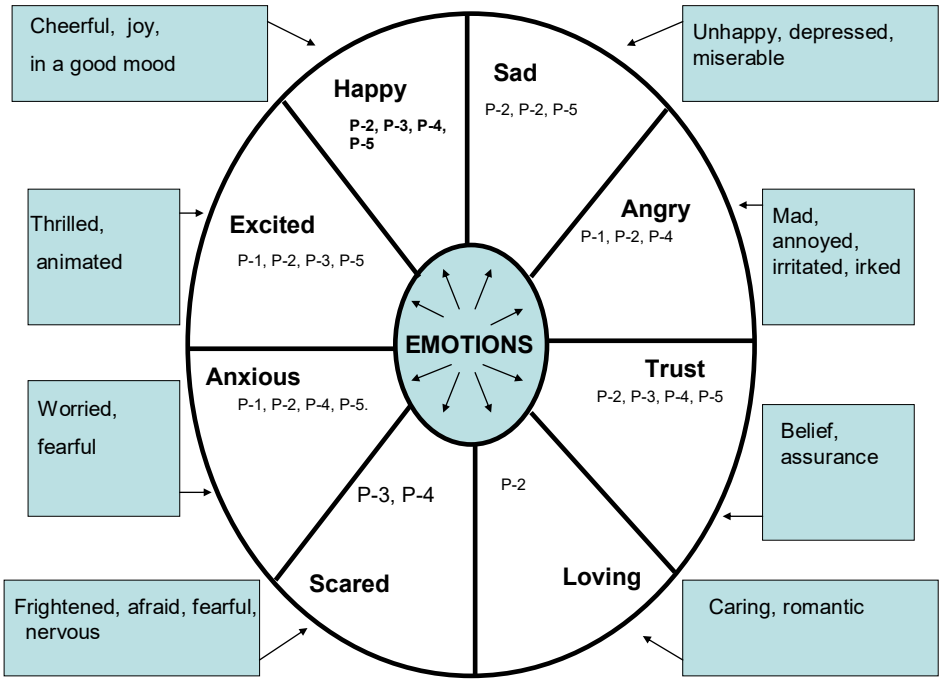


Figure 3: Wheel of emotions discussed by participants and synonyms they used to describe the emotion

Theme Four

Roles in Socialization, Friendships, and Life Interaction

Even though roles within the game and MMORPG were only discussed 18 times, the significance of role recognition for individuals with ASD is important. Understanding the individual roles within the game and face-to-face, they were able to learn specific skills that could be applied to real life situations and postsecondary education. As a result of playing the game, participants discussed learning skills and applying them to face-to-face settings 46 times.

Using the virtual environment, the participants were able to develop an understanding of different roles that people fill in the virtual environment and the face-to-face environment. They were able to generalize their roles and skills used in the gaming environment to support interactions at college or other environments (see example of a clam dissection on page 22).

Due to the nature of the games that belong to a category of MMORPG's, specifically, World of Warcraft, *MineCraft*, Halo-3, and EveOnline are games each player had to learn a very specific role within the game. The participants described each avatar as having a prescribed role specific to each task or guild event within the game that requires the user to make choices based on their desired interactions or goals of the guild. The roles were described as good verses bad.

For example, in *World of Warcraft* (WoW), the participants described making choices to play as an avatar in either The Alliance or The Horde. They described the Alliance as good and Horde as bad. In addition, each player also selects a "race" for their avatar. The races include options such as a Blood Elf, Dwarf, Gnome, Orc, Pandaren, and Human. Players must choose a gender and class for their avatar, as well as customize their appearance to include hair, skin color, clothing options, and facial expression. The final step in designing a personalized avatar is

to choose a name for the avatar. The name can be generated by the computer or developed by the user. After the avatar is developed, the player can enter the game, in the game the players then may also choose to specialize in a particular skill, such as first aid, fishing, tailoring, mining, blacksmithing, or herbalist (Sasaki, 2007). With each skill that they choose, they further define the roles within the game that can fill within the guild.

All of the participants in this study chose avatars that are representative of their real-life experiences.

> "I am always the one in the RTS [Real Time Strategy] type games that is playing the supportive role that making sure that we can see everything on the map and protecting my teammates." (Sequoia P-2).

For example, an avatar in the role of a pandaren monk may serve as a healer where a gnome ice mage may serve as a person who inflicts damage. To better help define characters, each participant sent images of their avatar. The avatars represent their perception of self and personify their individual characteristics. With the development of an individual avatar, they can create the "person" they want to be portrayed as and can explore freely who they are and skills they would like to learn. For example, Aspen P-4 stated that she enjoys playing a pandaren (see Figure 4) because the character is a larger breed and can tackle other players. Aspen P-4 described herself as a larger girl who enjoys dressing more masculine. In addition, in real life Aspen P-4 enjoys being physical with her friends and tackling them to the ground upon first meeting up with them; Aspen P-4 believes the pandaren race would be the best at tackling other gamers.

Redwood P-3 enjoys playing a night elf hunter (see Figure 5) because she is often mistaken for a male. However, she has a pet in the game that is a butterfly to represent that she is a female. Through the development of her character, she is able to identify as a masculine person with a female quality. Additionally, in her avatar selection, she felt that a night elf was representative of someone that would enjoy being outside. Redwood P-3 described herself as a person who enjoys being outside so she can feel the wind and see life around her since her hearing is not so good. One of her favorite things to do outside is to look for butterflies because they have to be spotted with your eyes not ears. Redwood P-3 also has a hearing impairment which again she has reflected in her avatar.

The overarching perceptions of self and roles in a virtual environment and face-to-face can be seen as demonstrated by Sequoia P-2 and his choice of a female priest with water tainted waveling pet (see Figure 6). Sequoia P-2 described himself both in the game and in real life as a person who enjoys supporting other people.

> "I want to play a role that is going to be valued within the team and most want to be the ninja or the mage blowing things up, they want to see the big numbers, not everyone wants to be the person to jump in front and take all the hits." (Sequoia P-2)

He described a female priest as an avatar that would be representative of his personality. The avatar is commonly known as a healer and is defined as a more supportive role within the game. He described himself as a caring and supportive person and had struggled to define that in a real life setting prior to practicing with his avatar. Lastly, Sequoia P-2 chose to represent

himself as a female in the game because he believes society is more accepting of a female to be in the role of supporter and healer.

Spruce P-1 sent the researcher a screen shot of his avatar (see Figure 6) using the in-game "selfie" app. A selfie is defined as an image of oneself taken by oneself (Merriam-Webster, 2014). In-game selfies were described as a photo that can replace a real photo that they use on other social networking sites such as Face book. Spruce P-1 would rather use a photo of his avatar then himself because he does not like his glasses and his avatar does not wear glasses. Additionally, he described his avatar as very representative of his personality. The avatar is a way for him to represent an ideal image of himself and his persona. He is aware of social challenges and feeling frustrated with face-to-face interactions and uses his role as a tough avatar to express himself in a role that is more of a leader. For example, on days that he needs to "get out frustration" he can play as a male and is more violent and on days that he is socializing and being "funny" he can play as his female avatar. "Yes but it helps get out the aggression I feel towards some people in life through a way that does not harm anyone in reality." (Spruce P-1)

Maple P-5 sent me a photo of his Pony avatar. His Pony avatar represents his choice to push for equality in gender acceptance. He has defined his perception of self as a person who enjoys speaking out, identifying the challenges, and advocating for change. He also described himself as a leader and is able to immerse himself in a leadership role through his gaming. For example, Maple P-5 really enjoys leading a clan in *RuneScape*. As a clan leader, he uses a Pony name for his avatar to represent equality in gender. Maple P-5 also described interacting with his friends in a virtual gaming MMORPG that they, as a guild, are developing. The game is based on the *My Little Pony* show. He belongs to a group of males who enjoy *My Little Pony* called

Bronies. Maple P-5 sent me a photo of his favorite pony (Figure 8) that he designed specifically as his avatar for the MMORPG game they are building on the STEAM platform. Through the use of an avatar he can explore his ideal self and practice exhibiting those skills in a relationship through the virtual environment.

All of the roles were unique to the participants' individual likes and personal desires for interaction. Each avatar was a way to represent individuality and persona. Based on the current day, each participant chooses a character that would represent their current feelings.

Figure 4: Aspen P-4 as a level 2 male pandaren monk

Figure 5: Redwood P-3 as a level 24 night elf hunter with moth/butterfly pets

Figure 6: Sequoia P-2 as a level 83 female priest with water tainted waveling pet

Figure 7: Spruce P-1 as a night elf hunter

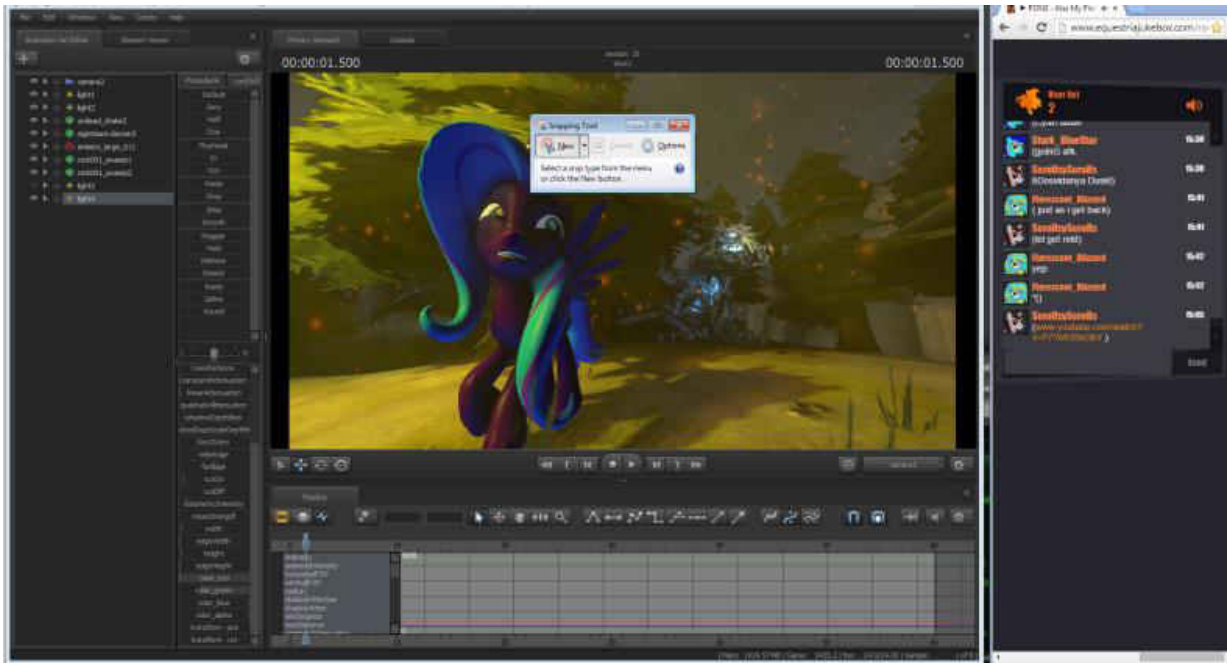


Figure 8: Maple P-5's Pony avatar used in his MMORPG and SFM group design

Each participant sent several screen shots of their characters as represented in Figures 4-8. Their avatars represent the person each participant felt comfortable portraying in the virtual environment or represent an aspect of their life they are either only comfortable with exposing in the virtual environment or are not able to obtain in real-life. The avatars were described as a tool to help them cope with humor and learn to understand the small nuances of social communication and verbal exchanges that are not intended to be taken literally.

