Virtual Reality Technologies and Autism Spectrum Disorder: Directors of Special Services’ Perceptions

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Abstract

This qualitative study explored the impact of virtual reality technologies on the educational setting of students with Autism Spectrum Disorder (ASD), as perceived by participating directors of special services. The significant increase in the number of students being diagnosed with ASD affects school districts across the country. These districts struggle to meet the high level of needs for support and services required to ensure students an educational experience that maximizes learning. There are no fixed solutions for students with ASD. However, the expanding market of innovative technologies, including virtual reality technologies, may offer alternative supports in the educational experience of the learner, with claims to provide a particularly facilitatory environment for students with ASD. There is, however, a lack of substantive research examining how directors of special services, frequently one of the the lead decision-makers in determining programming and technology acquisitions for classified students, perceive this relatively new and innovative technology as a potentially effective intervention.

Data were collected from eight semistructured interviews with participating directors of special services in both public and private K-12 schools in Monmouth County, New Jersey, as identified through the New Jersey Department of Education’s 2016-17 Directory of Directors/Supervisors of Pupil Personnel/Special Services. Data were analyzed to identify common themes among directors pertaining to the potential impact of virtual reality technologies on the educational experience of students with ASD. Attitudes toward teacher professional development to implement these technologies in the classroom setting were also examined. Data revealed important themes regarding the perceived potential of this intervention. These themes included the importance of life skills and social skills as a priori to academic competencies and the value of interactivity and experiential nature of technology. Data also revealed notable
themes regarding the effective facilitation of staff professional development for implementation of these technologies. Among these were fear and resistance to change, the importance of professional development structure, and the value of a culture of technology. This study contributes to the existing literature regarding best practices in technology integration for supporting students with special needs, particularly those with ASD. It attempts to provide district leaders with a better understanding of the ways in which virtual reality technologies can offer alternative educational supports that may have a positive impact on the academic competencies, life skills, and social skills of students with ASD. The study also provides a lens through which district leaders may better perceive barriers to staff professional development, and how a culture of technology may help mitigate these factors.
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This work is not mine alone to celebrate.

To my husband, Tommy, who knows in the most important ways how much his presence, his love, and his beautiful background music provided me with a wellspring of inspiration. This is for the eternal us, who promised each other as teenagers that we would one day change the world. This is just the beginning.

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VIRTUAL REALITY TECHNOLOGIES AND AUTISM SPECTRUM DISORDER

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Chapter 1
Introduction

Autism Spectrum Disorder (ASD) is defined by the Individuals with Disabilities Education Act as “a developmental disability significantly affecting verbal and nonverbal communication and social interaction, generally evident before age 3, that adversely affects a child’s educational performance.” The language of the American Psychiatric Association’s (2013) DSM-V concurs with this definition and further specifies a scope of criteria to categorize the level of severity for persons with ASD. These range from those “requiring support” to those “requiring very substantial support.”

The cause of ASD remains unknown, and researchers continue to explore biomedical, environmental, and genetic factors that may be responsible (Ratajczak, 2011). According to Ennis-Cole (2012), individuals with ASD may have mild-to-severe impairments in areas of communication/language, behavior, and social interaction, making it difficult to meet their needs and provide myriad educational challenges. Because individuals with ASD are a heterogeneous group and vary widely in their degree of impairment, a one-size-fits-all diagnosis and prescriptive therapy are ill-advised. Children with ASD characteristically present with a wide range of language and communication disorders and peculiarities, and frequently encounter difficulty in successfully following and mastering an unmodified school curriculum (Simpson, deBoers, & Smith-Myles, 2003). Further complicating the issue is the explosive increase in the number of children being diagnosed with ASD. In 2000, the Centers for Disease Control and Prevention estimated that 1 in 88 children born were diagnosed with ASD, representing more than a 68 percent increase in autism rates compared with the previous eight years. In 2014, the number of reported diagnoses increased to 1 in 68. In autism “hot spots” such as New Jersey, the rate is around 1 in 45 (Christensen, Baio, Braun, et al., 2016).
Advances in technology for special education have increased dramatically in the last decade. A number of studies have investigated diverse applications of technology-based interventions for students with ASD (Goldsmith & LeBlanc, 2004). In addition, parents and clinicians have routinely reported that children with ASD are drawn to technological devices (Colby, 1973, as cited in Goldsmith & LeBlanc, 2004). Research into the use of technology-based interventions as an evidence-based practice struggles to keep up with the rapid changes in smartphones, apps, and other types of devices and software. Some new technologies, including virtual reality technologies (VRTs), show a great deal of promise for helping students with ASD target communication, social, independent functioning, and even academic skills (Burton, Anderson, Prater, & Dyches, 2013). Since ASD involves a variety of impairments, including an abnormal stimulus response to the authentic external world, VRTs may offer the potential to regulate an artificial computer environment to better match the unique needs of individuals with this disorder (Riva, 1998).

**Statement of the Problem**

The significant increase in the number of students being diagnosed with ASD affects school districts across the country. Districts struggle to meet the high level of needs for support and services, thereby ensuring a “free and appropriate public education (FAPE)” as guaranteed under the Individuals with Disabilities Act (2004) (Hurwitz, 2008, as cited in Haney, 2013). According to Smith (2009), students with ASD are more likely than other special-needs students to receive out-of-district placements. Parents of these students increasingly demand more intensive, innovative, and expensive services and technologies that offer their child the best opportunity for educational success. There are no fixed solutions for students with ASD. However, the burgeoning development of innovative technologies, including VRTs, may offer
alternative supports in the educational experience of the learner. Moreover, many developers of these technologies claim to provide a particularly facilitatory environment for students with ASD that offers structure, opportunities for repetition, affective engagement, and control of the learning environment. VRTs may offer the ability to provide realistic settings, visual representations, and user control that students with ASD find highly appealing (Parsons, Rizzo, Rogers, & York 2009). These innovations in technology offer promising benefits but are still fairly limited in development and availability. In addition, an equally limited number of studies are available that provide statistically significant evidence of the impact of VRTs on the education of students with ASD. Moreover, interpretations of what constitutes VRTs vary widely among developers, users, and school administrators. These administrators include directors of special services (herein referred to as directors) in both public- and private-school settings who are frequently significant decision-makers in identifying and acquiring assistive and instructional technology. They may have a limited understanding and awareness of the potential of these technologies for academic application in the education of students with ASD. Additionally, implementing teacher development training to help teachers master new technologies must be considered, both in feasibility and, perhaps most importantly, teacher efficacy. These components help drive the study and lead to the main research question: What is the impact of VRTs on supporting students with ASD as perceived by directors?

**Purpose of the Study**

The purpose of this qualitative study was to explore the impact of VRTs in the educational setting for students with ASD as perceived by participating directors. A pre-qualifying questionnaire and invitation were sent electronically to 67 directors in both public and private K-12 schools in Monmouth County, New Jersey. These were used to develop an
interview cohort representative of the range of socioeconomic settings, enrollment dynamics, and experience levels of directors. Data were then collected from consenting participants in face-to-face interviews using open-ended, semistructured questions to effectively inform the research questions.

The findings of this study will contribute to the relatively limited body of research on VRTs in the educational setting for students with ASD. Results may also assist public- and private-school leaders in better understanding the potential strengths and challenges of facilitating VRTs in the classroom setting, and provide for teacher professional development for effective implementation of these new technologies.

Research Questions

This study focused on the following research questions to examine the impact of VRTs on supporting the educational experience of students with ASD:

1. What are special services directors’ perceptions of the impact of VRTs for positively impacting the educational experience of students with ASD, specifically with regard to content delivery, student engagement, and task focus?

2. What are the attitudes of directors of special services with regard to providing for teacher professional development for implementation of VRTs in the classroom setting?

Significance of the Study

This study sought to contribute to the relatively limited body of knowledge dealing with emerging modalities in VRTs that may offer alternative instructional and learning strategies for supporting the educational experience of students with ASD.