The participants described each role as contributing to the success within the game and guild. For example, a team of four or more has to play together in a cohesive unit with a high level of collaboration and communication that would be similar to working on a team to complete a project in a STEM field such as designing a structure as a structural engineer. The purpose of World of Warcraft is to acquire experience points and "level up" by completing challenges of increasing difficulty (Hagel & Brown, 2009). Different roles were described in the game and how each role has a specific purpose and must work closely with the other roles needed on the team to be successful. "Well, we are actually able to work as a cohesive team." (Spruce P-1)

An aspect of the game that supports role identification and team interaction is that players can join "guilds" or teams (Simmons, 2010). The participants described their clans or guilds as teams that allow the players on the guild and in the game that are not part of the guild to complete more difficult group tasks known as "raids", or missions. Further, they described working in their guild and having to change their specific role to meet the different needs of the raids or dungeons that must be completed in the MMORPG. One role is teaming skills on the guilds which is another individualization based upon their interests and skills.

The most successful guilds are comprised of members who have complementary skills such as different talents that are combined in a cohesive unit to help one another complete challenges that would otherwise be impossible. To do this, the participants described spending time learning their roles and how to interact within each group and the specifics of each character special traits. The participants described understanding how each role is unique to the race and quests set forth in the game. When discussing interactions with a guild or clan, the participants described their intentions in the game as purely social especially within their defined roles in the guild.

Theme Five

Skills Learned and Generalized

All of the participants indicated that they relied on the virtual environments to facilitate their socialization and support skill development for tasks they need to accomplish in the face-to-face setting. Skills were discussed 36 times and related to postsecondary education and success with group interaction 24 of the 36 times. All of the participants noted that the MMORPGs were instrumental in helping them navigate college level courses. For example, one participant related a biology project to gamine, he stated:

> "I have to learn to deal with people who constantly try to get in the way because they try to distract me. I have to learn to focus and especially when there is a given objective. Yes, yesterday I did my first dissection, it was of a clam, [and] I broke it down into steps. I have learned that if one thing is not working (and this is also outside of zoology) I have to try a different approach." (Spruce P-1)

In addition, all participants discussed the importance of having a high level of collaboration and communication to manage the tasks of the game. Four of the five participants related collaboration and communication to managing their class work at college and working on a team at their job. This relates back to understanding different roles and emotions that are experienced during the game as well as in the face-to-face setting. The participants described the MMORPG as an environment they could learn skills that were helpful in their college classes, as well as socialization in real life. For example one participant stated:

> "I like my clan because I can talk to them and not be a geek and they give me feedback on things like me dominating the conversation or not talking about stuff they like. And what's the point of communicating if you're not gonna listen to people and fix your problems?" (Maple P-5)

Throughout daily interactions at school, work, or interacting within the community the participants described needing to engage with people that are unknown, new, acquaintances, or friends. As repeatedly described by all participants, the gaming environment provided opportunities to learn to communicate and collaborate with new people using unknown variables (Gee, 2007; Prensky, 2006).

Results from the Self-reporting Survey

All five participants were very willing to discuss their participation in the context of a virtual environment and social interactions outside the virtual environment. Based on a survey given to the participants, data were collected for each day of the week for one week to indicate how often participants interact both in the game and outside of the game using phone calls, text

messages, video chats, or face-to-face interactions at a friend's house or in the community. Results are reported in Table 4.

Table 4
Description of Participants Social Interactions

	Videogame Hours played	Phone calls made	Phone calls received	Text message s sent	Text messages received	Video calls made	Video calls received	Face-to-face interactions	Visits to a friends
1	20	10	10	7	4	0	0	5	1
2	18	3	2	0	0	18	16	1	0
3	21	0	0	0	0	3	4	1	1
4	15	1	1	20	22	1	2	7	1
5	14	1	2	2	3	12	28	1	0
Total	77	15	15	29	29	34	50	15	3
Average	15.40	3	3	5.8	8.8	6.8	10	3	.60

Data for Table 4 were extrapolated from the self-reporting surveys.

The number of phone calls received and made was consistent among participants P-2 through P-5. P-1 was an outlier due to a change in living arrangements. During data collection, Spruce P-1 was moving and had increased his phone calls made and received to his family to meet his support needs. All participants clarified that their cell phone was used only to communicate with family and on average they make and/or receive two calls a week. Another outlier can be seen with the number of text based messages sent and received by P-4; P-4 recently subscribed to texting on her phone and had recently made contact with her friend from high school with whom she had regularly interacted with over the virtual environments. Finally, P-2 and P-5 made more face-time or Skype calls than P-1, P-3, and P-4 because they had developed close relationships with people in other countries and had developed their relationship to a point of wanting to see the other person as themselves and not just the avatar.

Document Analysis Results

Social Explanation of the Game and Various Interactions

During the interview process, the participants were asked if they use external websites to connect and to modify their gaming interactions. Several websites were provided and four were used to complete a document analysis (see Table 5 and Table 6 for a description of the website). The websites were compiled and analyzed using the same procedure as the interviews; however, only five codes were identified. From the five codes four reoccurring themes were identified. The themes included: (a) social interactions and explanations of socialization in the game, (b) comparison of the virtual environments or MMORPG's to other social media such as Face book, (c) barriers to socialization, and (d) skills learned.

Comparison of Virtual Environments to Social Media

All the participants provided a link to an article or blog that described interactions in the games they play. The goal is to use the article is to build a case that gaming is very similar to everyday socialization at work, school, and after. An excerpt was extrapolated from the article/blog:

"*World of Warcraft* houses a number of positive similarities to other social networks, including an engaged character customization process that isn't much different than customizing a wall or a virtual suite to match an owner's tastes or desired personality implication. From there, an active community of members who are free to speak and act as they like. Access to a guild – a large, organized group of players with similar aspirations in mind – provides the player with even more opportunities to engage in discussion, debate, or strategies, depending on the type of

guild (or group, for you Face book fans) that the player chooses to join." (Thunderbolt Games, 2014).

Blogs were used by three of the five participants to demonstrate to family and co-workers that, as humans, we rely on different personas to navigate our social interactions. For example when reading a blog suggested by a participant, one quote described how social platforms can support role identification and socialization with people that may be more comfortable in a virtual environment. The blog read:

> One might argue in response that Face book brings people together; that it employs imagery to emphasize a person's personality and that it encourages a web of social interaction and meeting that a video game couldn't possibly hope to match. This is, of course, false. Consider the difference between the person you know at home and that same person at a bar, donning a persona tailored specifically to fit their desire to live a life separate from the one they've grown accustomed to. Socially, little difference exists between this persona and any other kind. (Thunderbolt Games, 2014).

These passages provide an argument that the virtual world and MMORPG's are a very important part of socializing and developing friendships in the current day and age considering the rapid development of digital technology and interactions. From the author's perspective, people display different persona in different situations. In each situation, the author described a person as developing their image to fit the situation or fit the description of how they would like to perceive themselves; he further explains that in the virtual environments or over social media people do the very same thing. Many sites also support social interaction inside the game and

outside the game such as *Hearthstone* and *World of Warcraft WIKI.* These are sites that players can interact on, connect with other groups, and learn how to better their skills, or set up a face-to-face gaming session.

Social Interactions

As Gee (2006) states, videogames are highly social, incorporating complex problem-solving skills and a high level of collaboration. There are a plethora of websites available to support social gaming. In addition to WIKI pages, friendships were developed and sustained within a gaming community better than by way of email or within Face book setting. The WIKI page described a story about two friends hundreds of miles apart and maintaining a relationship. The story on this blog triangulates data from the interviews and observations noting that players can sustain a relationship without seeing each other face-to-face. A quote from the blog read:

> "A friend of mine departed for a career with the military in lands unknown. He would become a member of this long-distance relationship, birthed but not necessarily sustained by the forum that *World of Warcraft* made available to me, similar to the way that any other social network is intended to function and benefit people who are separated by space and time. Now, the intricate web of relationships that we had made as a team in the game became the saving grace for a friendship that yearned for more of an interaction than emails or photographs could provide. The ache was lessened and the distance closed knowing that we would continue to shout excitedly at each other through microphones when our two-versus-two encounters went well or awry. Through this medium, I knew

> when he was struggling, when he was proud of himself, or when he wanted little more than to return home, long before the off photograph or text message could ever tell me." (Sullivan, 2011 para 2)

The story about two friends (above) was typed on the *Thunderbolt* website. This site allows gamers to interact on different forums and share stories, ideas, and opinions. The forum was dedicated to social connections built over *World of Warcraft*. This particular article is written in an attempt to dispel the negative association to videogames. The author, Sullivan (2011), described a virtual environment that houses 12 million players represented in the form of an avatar. He described daily interactions in an environment that would be similar to meeting a friend at a coffee house or paying a monthly subscription to a health club and meeting a friend there to socialize and engage in physical activity. The virtual environment provides a way to interact, for those that are not comfortable always traveling, to engage socially.

The environment also supports the flexibility/versatility to meet up face-to-face to achieve a special achievement such as *Fire Side Gatherings* supported by *World of Warcraft* through a game called *Hearthstone*. *Hearthstone* is a card game that uses characters from the *World of Warcraft* game on the added medium of virtual cards. The game is played virtually, however, can be played in a face-to-face setting using portable devices such as iPads, iPods, or Android devices.