ASD has become the fastest-growing disability in the United States, with current prevalence rates increasing exponentially each year (Ryan, Hughes, Katsiyannis, McDaniel, &
Sprinkle, 2014). According to Autism New Jersey, the largest statewide ASD advocacy network of parents and professionals, New Jersey has the highest rates nationally, with 1 in 45 children diagnosed; there is particular concern regarding the 1-in-28 rate for boys. The increase in the number of students identified with ASD has significant implications for public and private schools and educators. Points of contention between parents and school districts include eligibility and services provided, instructional methodologies, and the variety of emerging technologies that offer support to enhance the education and life skills of students with ASD.

This study provides important conclusions about the perceptions of directors, who are often one of the lead decision-makers in acquiring and implementing new technologies in the special education setting. It explores the challenges they may encounter in effectively facilitating teacher professional development to implement a rather innovative technology system. The conclusions provide public- and private-school superintendents and directors with information to assist in making important decisions regarding curriculum and technology acquisition and integration for students with ASD.

**Limitations of the Study**

This study explored the perceptions of New Jersey public- and private-school special services directors regarding VRTs for educating students with ASD. It also examined their attitudes toward providing teacher professional development for effective implementation in the educational setting for students with ASD. The limitations of this study included a relatively limited body of statistically significant research on VRTs and their impact on educating students with ASD, as well as a fairly narrow market of identifiable VRTs. Thus, the knowledge and perceptions of directors, in part, depended on providing a research-based description of VRTs and their application to the educational setting. Directors had varying levels of experience and
exposure to these types of technologies, a limitation that could lead to different findings if conducted with directors from different regions of the state. Additionally, since the research base was limited to K-12 schools in Monmouth County, New Jersey, this limitation could lead to different findings in other states.

**Definition of Terms**

*Director:* Lead administrator in New Jersey public or approved private school who is responsible for the organization, implementation, and supervision of all programs and staff members who provide special education services to classified students.

*Least Restrictive Environment:* To the maximum extent appropriate, children with disabilities, including children in public or private institutions or other care facilities, are educated with children who are not disabled. In addition, special classes, separate schooling, or other removal of children with disabilities from the regular educational environment occurs only when the nature or severity of the disability of a child is such that education in regular classes with the use of supplementary aids and services cannot be achieved satisfactorily, as reported by the U.S. Department of Education (2016).

*Perception:* The process whereby information about one’s environment, as received and interpreted through the sense organs, cognitively organizes information in a meaningful manner.

*Professional Development:* Activities that develop an individual’s skills, knowledge, expertise, and other characteristics as a teacher.

*Technology:* Computer or computer-related devices and/or software that contribute to teaching and learning in schools. This can include hardware such as desktop computers, laptops, tablets, iPads, and any other mobile or stationary device that allows access to the Internet; software; and all networking capabilities.
Virtual Reality Technologies (VRTs): Software, web-based programming, or any other computerized system that enables the user to visualize and/or be immersed through two or more senses with complex data while interacting with a virtual environment that mimics a “real world” or “fantasy” scenario.

Organization of the Study

Chapter I comprises the following sections: Introduction, Overview of the Problem Underlying the Study, Statement of the Problem, Purpose of the Study, Research Questions, Significance of the Study, Limitations of the Study, Definitions of Terms, and Description of the Organization of the Study. Chapter II provides a review of pertinent literature and contains the following sections: Overview, Introduction to Understanding ASD, Exploration of the Increase in Students Diagnosed with ASD, Introduction to Educational Best Practices for Students with ASD, Overview of Assistive and Adaptive Technologies to Support students with ASD, Introduction of Emerging Modalities in VRTs to Assist Students with ASD, Overview of the Role of the Director in exploring new technologies and providing for teacher professional development in implementing new technologies to support students with ASD. In Chapter III, the researcher describes the methodology of the study. Chapter IV provides the results and analysis of the data, including a qualitative analysis by interview question and a summary of findings aligned with each research question. Chapter V provides a summary, conclusions, and recommendations for future research.

Summary

This chapter provides a general introduction to the topic of VRTs for supporting students with ASD. Also presented is the statement of the problem: namely, that there continues to be an
annual increase in the number of students identified with ASD, and an ongoing need for school
districts to identify and provide meaningful technology that best supports the diverse learning
needs of these students. An overview of the purpose, significance, and limitations of the study is
provided. This study is timely and addresses the ongoing need for school districts to identify and
implement technologies to support all students, particularly technologies that may offer support
for students with special needs, including students with ASD.
Chapter II
Review of the Literature

Overview

This chapter presents an overview of the relevant literature. It contains the following sections: Overview, Introduction to Understanding ASD, Exploration of the Increase in Students Diagnosed with ASD, Introduction to Educational Best Practices for Students with ASD, Overview of Assistive and Adaptive Technologies to Support Students with ASD, Introduction of Emerging Modalities in VRTs and Students with ASD, and Overview of the Role of the Director in providing for teacher professional development in implementing new technologies to support students with ASD.

Understanding Autism Spectrum Disorder

This subchapter informed the reader about the myriad facets of ASD, particularly with regard to the current research on the specific deficits affecting the educational experience of students diagnosed with ASD.

The American Psychiatric Association’s DSM-V (2013) describes ASD as the simultaneous presence of a triad of impairments in social interaction; communication; and restrictive, repetitive, and stereotypic patterns of behavior, interests, and activities. It further specifies a scope of criteria to categorize the level of severity for persons with ASD, ranging from those “requiring support” to those “requiring very substantial support,” depending on the central features present within each domain of the impairments associated with the disorder. According to Bregman (2005), the defining feature of autism is the distinctive impairment in the quality of social and communicative development, thus distinguishing autism from other neurodevelopmental conditions such as mental retardation, developmental language disorders,
and specific learning disabilities. Within the social domain, the central features of autism include impairments in social reciprocity or the “give and take of social interaction.” These impairments typically present in the first months of life, with limited ability to make meaningful eye contact, limitations in attending to the voices and faces of others, and an inability to participate in responsive smiling or socially imitative games (for example, peekaboo, so big, pat-a-cake). Haney (2013) asserts that some of the earliest indicators that a child might have ASD involve atypical development of social communication skills, such as joint attention and social referencing. Joint attention, coordinated by the infant, is the basis of engaging in shared experiences involving behaviors such as gazing and pointing. Social referencing involves referring to others to gather information about events. Within the communication domain, Bregman (2005) contends that the impairments are present in a number of linguistic and nonverbal areas. Although linguistic capability varies across the spectrum, persons with ASD communicate primarily to express needs, desires, and preferences rather than to convey interest or to share experiences, excitement, and feelings. There is little reciprocity or shared purpose for discussion. Additionally, gestural, implicit, and indirect communication are never used or perceived. According to Weatherby and Prizant (2005), individuals with ASD often have difficulty using facial expressions, body posture, and gestures to regulate social interactions, and they tend to use nonverbal communication to request rather than to engage in a shared experience (as cited in Haney, 2013). A child with autism may wish to join a group of children on the playground but lacks the skills needed to enter the playgroup. Further, if the child gains access to a peer group, there is a frequently an absence of the subtle give-and-take of play required to maintain membership in the peer group. On the other end of the spectrum, a child with ASD may entirely avoid interacting with peers and prefer to engage only in activities
involving inanimate objects (Haney, 2013.) Within the sensory and behavioral domains, developmentally immature and atypical perceptions, reactions, and behaviors occur (Bregman, 2005). Wing (1996) describes this third core deficit as an impairment of imagination (as cited in Haney, 2013). One of the defining features of ASD is rigidity and inflexibility in response to minor change and transition in the environment and daily routines. Additionally, a range of repetitive, stereotyped, compulsive, and ritualistic behaviors occur in ASD. These behaviors include ordering and rearranging, ritualistic patterns of walking and pacing, repetitive actions such as turning on and off lights, and an insistence on keeping all doors and cabinets closed. Stereotypic movements may also occur, such as hand and arm flapping, toe walking, head shaking, and rocking (Bregman, 2005). Interests and preferred activities are generally narrow and restricted, often favoring sensory exploration involving parts of toys or objects. Factual information; concrete perceptions; and the process of classification, categorization, and taxonomy are of particular interest and importance.