Barriers to Socialization

The suggested websites did not provide a discussion of barriers to socialization as did the findings from the interviews gathered from all the participants. The websites did discuss

potential stereotypes that may be a challenge for the players. This [*World of Warcraft]* is a game whose players are often stereotyped as addicts. Often in the literature, Granic and colleagues (2014) noted the negative focus on videogames, referring to the potential addictions and violent behaviors. They emphasized that a more positive review of games and benefits of games needs to be discussed.

Comparison to other Social Media that Led to Skills Learned

As the researcher analyzed the websites, a reference was made to Face book and Myspace to compare the social interactions of online videogames played in the virtual environment. The comparison was made when discussing opportunities to learn to communicate, build friendships, or "work" perceptions of self and emotional recognition. For example, one site discussed learning humility from engaging in the role of group leader in a game.

> "I was repulsed by my failure and was reluctant to admit that it might have been the wrong time in my life to assume the role of alpha dog. The experience taught me how to take criticism, how to hit the ground running, and the qualities that are necessary of a good leader. I learned how to play off my weaknesses and turn them into strengths through trial and error. This meant coordination, respect, and a willingness to accept what each individual person wanted from their playing experience. What I lacked was respect, and the knowledge that players, and people, progress in different ways and respond to different forms of

communication and criticism. The game has afforded me lessons of humility and teamwork". (http://www.getcarried.shivtr.com/ para. 3)

The websites provided by the gamers used in the document analysis are maintained by gamers all over the world who represent with their avatar alias. Therefore, it is impossible to know if they are male or female, what race they are, or if they have a documented disability.

Websites are developed as a place for individuals to connect and join a guild, clan, or a raid to support in-game actions. Once a guild or clan is developed, they may enhance their own site to support collaborations and communications to support their in-game activities. These activities, such as raids, dungeons, and battle arenas, are considered social in nature and carried out by the guild. The guild or clan requires a level of trust that is developed through connecting as friends (see findings section on friendship definition). By engaging in socialization through the game, these social interactions are completed by coordinating gaming times and guild or clan member calendars to set times to get together and play. Additionally, sites dedicated to specific guilds or clans may also sustain dialogue about individual tasks and specific group tasks that each player desires to complete.

The continued dialogue can be recognized as a high level of collaboration and communication within a group of defined roles. For example, http://www.meetup.com/WOWorlando/ is a social group that gathers once a month for dinner to get to know each other in real life (IRL) and discuss the game and strategies. The group is comprised of several gamers that make up multiple guilds or clans who may interact with each other in the game to complete specific achievements. The meet-ups are specific to gamers playing *Blizzard* games to

include *World of Warcraft, Hearthstone, Diablo, Starcraft,* and *Heroes of the Storm*. This specific group has 389 members, and has had 113 face-to-face meetings, with eight currently scheduled in 2015.

The website *Meetup.com/OrlandoWoW* encourages new and experienced gamers to join. As discussed on their site, to demonstrate they are a welcoming group, they order pizza and spend time getting to know each other. After dinner the group will go over to the arcade and play games or go bowling at a nearby bowling alley. In addition to their website to support local gamers comprised of guilds and clans that work together, the *Orlando WoW team* also has a Facebook site that supports additional social connections with new gamers or friends that may already be a part of the *OrlandoWoW*.

Another site http://www.liquidhearth.com/gatherings/ is unique to *Blizzard Games*. Liquidhearth is a site dedicated to supporting face-to-face interactions based around *Hearthstone. Hearthstone* has a tab on their webpage specific to supporting local IRL meetings; meetings are listed for locations all around the world so that players may have an opportunity to join and make new friends. The site described in detail how to set up a *Fireside* gathering which is a gathering of gamers that want to play *Hearthstone* in a face-to-face setting. Instructions for a *Fireside* gathering include posters to put up, invitations, and photo release forms for all participants. In addition, the website described how to locate other players and connect if a person is new to the game and is not socially connected.

Finally, a blog can support additional gatherings. The blog http://toucharcade.com/2014/04/18/hearthstone-fireside-gathering-next-saturday-april-26th/ is

sustained by a person that articulates how important socialization and gaming is to him. The writer of this blog discusses how he feels the game *Hearthstone* and the *Fireside gatherings* will connect people socially. He described how he is excited as he closes the blog posting:

> "Personally, I'm excited to see what else they do with the *Hearthstone* iPad game and in-person play. This is opening some really cool doors to "fix" the problems virtual CCG's have compared to paper CCG's in that the in-person social aspect is totally non-existent." (http://toucharcade.com/2014/04/18/hearthstone-fireside-gathering-next-saturday-april-26th/ para. 3)

Hearthstone has 2,000,000 players now since its launch of *Fireside Gatherings* several local websites have popped up to support IRL gatherings. Ultimately, as Gee (2006) stated, videogames are highly social and support complex problem solving, collaboration, and a high level of communication. The gaming industry, specifically *Blizzard,* appears to support IRL interactions especially through their efforts with *Hearthstone* and *Fireside Gatherings.*

Table 5
Websites Provided by the Participants used in the Document Analysis

Web Address	Social explanation of the game	Social Interaction	Barriers to Socialization	Comparison to other social media sites	Skills learned
http://toucharcade.com/2014/04/18/hearthstone-fireside-gathering-next-saturday-april-26th/	19	20	3	2	6
http://www.thunderboltgames.com/opinion/world-of-warcraft-the-social-network	10	11	3	2	5
http://us.battle.net/wow/en/forum/topic/15538334825	1	9	0	1	1
http://www.meetup.com/WOWorlando/	8	14	0	0	0

Websites provided by participants for document analysis, coding matrix, and frequency count

Table 6
Websites Suggested by Participant and Analysis of Words

Suggested Website	Number of Words	Breakdown of Words Related to Socialization and Friendship
http://toucharcade.com/2014/04/18/hearthstone-fireside-gathering-next-saturday-april-26th/	363	Friend – 3 Interaction - 1 Meetup - 4 Social - 3
http://www.thunderboltgames.com/opinion/world-of-warcraft-the-social-network	1825	Friend – 8 Interact – 5 Meetup - 7 Social – 12
http://us.battle.net/wow/en/forum/topic/15538334825	2437	Friend – 1 Meetup - 14 Interactions – 2 Social – 0
http://www.meetup.com/WOWorlando/	556	Friend - 1 Interact - 0 Meetup – 22 Social - 0

Results from Observations

Setting

Observations took place over the virtual environment using Skype and a guest login to observe Maple P-5 work with his clan to build a scene for their virtual environment game, complete the weekly battle against the boss, and work as a clan/guild to complete specific player needs. The researcher met Maple P-5 at a room in the library where he set up his laptop. Maple P-5 called the observation an "over-the-shoulder-observation", often used when teaching a new clan member how to work with the team to create their virtual environment game. The

researcher was then Skyped into the gaming environment. The following observations took place virtually using Skype, no face-to-face was required.

Their virtual environment game in development is focused on *My Little Pony's* (MLP); and they belong to a group of people called *Bronies. Bronies* is a group of males interested in *My Little Pony's*. The *Bronies* group engages in several social interactions; for example, they play video games together, socialize in chat rooms or through the in-game chat, and they work together in *Source Film Maker* (SFM) to design their own videogames on the STEAM website, and work as a clan to develop specific in-game design tasks.

Participants

Observations were only able to be collected for one participant as there were no other gaming events were taking place during the period of data collection. The clan that Maple P-5 is a part of held a gaming event focused on building a new pony and expanding their virtual environment. Three other players were included in the event. Maple P-5 explained that they average ten players, but can include up to 20 when building on their virtual gaming environment. Due to the nature of the environment it is impossible to identify the age, gender, race, or possible disability from the interactions. Maple P-5 identified one player as a girl because he had "seen" or interacted with her over Skype. Maple P-5 discussed using the game to build a relationship and trust with her so he felt comfortable meeting her over Skype.

Discussion of Gaming Event

Purpose of the Gaming Event

The purpose of the gaming event was to demo their current virtual environment and identify any problems or areas of need within the game and complete their in-game animation task. Four participants interacted over Skype voice calls (no video included) to play the game and develop a scene to be implement in the game. The gaming event began at 9:00 p.m. EST to ensure that one participant from California could attend after work. The gaming part of the observation lasted 13 minutes to complete the weekly boss attack. During this time the players all provided directives to each other and were very vulgar. Each team member had a specific role within the game. Maple P-5 explained that if a person was not focused on their specific task, they could contribute negatively to the success of the group. He also mentioned that there is a lot of action going on in a game. During game play it is helpful for each participant to call out tasks to ensure that the group is not missing objectives.

The second section of the event was to complete the development of their pony which lasted about 63 minutes. The game development consisted of several directives, collaborative discussions on color, shading, and angle of the pony's features, and discussion over the music select. Many of the directives or comments were vulgar in nature. After completing the in-game animation, the clan moved onto their online MMORPG game and at that point referred to themselves as a guild. The guild comprised of four individuals that each had specific objectives for the night. Each guild member typed their objective into the chat box for the guild to prioritize the importance of the tasks. After prioritizing the tasks each member took lead and shouted directives to the other guild members to help him or her complete their specific daily

task. The other two observations also occurred as an "over-the-shoulder" observation as Maple-P-5 described. The researcher was Skyped in to observe the weekly battle with the clan. All three observations were equal in directives, language used, and socialization in the game. Interestingly, the event appeared is an exact replica of the initial observation. During the observations a "world-event" was taking place in WoW for Easter. Each player had to get another to turn them into a rabbit, and enchant a piece of their clothing. After being turned into a rabbit, they then went to a specific spot on the map for one achievement. Other achievements included locating specific avatar combinations of race and class such as a blood elf hunter, female human warlock, and female pandaren, after locating the specific combinations each guild member had to "apply" rabbit ears on them so the player applying received an achievement and the avatar that the ears were applied to receive a vanity-buff. A vanity-buff is perceived as a "cute" adornment to the character. This achievement took just over 90 minutes for all guild members to accomplish.

During the game play, they told jokes once in a while, discussed the world event, and primarily provided directives. The directives were evidence that the MMORPG required a high level of communication, roles to be managed and understood, and guilds to successfully work together. An image of a gaming event was shared with the researcher to demonstrate all the communication that occurs during the context of one short online battle.

Figure 9: In-game directives

Directive Conversation and Emotions with Avatars

The gaming conversations consisted of directives given to other players as well as name calling. Participants in the game would provide directions through Skype voice chat, because they described the game as moving too fast to take a break from character manipulation to typing directions in the in-game chat boxes. Direct conversations in the game using Skype demonstrate that the MMORPG is an environment that does require more than basic in-game interactions. The participants in the game joked with each other, discussed daily activities, asked about the

state of each person's day, along with shouting directives through Skype. The participant leading the game described emotions as an important part of managing a raid in a game. The players used STEAM a website dedicated to connecting gamers and supporting the development of new games. STEAM was used to link the chat forum or box to their game so players can chat quicker with voice if Skype is not available. Many of the game platforms they use are on the STEAM website.

Interactions with Players during Gaming

Many interactions happen during a gaming event from excitement to frustration. During the observation, it was evidenced from the data that the guild members socialized outside of specific gaming events through a MMORPG, virtual environment, or Skype. All of the participants in the game greeted other players, recognized something that they were working on and expressed how they felt about any upcoming events in the game. In addition to basic conversations, the participants also set up a strategy to work together in the game within their defined and chosen roles to be successful in the game. It was interesting to note that at the end of the gaming session, not a single player made any remarks about enjoying their time and saying "good bye". The guild leader simply said, "Ok, let's meet up on the 10th of April, by 6:00EST." Some members replied, "ok, right on", while others merely left the chat room.

The observation supported triangulation of the data collected through interviews and document analyses. The clan collaborated to accomplish tasks; they worked over Skype chat, had met over video chats, and consider each other friends. Additionally, emotional recognition and use of emotions was important to the gaming and the work done on the virtual gaming

environment that the *Bronie* clan is making because they use a lot of sarcasm, directives, and vulgar language that could be misconstrued.

Chapter Four Summary

In this chapter, the researcher presented the findings uncovered by this phenomenological study. Findings were organized according to the identified themes. Data from individual interviews, self-reporting survey, observations, and document analysis revealed the participants' perceptions of their social interactions in the context of a virtual environment. By using participants' own words, the researcher strived to build the confidence of the readers by accurately representing the reality of the people and interactions studied.

The primary findings of this study were that the participants have identified friends and actively seek socialization in a virtual environment. Often, participants joined a guild, clan, or chat room strictly for the social interaction with other people and potential to develop a friendship that may generalize to a face-to-face setting. All of the participants noted that they would be interested in meeting people from their MMORPG that they do not already know and all have traveled via bus to visit a person they had met in the MMORPG. The participants defined friendship and social interactions as an important part of their mental health, a way to engage support and give support, and a way to have someone interact with on a daily basis doing what they enjoy doing and socializing with many people from the comfort of their home.

The second finding supported the first by locating an environment that was comfortable for them to interact in and overcome barriers to socialization. The virtual environment supported ways to develop trust with a person prior to meeting face-to-face or to strengthen a face-to-face

relationship. Overcoming barriers in the virtual environment participants revealed anonymity as a way to allow other people in the virtual environment without knowledge of their gender choice, sexual orientation, social quirks, boldness or frankness during conversations, and desires to get to know someone virtually, to build trust prior to meeting in a face-to-face setting. Travel to and from places is a barrier to additional social interactions because of their inability to drive, poor public transportation, and anxiety with travel, in general.

The third theme was recognition of emotional awareness for self and others. Emotional recognition was almost as high as friendship and friendship perceptions. Emotional awareness is an unexpected finding based on the current literature (see discussion in Chapter Five). Participants recognized when they were frustrated, happy, excited, anxious, or depressed. They also identified when their virtual and IRL friends were sad, happy, stressed, or depressed. They used the virtual environment as a way to manage frustration and anxiety, as well as celebrate and enjoy the game and social interactions with others.

The third theme that emerged was roles in socialization. Participants were able to define their preferred role to interact within a virtual environment and in real life. They discussed overlap of their role IRL to the virtual environment. For example, when playing a supportive role and healing role in the game, participants also played a supportive role IRL at work on his project team.

The fifth and final theme described the roles learned and generalized by the participants as a result of their interactions in a MMORPG with a guild or clan. Many interactions in the guild were transferred to a face-to-face setting. For example, task management and completion of a project in the MMORPG was related to a biology project for a college class.

Findings from the self-reporting survey provided information about their social interactions outside the game such as lunch interactions, visits to a friend's house, phone calls, or text messages. Based on the five participants interviews and self-reporting survey findings corroborated their desire to interact in a virtual environment and in real live only when the friendship had been well established and a level of trust was met and maintained.

Findings from the document analysis corroborated the findings from the interviews and observations. The findings from the documents revealed that gaming is a social event and many social interactions and opportunities to engage with the same people repeatedly through gaming was possible with the development of a guild or clan. In addition, discussions of developing and maintaining long-distance friendships were possible through the game. In fact, one document highlighted an even stronger bond and connection within the friendship because they could interact in an environment that was of interest to both of them rather than just sending emails, letters, and photos to stay in touch.

Finally, the observation made clear that the virtual environment provided opportunities for the participants to socialize, hang-out, and virtually do things together that would be similar to previous endeavors in a real life setting. They worked on projects together, played games, interacted socially with humor, and represented humor using in-game tools such as emoticons. Additionally, each time a person logs onto the MMORPG in-game tips are displayed on the bottom of the opening screen. Several tips support social interactions (see block quote below, sent by a participant).

> ***"If you are polite in a group, you will be invited back" -World of Warcraft load screen tip sent by Maple P-5***

The game encourages friendships and social interactions and ultimately provides tips for individuals to learn how to socialize better in the context of a virtual environment.

CHAPTER FIVE

The final chapter of this study summarizes the research from this study and develops conclusions, implications, and recommendations for further study. Initially, this chapter restates the research problem and reviews the methods used in the study. Then, a summary of findings, conclusions, limitations and recommendations for further study are presented.

Statement of the Problem

The rationale for this study focused on the need to identify and describe the phenomenon of social interactions and communication of young adults with ASD within online environments. In the United States, it is estimated that 99% of boys and 94% of girls play video games at least one hour a day (Vitelli, 2014). The stereotypical gamer was thought of as a person who uses video games to shun social contact; however, today over 80 percent of gamers play with friends, whether as part of a team or in direct competition (Moore, 2009; Vitelli, 2014). Specifically, massively multiplayer online role-playing games (MMORPG) are a highly social virtual community where several individuals can interact in an evolving environment (Gee, 2006; Yee, 2006). "Social and pro-social activities are an intrinsic part of the gaming experience, with gamers rapidly learning social skills that could generalize to social relationships in the real world" (Vitelli, 2014). Virtual environments are multifarious and require sophisticated forms of thinking that include: (a) understanding complex systems, (b) creating expression with digital tools, and (c) developing social networks to communicate and collaborate (Gee, 2004; 2007;

Prensky, 2006; Squire, 2005). Therefore, in this phenomenological study, the researcher investigated the phenomenon of social interactions and communication among young adults with ASD to identify and describe social interactions within online and face-to-face settings as related to current and future interactions. This study was significant given that increasing rates of individuals with ASD fail to graduate at commensurate rates with typically developing peers (National Center for Educational Statistics, 2012; Newman et al., 2011), possess a lower employment rate when compared to other disability categories (Shattuck, 2014), and fail to live independently, at a rate of 3% nationally (National Center for Educational Statistics, 2012; Newman et al., 2011; Wei et al., 2013).

Review of Methodology

The researcher employed a phenomenological design to examine the social experiences of young adults with ASD to define and describe socialization within the context of a virtual environment (MMORPG) for young adults with ASD. The research question which guided this study was:

1. What are the social experiences of young adult college students with ASD, enrolled in a STEM track, who participate in online gaming environments (MMORPG)?

Summary of the Results

The findings reported provide a rich description of social interactions related to individuals with ASD in a virtual environment or MMORPG to understand these phenomena

described in earlier literature. Cheng (2005) described a virtual environment as one that may support greater interactions for individuals with ASD. Emerging literature from various researchers discussed the potential use of virtual environments to teach specific social skills (Cheng, 2005; Parsons & Cobb, 2012). Recently, virtual environments have generated interest as a medium that may be a promising practice to support social skills acquisition (Parsons & Cobb, 2011; Parsons, Leonard, & Mitchell, 2010). The research in the analyses described the social interactions of young adults with ASD as active participants in MMORPG settings. The researcher strived to bring a more positive perspective on gaming as suggested by Granic and colleagues (2014). However, several considerations should be addressed when interacting in an online environment such as safety of all users, especially children. Safety includes internet awareness; knowledge of what is acceptable and not acceptable to post online. For example, photos could be misconstrued. Internet predators have been an increasing problem with the large amount of people interacting in an online environment. All of the participants described an awareness of the dangers that exist in the online environment and had implemented precautions to ensure their safety such as never meeting a person online in a face-to-face setting alone or outside of a very public place.

All of the participants described friendships, social interactions, emotions, and roles in these environments where they learned new skills that they could apply to their face-to-face settings. The participants described friendships, social interactions, emotions, and roles in these environments where they learned new skills that they could apply to their face-to-face settings.

Often, gaming structures and features stimulated interactions. For example, consistently across all of the participants it was emphasized that working within a guild consisted of

interactions with multiple people required to complete tasks. Within the virtual environments, participants were able to comfortably interact and circumvent face-to-face challenges by engaging within this controlled environment (Cheng, 2005; Parsons et al., 2014). As identified by all the participants in this study, another reason for playing MMORPGs and engaging in "chat-rooms" was for the social interactions and friendships. For example, Sequoia P-2 and Maple P-5 said they joined guilds and clans for the social interactions and opportunities to develop friendships with people they may then choose to meet face-to-face. Additionally, all participants stated if their friend(s) chose not to play the game, they would choose another game that their friend(s) would enjoy more, because the primary reason for playing the games was for social interactions. In the following sections of this chapter, the researcher discusses the major findings and themes from the data analyses related to research as a foundation for implications and recommendations for further study.

Seeking Friendships and Socialization

The first major finding described by the researcher depicted the rationale and interactions of the participants to actively engage in friendships and develop social connections through the virtual environments. As evidenced by the findings, virtual connections can be a powerful conduit to increase socialization, friendships, and skills that can be used in postsecondary education. Online role-playing games allow thousands of gamers to play in the game's expanding virtual world at the same time via the Internet (Yee, 2006). The researcher described findings from this study (see Table 7) which included active participation, socialization and

interaction of young adults with ASD with people all over the world through the virtual environment.