According to Ryan, Hughes, Katsiyannis, McDaniel, and Sprinkle (2014), one aspect of ASD that distinguishes it from other disabilities is the spectrum of related disorders it encompasses. One subtype of ASD is Asperger’s Syndrome, not included in the DSM until the fourth revision (DSM -IV) in 1994. Typically, children with Asperger’s Syndrome can be distinguished from those with ASD primarily by lack of developmental delays in the onset of language development. They may even demonstrate particular strengths in vocabulary knowledge and some types of verbal skills. Yet social communication remains a hallmark of the disorder (Haney, 2013), presenting challenges in the social and educational settings.
Increase in Diagnoses of Students with ASD

This subchapter discusses the reported increase in diagnoses of students with ASD, a trend that informs the focus of this study and underlines the growing need for impactful technologies to support the educational experience of this population.

In 2007, the United Nations General Assembly passed a resolution declaring April 2nd “World Autism Awareness Day.” In 2011, former President Obama followed suit, declaring this date as World Autism Awareness Day in the United States. He emphasized that “autism is an urgent public health issue with a profound impact on millions of Americans” (Cohen, Dickerson, and Forbes, 2014). ASD has become the fastest-growing disability in the United States, with current prevalence rates increasing exponentially each year. New Jersey — with 1 in 45 children diagnosed annually — ranks among those states with the highest rates nationally (Ryan, Hughes, Katsiyannis, McDaniel, & Sprinkle, 2014). According to Maenner and Durkin (2010), recent epidemiological studies have reported that the prevalence of autism exceeded 1% of children in some populations. This has brought about increased public concern about a possible epidemic of autism attributable to hypothesized or unknown environmental factors. Theories about its causes abound, from genetics to food additives to environmental toxins such as polychlorinated biphenyls, as well as suspected mercury preservatives commonly found in vaccines (Smith, 2009). Additional media reports and research, including a 2006 Cornell University study, suggest a correlation between autism and the amount of television exposure in infancy (as cited in Smith, 2009).

In the United States, annual special education enrollment data are frequently used as a measure of disability and often cited as evidence of the increasing prevalence of autism. This data source indicated that the number of children who received special education services under
the autism reporting category increased by 13% to 28% each year, and by 1,700% overall, between 1992 and 2008 (Maenner & Durkin, 2010). Smith (2009) contends that better detection and a broader definition of autism could suggest that more children are being identified today who would have possibly been diagnosed as mentally retarded or emotionally disturbed a generation ago. Gernbacher, Dawson, and Goldsmith (2005) posited that annual increases in the number of children served under the special education category could be a function of the pace at which school districts adopted the autism reporting category after passage of the federal Individuals With Disabilities Act in 1991, rather than an indication of the actual changes in the number of children diagnosed with autism.

**Educational Best Practices for Students with ASD**

This subchapter explored the range of current best practices in educating students with ASD. This information informed the focus of this study with regard to investigating the strengths and challenges of these practices, as well as the need for new and innovative strategies.

Durand (2005) asserted that educational intervention research has focused primarily on how students are taught, often at the expense of what students should be taught. There remains considerable controversy regarding the scope and sequence of techniques most appropriate to teach students with ASD. There has been a particular focus on determining whether these students need to be “readied” with life skills before exposure to the academic curriculum. Additionally, there are ongoing concerns for children with autism in the educational setting with regard to the frequent presence of aggression and self-injurious behavior. These types of behaviors represent some of the major obstacles to children’s full participation in meaningful educational activities (Durand, 2005). Angel, Stoner, and Sheldon (2009), as cited in Haney (2013), identified additional barriers, such as the inability of parents and teachers to build a
trust relationship due to a lack of perceived competence. Parents perceive of teachers as lacking knowledge about their child’s specific disability and how to best provide interventions, a school climate lacking acceptance and warmth, and an overall lack of communication between the educational team and parents with regard to the specific goals being established.

The most current research-based educational practices for teaching students with ASD include, but are not limited to, applied behavior analysis (ABA), the Developmental, Individual Difference, Relationship-Based method (DIR/Floortime), the Picture Exchange Communication system (PECS), social stories, and the Treatment and Education of Autistic and Related Communication Handicapped Children (TEACCH) program (Ryan, Hughes, Katsiyannis, McDaniel, & Sprinkle, 2014).