To develop friendships, Roeher (1990) discussed having to sustain communication and reciprocate feelings. Virtual environment games require the use of advanced digital literacy and more complex communication skills (Gee, 2007). Further, Gee (2007) and Fullan (2012) discussed gaming in a virtual environment as a social event providing a platform to buttress the teaching of social communication and complex communication skills. As described in the data analyses of this study, it is common for gamers to seek out a guild or clan to actively work together and solve complex problems using their advanced digital literacy skills and communication within the game. In addition, the findings presented information related to learning to communicate within a MMORPG and to apply those skills to real-life settings. One specific subtheme described the skill of learning how to take feedback and not dominate a conversation in the virtual environment or in real life. Granic et al. (2014) and Yee (2006) described virtual environments as a platform to learn specific skills and use them in a face-to-face environment. Young people are dexterous collaborators, navigating digital gaming and social networking with ease: they are capable of generating and manipulating content and experimenting virtually with online social sites and games (Craft, 2012; Durkin et al., 2013). By leveraging the attraction and current use of technology by young adults with and without ASD, digital virtual environments present a unique opportunity to learn and practice social communication skills that may directly relate to authentic interactions (Bricker & Bell, 2012; Durkin, 2010; Durkin et al., 2013).

A conclusion that can be drawn from these findings is that young adults with ASD are engaging with a virtual community and building friendships through their continued social interactions. The current study may be inadequate to account for all the social possibilities and opportunities to connect with a community. However, it begins to describe the development of a rich understanding of the social interactions possible to young adults with ASD. This initial understanding of social interactions within the context of an MMORPG may yield information about the potential of social and friendship connections, support networks, and skills used in a virtual environment that are similar to those needed in face-to-face settings.

Comfort Level of Interacting in a Virtual Environment

The second major finding was the rationale for engaging and interacting within the context of a virtual environment by young adults with ASD. It removed extraneous variables such as sound, large crowds, and other challenges that produce anxiety within face-to-face settings. Many barriers to socialization and friendship have been reported in the literature such as anxiety and lack of interpretation of social cues among young adults with ASD (Shattuck et al., 2013). These barriers cause an increase in stress and deter individuals with ASD from seeking out friendships in a face-to-face environment. A virtual environment offers multiple opportunities to engage with people, practice interactions, and learn how to socialize.

Despite social impairments noted in the literature as one of the most salient aspects of ASD (APA, 2014; Kanner 1943), the participants in this study engaged in social behaviors on a daily basis and overcame challenges to socialization, actively seeking out opportunities for socialization and friendships. The participants described using the virtual gaming environment

as a way to feel comfortable with themselves and their interactions with others. Each participant effectively used the virtual environment as a way to build trust and develop a friendship while learning to interact by recognizing social cues and accepting feedback.

In addition, participants recognized their barriers to socialization and friendships and had used MMORPGs to support their interest in having friends and engaging with people. A conclusion that can be drawn from this finding is that virtual environments may provide opportunities for interactions with others that support greater access to socialization for individuals with ASD. Further, these interactions by young adults with ASD may not be so different than their typically developing peers who interact within MMORPGs and other virtual environments or social platforms. Finally, a conclusion that can be drawn from this research is that some young adults with ASD are interested in friendships and do seek socialization. Further research in the area of MMORPG interactions specific to individuals with ASD would support potential use of MMORPGs as an intervention to overcome barriers to socialization. For example, research to identify the level of interactions and type of interactions occurring in conjunction with appropriate conversations for individuals with ASD when compared to their typically developing peers, would identify comparisons between interactions. Table 7 illustrates current findings in the literature and a comparison of findings in this study with potential implications for the field.

Learning to be Aware of Emotions and Interact with Others

The third major finding in this study was the overwhelming recognition and discussion of emotions throughout the data analyses evident from the interviews, observations, and document

analyses. The review of current literature revealed limited research in the area of emotional awareness for individuals with ASD (Stichter, O'Connor, Herzog, & Lierheimer, 2011). Emotions are internal feelings attributable to some causes that are recognizable to others through emotional behaviors, particularly facial expressions (e.g., Ekman, 1992). Emotions can encompass feelings of happiness, sadness, enthusiasm, anxiety, love, or anger. Understanding others' feelings, mental states, and perspectives is important to a person's development (Weimer, Sallquist, & Bolnick, 2012). Additionally, young adults with ASD are characterized by a reduced ability to understand the emotions of other people; this ability involves recognizing facial expressions (APA, 2014; Duff & Flattery, 2014).

Emotional recognition and self-awareness are a constant challenge for individuals with ASD (Duff & Flattery, 2014; Zager & Alpern, 2007). Based on the findings from this study (see Table 7), participants not only described a plethora of emotions (See Figure 3), but also described how to manage various emotions with the virtual environment. Figure 3 is a visual of all the emotions and synonyms used by each participant during the interviews. In addition, participants are labeled with the specific data of the emotions they described during the interviews. For example, participants frequently described dealing with frustration by disengaging from the challenging environment and seeking emotional support from gaming friends, in an effort to reframe their emotional state. In addition to emotional recognition and management of emotions, participants discussed skills they had learned such as communicating in a group, waiting their turn to talk, giving and receiving empathy, breaking large tasks into more manageable tasks, managing time, and general awareness of self and specific roles in life and game. A conclusion to be drawn from these findings describe possibilities that individuals

with ASD may understand and recognize emotions but have had a persistent challenge with expression as a result of challenges related to their disability. However, by engaging socially within a MMORPG, young adults with ASD have an opportunity to engage with others and develop meaningful relationships and social skills that are not devoid of emotions and lead to important socialization skills for personal interactions.

Roles in Socialization, Friendships, and Life Interaction

The fourth major finding in this study was the recognition of specific roles for all participants in both the virtual environments and face-to-face settings. Simulations and virtual training are frequently used in multiple professional fields (Carlson et al., 2009). Some of the roles required in a STEM field are: (a) analytical skills to research a topic, develop a project plan and timeline, and draw conclusions from research results; (b) science skills to break down a complex problem into more manageable tasks; (c) attention to detail; (d) technical skills to trouble shoot problems; (e) leadership, collaboration, and communication skills; and (f) time management skills. All of these skills can be identified within the context of a gaming event that occurs in a MMORPG with a guild. A conclusion that can be drawn is that MMORPGs require players to select an avatar that can be customized to their specific interests. For example, players can choose between races, hair style, clothing, and accessories that are representative of them. However, with those specific interests come defined roles that are expected for contribution to a guild and group collaboration to complete specific tasks in a game. Some of the defined roles include being a leader and directing the guild through daily activities and arranging gaming interactions throughout the week. Another is the type of interactions required by the avatar such

as healing an injured avatar, inflicting damage on the in-game opponent (boss), or developing and enchanting adornments to the avatar and armor worn to sustain damage in a battle. All participants recognized the defined roles and related their chosen roles to the roles they enjoy interacting with in a face-to-face setting.

Another conclusion that can be drawn is virtual environments or MMORPGs can serve as a catalyst for reflection, awareness, and action within a defined role that can potentially be generalizable to a face-to-face setting. The avatar helps the individual personify their individual characteristics. In this study, young adults with ASD made it clear that they can create a character to represent who they want to be and is representative of their life. The avatar appeared to allow students with ASD to explore who they are and supporting exploration of new skills and repeated trials to practice. The game encourages interactions with friends and supports interactions with others by providing tips on how to engage with others such as the one provided by Maple P-5, *"If you are polite in a group, you will be invited back",* from a *World of Warcraft* load screen tip. As noted by Gee (2006), Granic and Colleagues, 2014, Prensky (2007), and Robles (2014), online games are highly social and hold the potential to support real world benefits in a face-to-face setting.

The roles the participants interacted in represent similarities to roles of a collaborative project or research team in many STEM fields. As evidenced by the data collected and triangulated through observations and document analysis, all participants recognized the need to interact with people and collaboratively work together to accomplish the goals and objectives of the game in the virtual environment.

Skills Learned and Generalized

Finally, a small but significant finding revealed that all the participants in this research identified skills that they had learned as a result of playing in the MMORPG within a guild or socializing in a virtual environment. For example, the soft skills outlined by the Accreditation Board for Engineering and Technology, Inc. (ABET) accreditation for engineers identified five soft-skills that are required for success in the chosen STEM career:

- an ability to apply creativity in the design of systems, components, or processes appropriate to program objectives,
- an ability to function effectively on teams,
- an ability to communicate effectively,
- a respect for diversity and a knowledge of contemporary professional, societal, and global issues, and
- a commitment to quality, timeliness, and continuous improvement.

These skills are repeatedly practiced in the context of the virtual environment through interaction within the guild and in the many countries inside the virtual environments.

Several opportunities exist to support socialization, role development, emotional understanding, complex communication, and cooperative team problem-solving in the context of a virtual environment or MMORPG (Gee, 2006; Prensky, 2007; Yee, 2006). As described by the participants, many skills that are used daily in school and careers are a basic part of interacting within MMORPGs and other virtual environments. By identifying these skills and the specific

quests within the game that utilize the skills an empirical study can be identified to test skill acquisition and generalization. A conclusion that can be drawn is that MMORPGs may serve as a platform to buttress the acquisition of social skills and soft skills required for postsecondary education specifically in the area of STEM. Another conclusion that can be drawn is that individuals with ASD possess the ability to self-reflect and relate activities in the context of the MMORPG to similar situations in a face-to-face setting. This study considers the findings from five participants and therefore cannot be generalized; however, further study of emotional recognition would be important to the field of ASD.

Table 7
Comparison of the Literature to the Findings from the Study

Literature	Study Findings	Implications
Given the changes in communication and socialization that occur with the use of digital virtual communication, it may be possible to integrate young adults with ASD into a virtual community that may support greater communication (Cheng, 2005).	All of the participants discussed • a strong desire to have friendships • develop meaningful connections that were reciprocal in the game and in real life (IRL). The participants all stated that they use the virtual environment as a way to feel comfortable with their interactions prior to face-to-face or Skype interactions.	New opportunities to engage in community and friendships are possible with virtual environments
Advancements in virtual environments and accessibility through portable devices may offer a medium that is comfortable for those with ASD to communicate and develop interpersonal relationships (Parsons et al., 2013).	Four of the five participants discussed wanting to interact with people in the virtual environment prior to meeting so they had the opportunity to develop a friendship and get to know the other person first.	Generalization of social interactions from a virtual environment to a face-to-face setting
Virtual environments potentially	All of the participants had anxiety	Opportunities to

remove extraneous variables often experienced in a face-to-face situation such as additional noises, movement of people, and body language (Yee, 2006). Mitchell, Parsons, and Leonard (2007) and Parsons and Cobb (2013) noted that virtual environments afford young adults with ASD a controlled and safe environment within which it is comfortable to communicate and to learn interpersonal communication skills. The skills learned in a virtual environment may be generalizable to a real-world situation (Prensky, 2007; Yee, 2006).	when traveling to meet friends or dealing with large crowds; they described interacting socially with friends in the virtual game where they were able to experience more frequent interactions without having to manage a lot of anxiety.	engage without anxiety
A reoccurring problem for many current interventions such as Social Skills Training Groups, Structured Play Group, Video Modeling, and Functional Communication Training require multiple opportunities to learn the behavior. (Parsons et al., 2011)	This study identified that all participants repeatedly had opportunities to • engage socially, • practice working within a group and, • recognizing their emotions, and how they affect the group interactions.	Virtual environments provide multiple opportunities to practice social skills that are required for postsecondary education and careers in STEM. The opportunities available are limitless and include interactions with the same people or different people all over the world.
Further, Gee (2007) and Fullan (2012) discussed gaming in a virtual environment as a social event providing a platform to buttress the teaching of social communication and complex	All participants learned how to • manage frustration by disengaging from the challenging environment • seek emotional support from gaming friends,	

communication skills.	• reframe their emotional state. In addition to emotional recognition and management of frustration, all participants discussed skills they had learned such as • communicating in a group, • waiting their turn to talk, • giving and receiving empathy, • breaking large tasks into more manageable tasks, managing time, and • awareness of self and specific roles in life and game.	
Bellini and Akullian (2007) noted that individuals with ASD who choose to play MMORPGs or interact in virtual environments may intentionally interact with more than one person.	Findings from this study demonstrate that these young adults with ASD were active participants in the virtual environments available for socialization and interaction with people all over the world. In fact, all participants discussed having friends on more than one continent as a result of the MMORPG that they played.	Potential environment to support socialization in the classroom
Researchers have noted that young adults with ASD possess a desire to establish friendships (Bauminger & Kasari, 2000)	As noted by the direct quotes from P-1, P-2, P-3, and P-5, it is common to seek out a guild or clan to actively work together and solve complex problems using their advanced digital literacy skills and communication within the game	When given an environment that is conducive to their unique needs individuals with ASD actively socialize.
	All of the participants discussed a strong desire to have friendships and develop meaningful connections that were reciprocal in the game and in real life (IRL). Each participant effectively used the virtual environment as a way to build trust and develop a friendship while learning to interact by recognizing	MMORPGs are an environment that can be used to develop social skills and build trust that then can be supportive in a face-to-face setting.

	social cues and taking feedback.	
Social impairments are noted in the literature as one of the most salient aspects of ASD (APA, 2014; Kanner 1943),	All participants in this study managed to engage in social behaviors on a daily basis, and overcame challenges to socialization – and they actively sought out opportunities for socialization and friendships.	Multiple opportunities to practice and receive feedback.
Cheng (2005) noted that virtual environments may provide opportunities to engage in communication and engage socially without the stress or anxiety associated with face-to-face communication.	As identified by all the participants in this study, their main reason for playing MMORPGs and engaging in "chat-rooms" is for the social interactions and friends they can make.	Virtual environments support social interactions and friendship development.
Granic and colleagues (2014) stated that video games may foster real-world psychosocial benefits.	All participants discussed a time when they felt depressed because they did not have social connections or friends to interact with and to remediate those feelings they used the virtual video games.	Virtual environment interactions supported healthy social behaviors and reduced feelings of loneliness.
Using an avatar may increase the comfort level of interactions and support greater social interactions (Cheng, 2005; Parsons et al., 2011).	All participants identified the gaming environment as a way to be comfortable interacting with others and developing comfort with their perceived self-identity.	Virtual environments remove extraneous variables that inhibit social interactions.
Gee (2006) noted that learning is a by product of gaming; gaming provides constant feedback that will modify interactions within the game. Further, Yee (2007) postulated that skills learned during the gaming experiences may generalize to real world situations and social skills are a required part of virtual interactions.	One specific example is P-1 discussing how he used his process of task analysis in a game to complete the challenge and applied that to his clam dissection for his college course.	Continuous feedback in the game provides learning by observation, construction of knowledge, feedback, tools used in the game, and the demands of social interactions (see Figure 1

		theories)
Considering the immersive social contexts that include social and pro-social activities as part of the gaming experience, gamers rapidly learn social skills that could generalize to social relationships outside of the gaming environment (Gentile & Gentile, 2008; Gentile et al., 2009; Vitelli, 2014; Yee, 2006).	All participants discussed learning • to socialize, • take turns in conversations, and • consider others' needs and wants in the virtual environment first Ultimately they discussed using those skills in their college courses or when spending time with friends.	Transfer of skills
Additionally, people often spend multiple hours per day in virtual environments communicating, developing friendships, and working together on projects (Granic et al., 2014)	All participants played videogames in the context of a virtual environment three hours a day. During that time they cultivated relationships by listening, providing support, and interacting within a group	Virtual environments support relationships.

Suggestions for Future Research and Implications

The researcher offers recommendations based on the analyses and conclusions of this study. The recommendations that follow are for researchers in the field of ASD and postsecondary transition and current and prospective teachers in the field of special education.

Recommendations for Researchers

Given that there are multiple factors that affect socialization and friendships within the context of virtual environments, understanding and acknowledgment of connections between virtual environments and characteristics of social interactions will support future research specific to adolescents and young adults with ASD. It should be noted that a plethora of virtual

environments that exist and entail complex systems that require socialization and communication. Considering that a majority of all adolescents and young adults play a virtual game at least one hour a day (Granic et al., 2014), it is important to focus on the potential positive outcomes and learning for individuals with ASD when connecting with their typically developing peers within a virtual environment. As described in this study, advancements in virtual environments hold the potential to support social skills acquisition and friendship development that will ultimately increase successful face-to-face interactions and transitions.

From the rich descriptions and findings from this phenomenological study, this researcher recommends further studies be conducted to develop a larger database of information targeting more comprehensive understanding of the socialization and skill development through a MMORPG for individuals with ASD. In light of the findings and conclusions, the following should be considered:

1. Based on the limitations of the current study to include the homogeneity of the sample, and potential researcher bias, a survey of a large sample of young adults who actively play MMORPGs and interact in a gaming environment should be conducted to assess the extent to investigate details from the themes evidenced in this research.
2. Additional survey research using the same criteria should be undertaken among students who have successfully completed postsecondary to compare the college experiences of students with and without ASD using time and experiences of virtual environments as variables.
3. Additional survey research focused specifically on the necessary skills for STEM careers should be undertaken among students who have successfully completed

postsecondary education in STEM fields of young adults with and without ASD using time and experiences of virtual environments as variables.

4. Longitudinal studies of young adults with ASD should be conducted to identify patterns of social interactions in virtual and face-to-face classes and transitions across multiple settings (e.g., virtual, face-to-face, college, jobs)
5. Correlations between success in virtual environments and generalization of soft skills learned specific to culture, gender, race, and socioeconomic status.

Recommendations for Teachers and Related Professionals

Based on the current findings and potential of the findings the researcher recommends teachers and related professionals should:

1. Consider implementing virtual environments or MMORPGs, such as *MineCraft,* as part of a curriculum to support collaborative group work. Some potential topic areas could include: (a) science – deforestation by farming resources in *MineCraft* and working on a team to gather such resources as trees or flow and volume of water, (b) technology – coding and hardware rendering power of a gaming computer, (c) engineering – designing structures, using Redstone for mining and industrial engineering (see Smith, 2014), and (d) mathematics to enhance learning opportunities that students can relate to by creating visual concepts such as developing slopes and learning to read rise over run. *MineCraft* is a tool that can support implementation of common core standards in relatable enjoyable experience that can be internalized and shared in a community of learners. All of the suggestions above in STEM require group interactions and communication through

the virtual environment as well as face-to-face and hold the potential to increase inclusion in more advanced classes for students with ASD.

2. Consider the development and implementation of a summer orientation project for students with ASD through a virtual environment or MMROPG to support the development of common topics and interests that lead to trust, occupations, relationships, and friendships. A summer orientation program could be implemented for students with ASD and their peers and students with ASD and future teachers. Virtual environments such as Face book, *Second Life, MineCraft,* or even Google+ hangouts could be considered.
3. Become knowledgeable about virtual environments and MMORPGs that may be of interest to students with ASD. These environments could serve as a foundation for future conversations that may help students with ASD feel comfortable in the classroom.
4. Relate the soft-skills such as collaboration in the virtual environments to lab projects in classes such as science, technology, and engineering group work. Relate the student's strengths in the MMORPG to the classroom environment to help younger students see patterns of similarity between both the virtual and face-to-face environments.
5. Consider multiple opportunities to interact with the same or very similar scenario in a virtual environment. Repeated opportunities to interact are readily available in virtual environments. The repeated trials offer students multiple attempts to master a specific skill. Virtual environments can be very objective based or non-objective when teaching skills such as communication, collaboration, and emotional recognition to students with ASD.

6. Consider transition opportunities to postsecondary transition curriculum. Using MMORPGs to learn to task manage, self-regulate time and skills, and as well as develop social support networks can increase transition and persistence in postsecondary settings.

Recommendations for STEM Education and Researchers

Given the identified soft skills required by ABET (2013) accreditation and the skills supported through CCSS for college, career, and life readiness, virtual environments, specifically MMORPGs, support given objectives, task management, timeliness or interactions, group collaboration, and complex communication skills that are parallel to skills required to postsecondary education and specifically the ABET accreditation standards. According to current research, the vast majority of young adults and adolescents play videogames online. Therefore, a more positive approach to gaming that considers the individual strengths of each person should be researched and connected to success in postsecondary education (Granic et al., 2014). Considering the rich data and the findings and conclusions presented, the following should be considered:

1. A comprehensive understanding of the soft skills used in virtual environments should be developed.
2. Utilization of MMORPGs such as *Minecraft* and *World of Warcraft* as tools in STEM classes to teach concepts and comparison of results to classes strictly taught in a face-to-face environment without the use of any virtual mediums.

3. Relate concepts such as deforestation to survival mode in *Minecraft* and utilization and scantiness of recourses available. Such studies could also include a comparison of group work and team building skills to preserve resources and develop outcome plans for larger communities. This type of project would allow for individuals with ASD to become comfortable with their peers in class and potentially generalize skills to face-to-face while introducing new concepts to teach science standards.