Generally speaking, ABA, based upon the work of behaviorist B. F. Skinner, is a systematic process of studying and modifying observable behavior through a manipulation in the environment (Chiesa, 2004, as cited in Ryan, Hughes, Katsiyannis, McDaniel, & Sprinkle, 2014). Lovaas’ (1987) seminal study on ABA therapy explored the discrete trial trainings that are central to the therapy, including isolating and teaching specific tasks by repeatedly presenting to the student the command and delivering reinforcing consequences (smiles, hand claps, token reward) until the skill is mastered. Critics contend that the ABA approach is uncreative and does not stimulate learning so much as compliance. Further, ABA is contrary to the inquiry-based, student-centered learning that is considered best practices in general education (Smith, 2009).

DIR/Floortime is a comprehensive, interdisciplinary educational intervention for students with ASD, typically involving 20- to 30-minute playtime interactions between the teacher and student that encourage appropriate, interactive play and socialization through modeling and prompting (Greenspan and Wieder, 2001). One of the primary aims of DIR/Floortime is to train
teachers to engage the emotions of even the most withdrawn students by entering their world through play. According to Solomon, Necheles, Ferch, and Bruckman (2007), children make significant functional developmental progress through DIR/Floortime (as cited in Ryan, Hughes, Katsiyannis, McDaniel & Sprinkle, 2014).

PECS (Brody and Frost, 1994) is an increasingly common intervention used to enhance communication skills in students with ASD (Lerna, Esposito, Conson, Russo, & Massagli, 2012). PECS is a multitiered program that promotes communication through the exchange of tactile symbols and objects, including photographs, drawings, and pictures of objects that a student is taught to associate with a desirable toy, person, or activity. Research suggests PECS is a promising practice for teaching students with ASD how to communicate requests more appropriately (Carr & Felce, 2007).

Social stories provide brief descriptive stories to help students better understand social situations. According to Gray and Garand (1993), the goal of social stories is not to change the student’s behavior but to expose the individual to a better understanding of an event, thereby encouraging a proper response (as cited in Ryan, Hughes, McDaniel, and Sprinkle, 2014). Within the classroom setting, the teacher and student may create personalized stories that inform the child about what to expect in a given situation, and, in turn, how he or she should act in that particular situation. Critics of the social stories intervention argue that the majority are confounded by the use of additional intervention strategies used at the same time, or do not provide adequate descriptions of the participants’ communicative and cognitive skills (Reynhout & Carter, 2006; Kuoch & Mirenda, 2003, as cited in Ryan, Hughes, McDaniel, and Sprinkle, 2014).
The TEACCH program has been used to educate children with autism since the early 1970s. Based on the work of Eric Schopler, TEACCH blends behavioral components firmly rooted in ABA with cognitive components integrated alongside a multitiered education program designed to empower teachers to create environments that support children with ASD. The educational setting is highlighted by the structure and organization of the workspace to maximize the independent function of the student. Tasks and work systems depict detailed expectations of the student, and task organization explicitly describes each learning task (Haney, 2013), as cited in Ryan, Hughes, Katsiyannis, McDaniel, & Sprinkle, 2014).

With the most current reauthorization of the Individuals with Disabilities Education Improvement Act in 2004, support has grown for empirically validated instructional practices and greater access to the general curriculum (Hurwitz, 2008, as cited in Haney, 2013). Increasingly, children identified with ASD and deemed eligible for special education services may find themselves included in the mainstream setting with appropriate modifications. Haney (2013) contended that in creating the most supportive academic environment for students with ASD, the following general considerations are most relevant:

1. Create a classroom environment based on the principles of Universal Design, which involves structuring the environment to provide multiple ways of meeting the learning objective and multiple expressions of demonstrating understanding.
2. Incorporate structured and systematic teaching whereby students with ASD can benefit from an organized, systematic presentation of instruction.
3. Integrate maximal visual aids into instruction and daily routines. These visual prompts and cues provide predictability and routine, and take into account children’s sensory needs and potential for overstimulation.
4. Consider the degree to which technology, both assistive and instructional, can be integrated to enhance clarity and communication.

5. Provide inclusion experiences and opportunities for social communication development with peers, as children with ASD benefit from opportunities to observe, model, and receive feedback from their peers.