Conclusion

In this study, the researcher employed a phenomenological approach to better understand the social interactions of individuals with ASD during online virtual gaming and real-life interactions. As noted in the literature, there is a rising prevalence of individuals diagnosed with ASD (Shattuck, 2013) and approximately 50,000 youth with ASD turn 18 years old each year, a proxy indicator for the number entering adulthood (Shattuck et al., 2014). Of the 50,000 that turn 18, we know that only 54% graduate high school, and of that, only 35% go onto college (Shattuck, Narendorf, Cooper, Sterzing, Wagner, & Taylor, 2012). Additionally, about 34% choose a major in STEM, which is significantly higher than that of any other disability category, and also higher than the 23% rate seen in the general population (Baron-Cohen et al., 2007; Wei et al., 2013). Unfortunately, Shattuck and colleagues (2011) identified that only 29% of individuals with disabilities graduate college. This data is not disaggregated based on disability categories.

A primary problem that has contributed to lack of persistence in postsecondary education for college students that are typically developing is the development of friendships and support

networks (Tinto, 2004; Noel-Levitz, 2011). Noel-Levitz (2011) identified that 27% of all college students in their first year struggle to develop friendships. Given the additional challenges for individuals with ASD, developing friendships and support networks can be challenging, ultimately augmenting the challenges already experienced with postsecondary education.

Adults with ASD who have obtained a college degree have statistically better postsecondary life outcomes than those without a college degree (Socha et al., 2011). Therefore, understanding the social interactions of virtual environments and how that correlates to success in postsecondary education among young adults with ASD could significantly support social science professionals identifying efficacious interventions which could help college students with ASD succeed.

There is emerging research that states that some individuals with ASD seek friendship; however, fail to maintain friendships and interpret social cues (Bauminger & Kasari, 2000). Based on the findings from the rich data collected, the individuals in this study actively sought out friendship and social interactions. In fact, a primary reason for playing MMORPGs was to socialize and interact with people in an environment that was conducive to their unique needs.

As a result of the interactions in the environment with friends all the participants had developed an awareness of self and repeatedly spoke about emotions. Based on these findings, the researcher contends that a virtual environment and MMORPG gaming platform truly hold the potential to connect individuals with ASD to a community, develop communication skills and relationships, and identify supports that will increase postsecondary transition and persistence in postsecondary education. Continued exploration of social interactions, friendship perceptions, and persistence in postsecondary STEM tracts should be explored.

The researcher sought to: (a) help to fill the gap in literature on friendships, interpersonal relationships, and postsecondary education with an emphasis on STEM; (b) provide a foundation for research into alternate venues that can provide support for individuals with ASD in postsecondary education; and (c) initiate a line of research to further examine the use of MMORPGs in the field of exceptional education specific to young adults with ASD enrolled in postsecondary education STEM tracts.

The virtual environments hold endless potential to support greater access to inclusive environments, postsecondary education and support networks, and skills that can be learned and generalized to a face-to-face setting. Ultimately, technology has provided a virtual community that the vast majority of society is using for interactions. These environments are a part of everyday living and could be considered natural. Gaming has become a conduit for greater social interactions, support networks, and skills learned that are supporting success in postsecondary STEM education. Through the findings of this study, the researcher was able to illustrate that a MMORPG has the potential to provide enhanced social opportunities for individuals with ASD and support success in postsecondary education with an emphasis on postsecondary education in STEM.

APPENDIX A:
QUESTIONS FOR A SEMI-STRUCTURED INTERVIEW

Primary interview questions	Prompts and elicitations
Demographic Questions? Age: Gender: Race: STEM Tract: Diagnosis: Age of Diagnosis: IQ if possible:	
1. Describe how you feel when you game? (Gee, 2007; Fullen 2012; Prensky, 2006)	a. Prompts: discuss your social experiences? b. Interactions on-line different from face-to-face
2. Describe your social interactions outside of the gaming environment	a. Interactions on-line different from face-to-face
3. Discuss your perspective of the gaming community and communication that occurs in the game. (Gee, 2007; Prensky, 2006)	a. Is this different than experiences you have face-to-face? b. Discuss social interactions when not playing the game, back-and-forth dialogue in real life and during group game play
4. When you are playing an online game, do you think there are differences in the way you communicate with people you know from face to face contact and those you have never met in person? (Gee, 2007; Fullen 2012; Prensky, 2006)	a. Friendships online
5. How does being part of a gaming community increase your social experiences? (Mitchell, Parsons, & Leonard, 2007).	a. Prompts: During my observation I heard a lot of collaboration and willingness to speak negatively about each other, can you describe that? b. How are interactions online different than face-to-face?

5. Discuss your friendships and what it means to be part of an online community. (Alpern, & Zager, 2007; Durkin et al., 2013; Locke et al., 2010)	a. Is this different than experiences you have face-to-face? b. Look forward to scheduling gaming events.
6. Discuss your friendships outside of the gaming community (e.g. school).	
7. Describe the social norms of your gaming community. (Fullen, 2012; Gee, 2007; LeGoff, 2004; Macchiarella, 2012; Prensky, 2006).	a. Acceptance, friendships
8. Describe your social interaction in the gaming community. (Locke et al., 2010)	a. Are you more comfortable talking to people? b. Do these interactions online make you more comfortable with meeting these individuals face-to-face?
9. Describe your social interactions in a face-to-face situation. (Kanner, 1943; Locke et al., 2010)	
10. How many friends do you have? Bauminger & Kasari, 2000; Bauminger, Solomon, Aviezer et al., 2008; Kanner, 1943; Locke et al., 2010)	a. online b. in the f2f real-world environment
11. How would you define friendship? (Bauminger & Kasari, 2000; Bauminger et al., 2008; Locke et al., 2010)	a. Is it different in an f2f environment than a virtual?
12. How important are friendships to you? (Bauminger & Kasari, 2000; Bauminger et al., 2008; Locke et al., 2010; Zager & Alpern, 2007)	a. discuss virtual and f2f
13. Why do you game? (Yee, 2006)	*Should be asked near the end (Yee, 2006)
14. Can you describe to me how the feedback in the game helps you evolve as part of a guild? (Gee, 2006)	a. observations of others in game b. feedback from characters c. computer generated feedback and automated tools

	(Theory related prompts)
15. Do you change your gaming interactions based on the feedback in the game from other players, observations, or game based computer feedback? If so why or why not? (Gee, 2006)	(Theory related prompts)
16. Do you feel that your gaming experiences support interactions outside of the game? If so why or why not? (Yee, 2007)	
17. Do you feel more social because the game requires social interactions? (Yee, 2007)	a. Prompts from the game, achievements, guild interactions, observations of others (Theory related prompts)

APPENDIX B:
LENGTH OF ACTIVITY

Length of Activity	
Descriptive Notes	Reflective Notes
What are the experiences of the gamers as they interact during the gaming event?	
What is the layout and comments about the physical setting?	
Description of the interactions	
How many participants?	

Based on Creswell's (2013) Qualitative Inquiry Research Design

APPENDIX C:
CURRENT EBP CHART

This table describes the current EBP, 19 out of the 27 addressed the needs for adolescents and young adults. Only 11 out of 27 are EBP for adults with ASD. Of the 11, ten can potentially be adapted and implemented in a virtual environment such as a MMORPG.

	Age Range	Outcomes	Adults	Adolescents	Potentially adapted to a virtual environment or MMORPG
Antecedent-Based Intervention	Toddlers (0-2 years) to young adults (19-22 years) with ASD.	ABI can be used effectively to address social, communication, behavior, play, school-readiness, academic, motor, and adaptive skills	Yes	No	No
Cognitive Behavioral Intervention	Elementary school-age learners (6-11 years) to high school-age learners (15-18 years) with ASD	CBI can be used effectively to address social, communication, behavior, cognitive, adaptive, and mental health outcomes.	No	Yes	Yes
Differential Reinforcement of Alternative, Incompatible, or Other Behavior	Preschoolers (3-5 years) to young adults (19-22 years) with ASD.	DRA/I/O can be used effectively to address social, communication, behavior, joint attention, play, school-readiness, academic, motor, and adaptive skills.	Yes	No	Yes
Extinction	Preschoolers	EXT can be	No	Yes	No

	(3-5 years) to high school-age learners (15-18 years) with ASD.	used effectively to address communication, behavior, school-readiness, and adaptive skills			
Functional Behavior Assessment	Toddlers (0-2 years) to young adults (19-22 years) with ASD.	FBA can be used effectively to address communication, behavior, school-readiness, academic, and adaptive skills.	Yes	No	No
Functional Communication Training	Preschoolers (3-5 years) to high school-age learners (15-18 years) with ASD.	FCT can be used effectively to address social, communication, behavior, play, school-readiness, and adaptive outcomes.	No	Yes	No
Modeling	Toddlers (0-2 years) to young adults (19-22 years) with ASD	MD can be used effectively to address social, communication, joint attention, play, school-readiness, academic, and vocational skills.	Yes	No	Yes
Peer-Mediated Instruction and Intervention	Preschoolers (3-5 years) to high school-age learners (15-18 years) with ASD.	PMII can be used effectively to address social, communication, joint attention, play, school-readiness, and academic	No	Yes	Yes

		skills.			
Prompting	Toddlers (0-2 years) to young adults (19-22 years) with ASD	PP can be used effectively to address social, communication, behavior, joint attention, play, school-readiness, academic, motor, adaptive, and vocational skills.	Yes	No	Yes
Reinforcement	Toddlers (0-2 years) to young adults (19-22 years) with ASD.	R+ can be used effectively to address social, communication, behavior, joint attention, play, cognitive, school-readiness, academic, motor, adaptive, and vocational skills.	Yes	No	Yes
Response Interruption/Redirection	Preschoolers (3-5 years) to young adults (19-22 years) with ASD.	RIR can be used effectively to address social, communication, behavior, play, school-readiness, and adaptive skills.	Yes	No	No
Scripting	Preschoolers (3-5 years) to high school-age learners (15-18 years) with ASD.	SC can be used effectively to address social, communication, joint attention, play, cognitive, school-readiness, and vocational	No	Yes	Yes

		skills.			
Self-Management	Preschoolers (3-5 years) to young adults (19-22 years) with ASD.	SM can be used effectively to address social, communication, behavior, play, school-readiness, academic, and vocational skills.	Yes	No	Yes
Social Narratives	Preschoolers (3-5 years) to high school-age learners (15-18 years) with ASD.	SN can be used effectively to address social, communication, behavior, joint attention, play, school-readiness, academic, and adaptive skills.	No	Yes	No
Social Skills Training	(0-2 years) to young adults (19-22 years) with ASD.	SST can be used effectively to address social, communication, behavior, play, and cognitive skills.	Yes	No	Yes
Technology-Aided Instruction and Intervention	Preschoolers (3-5 years) to young adults (19-22 years) with ASD.	TAII can be used effectively to address social, communication, behavior, joint attention, cognitive, school-readiness, academic, motor, adaptive, and vocational skills.	Yes	No	Yes
Time Delay	Preschoolers (3-5 years) to	TD can be used	Yes	No	Yes

	young adults (19-22 years) with ASD.	effectively to address social, communicatio n, behavior, joint attention, play, cognitive, school-readiness, academic, motor, and adaptive skills.			
Video Modeling	Toddlers (0-2 years) to young adults (19–22) years with ASD.	VM can be used effectively to address social, communicatio n, behavior, joint attention, play, cognitive, school-readiness, academic, motor, adaptive, and vocational skills.	Yes	No	Yes
Visual Supports	Toddlers (0-2 years) to young adults (19-22 years) with ASD.	Visual supports can be used effectively to address social, communicatio n, behavior, play, cognitive, school-readiness, academic, motor, and adaptive skills.	Yes	No	No

APPENDIX D:
SELF-REPORTING SURVEY

Dear Participant,

Thank you for agreeing to help me with my study. Please take a moment to respond to the following questions.

How many:

- Hours did you play your MMORPG? _____
- Phone calls did you make? _____
- Phone calls did you receive? _____
- Text-based chat messages did you send? _____
- Text-based chat messages did you receive? _____
- Video conferences like Skype or Google-Hangouts did you start? _____
- Video conferences like Skype or Google-Hangouts did you get invited to? _____
- Lunch interactions or other (as discussed with the participant)? _____
- Visits to a friend's house? _____
- Interactions with a friend in a face-to-face setting? _____

	Calls made	Calls Received	Texts sent	Texts received	Video chats using Skype Google-Hangouts, etc... did you start	Video conferences like Skype, Google-Hangouts, etc...did you get invited to	Face to face meetings with a friend
Monday Tuesday Wednesday Thursday Friday Saturday Sunday							

You may use the table provided to tally each time you complete an activity during the week.

Thank you so much and have a great week!

Jenn Gallup

Doctoral researcher

University of Central Florida

APPENDIX E:
UCF IRB APPROVAL

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Jennifer Gallup**

Date: **March 05, 2014**

Dear Researcher:

On 3/5/2014, the IRB approved the following human participant research until 3/4/2015 inclusive:

Type of Review:	UCF Initial Review Submission Form
Project Title:	A phenomenological look at the social culture of videogaming for people with Autism
Investigator:	Jennifer Gallup
IRB Number:	SBE-14-10099
Funding Agency:	
Grant Title:	
Research ID:	N/A

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

If continuing review approval is not granted before the expiration date of 3/4/2015, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

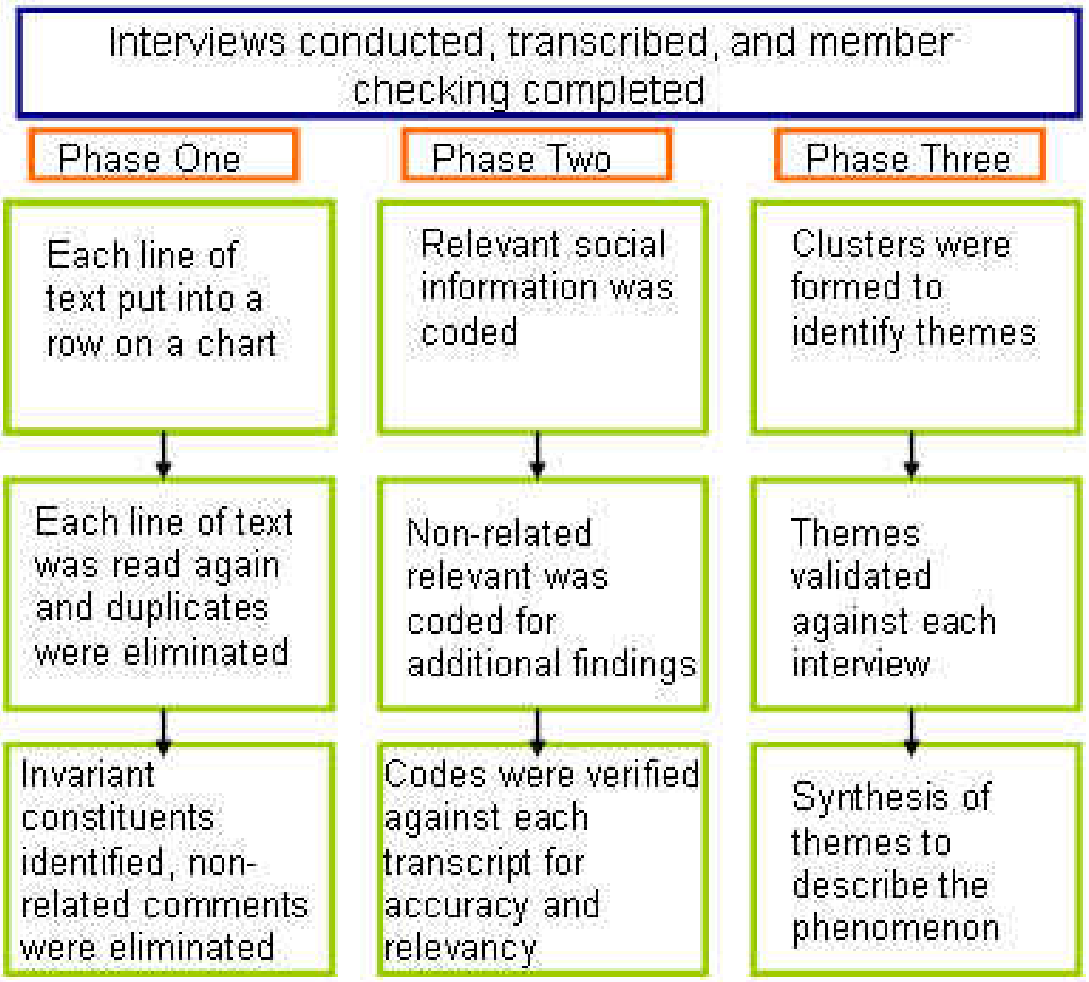
On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Joanne Muratori

IRB Coordinator

APPENDIX F:
MOUSTAKAS FLOW CHART

Moustakas Flow Chart



APPENDIX G:
RESEARCHER INTERVIEW NOTES

Notes on non-verbal cues and textural data during the interviews.

Participant	Hand twitching	Eye contact	Wiggling in Seat
P-1	Would flex his fingers open and shut.	Made very limited eye contact.	
	He used his phone as a distracter; he rolled it over and over in his hands when he was not flexing his fingers.	Eye contact increased when he spoke about frustration and not having to do things alone. He also increased his eye contact when he wanted to emphasize a point such as when he described his friends in the game. discussed his	In the 42 minutes P-1 sat in the interview he repositioned eight times.
P-2	P-2 continuously touched his index finger to his thumb throughout the entire interview alternating from left hand to right hand.	P-2 had excellent eye contact that did not make the researcher feel that he was staring or not paying attention.	P-2 was very wiggly in his seat and changed positions 13 times in the 68 minute interview. He would sit on his leg, move it out from under him, lean on the table, rearrange the glasses on his face, and move his hair from one side of his head to the other when not connecting his index and thumb.
P-3	P-3 continuously picked at her right foot or left index finger when talking.	P-3 eye contact was limited Eye contact was greatest when speaking about being clan administrator.	P-3 changed positions six times in the 59 minute interview, and then asked if it would be ok if she just lay on the ground so she wouldn't move.
P-4	P-4 Sat with her hands clenched in her lap or on the table when talking; however she wiggled her fingers across her knuckles as if her knuckles were a piano.	P-4 had very limited eye contact and made consistent eye contact when discussing how important friendships were to her and how not having socialization affected her mental health.	P-4 preferred to sit on a yoga ball in the library and rocked side to side or back and forth during the interview.

P-5	P-5 brought his lunch to the interview – one piece of cheese pizza, a chocolate lava cake, and a large glass of mixed soda. He picked off very small pieces of the crust and crumbled them in-betweens his index and middle finger, and thumb until they were very fine pieces of bread.	P-5 had very limited eye contact; his eye contact was very prominent when he discussed his social clan.	P-5 changed his position about every two minutes from sitting back in a very relaxed leaning back position to an upright attention position.

APPENDIX H:
THEME CODES

Codes for Identifying Themes

Initial Codes Combined	Emergent Themes
Friendship, **perceptions of friendship**, and **interactions online** Barriers to socialization online and f2f correlate with **f2f friendships and social interaction** and socialization in a virtual environment	Seeking Social Interaction and Defining Friendship and Overcoming challenges
Common theme awareness of comfort/safety net in the game	Barriers to Friendship comfort in socializing comfort in socializing
Emotional recognition and Self perceptions, , and roles	Emotional awareness Roles in life, Increased socialization and friendships
skills learned	Skills Learned

	Pink = socialization in the game	Pink and Blue = perceptions of social communication and technology to communicate	**Blue bold = perceptions of social communication**	Grey – Self perceptions of interaction	Blue = comfort and safety of socialization
Spruce	10	3	1	10	2
Sequoia	27	8	10	30	19
Redwood	8	18	9	13	14
Aspen	9	4	2	8	2
Maple	32	15	7	12	11
	Total: 88	Total: 48	Total: 29	Total: 73	Total: 48

	Puke Green = barriers to socialization and interaction Red = challenges with the game socialization	Yellow = Friendships	Yellow with Blue = Friendship perceptions	Purple = Management of frustration	**Rust = Socialization and life roles/rules**
Spruce	1	10	0	8	0
Sequoia	7/12	20	15	3	10
Redwood	15	16	37	3	1
Aspen	1	8	6	1	2
Maple	2	17	16	3	8
	Total: 40	Total: 71	Total: 74	Total: 18	Total: 21

	Purple and black = friendships and interactions outside the game	Teal=Skills Learned	**Personal perception of videogames = Underlined & Bold**	Emotional Recognition
Spruce	15	17	9	4
Sequoia	6	14	22	26
Redwood	4	3	8	19
Aspen	8	2	3	2
Maple	4	8	8	21
	Total: 37	Total: 44	Total: 50	Total: 72

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