**Assistive and Adaptive Technologies to Support Students with ASD**

This subchapter examines the role and range of assistive and adaptive technologies to support the educational experience of students with ASD. The information presented provides a foundation for better understanding the differentiation between assistive and adaptive technologies versus VRTs.

Undeniably, technology has revolutionized the ways in which educators must consider preparing students for situations in which information is no longer predominantly presented in printed books, but more often through the Internet and other digital media (Leu and Kinzer, 2000). According to the U.S. Department of Education’s National Center for Educational Statistics (U.S. Department of Education, 2001), approximately 90% of children aged 5 through 7 use computers. In contrast, students with disabilities are significantly less likely to use computers than their typical peers. Historically, when the term technology was used in conjunction with the term disability, it was usually associated with assistive technology, such as augmentative and alternative communication, switches to activate computers, and so forth (Knight, McKissick, and Saunders, 2013). Research on the benefits of assistive and adaptive technologies for students with disabilities has been robust. Currently, there is an increased interest in research and development of other instructional technologies that may have the potential to increase autonomy and quality of life for students with disabilities by helping them
learn academic content (Braddock, 2004, as cited in Knight, McKissick, and Saunders, 2013). According to Goldsmith and LeBlanc (2004), as technology begins to permeate educational programming, practitioners need to identify the most promising and helpful tools that can be deployed readily within classroom contexts to assist in supporting the education of students with ASD. Further, Nally, Houlton, and Ralph (2000) suggested that many parents of children with ASD report their child’s fascination with and propensity for learning from visually based media, such as computers (as cited in Ayres, Mechling, and Sansosti, 2013).

**Emerging Modalities in VRTs to Assist Students with ASD**

This subchapter considers emerging modalities in VRTs that are being used in the educational setting, as well as their strengths and challenges in regard to implementation.

VRTs are an emerging medium currently being used in some educational settings, including the general education classroom and distance education. According to Hew and Cheung (2010), VRTs can offer incomparable environments for creating spaces where teachers and learners can engage in social activity and learning. Immersive and virtual worlds are being considered as a potential medium to provide learners with a new educational environment, particularly with regard to affording them the opportunity to express their actions and intentions (Kim, Lee, & Thomas, 2012). VRTs have the potential to offer learners, regardless of ability or disability, the experience of anonymous real-time interaction with the virtual world and access to a rigorous, challenging educational experience. According to Parsons, Rizzo, Rogers, and York (2009), virtual and immersive technologies have many advantages over traditional instructional practices in educating students with ASD. These include strong visual presentations, systematic control over real-world visual scenarios, the ability to capture detailed performance data, user control, and the high appeal of visual technology to children with ASD. Additionally, these
technologies support individualized learning, offer the learner incomparable control over the environment, can introduce or remove distracting stimuli, and provide a high degree of realism for teaching life skills that may contain an element of danger, such as crossing the street, working with machinery, and the like (Ennis-Cole, 2012). Early discussions of the potential of VRTs for educational purposes noted their powerful intuitive appeal for teachers, especially those who work with children with special needs. Teachers appreciate the value of learning environments in which content can be controlled and responses/understanding explored in ways that may not be possible in the real world (Ennis-Cole, 2012). Strickland (1996) emphasized the importance of being able to program and control stimuli and provide safe learning spaces in virtual environments, arguing that these features made them potentially valuable for children on the autism spectrum in particular (as cited in Parsons & Cobb, 2011). The possibility of being able to offer individualized “treatments,” capitalizing on children’s preferences for visual material, was also considered beneficial. Virtual environments may be particularly helpful for people with cognitive and perceptual impairments, including ASD: the technology can assist in planning, problem-solving, and management of behavior and offers powerful communicative facilities for people with limited expressive language (Rizzo and Kim, 2005). In a review of strengths, weaknesses, opportunities, and threats of using VRTs for rehabilitation and therapy, Parsons and Cobb (2011) identified a number of qualities that make the technology suitable for use as a learning resource, including the empowering feature of stimulus control, consistency, self-guided exploration, and independent practice in a safe test/training environment. Parsons and Cobbs (2011) suggested that VRTs could be particularly helpful for students with ASD because (a) users have active control over their participation; (b) interaction can take many forms and does not necessitate face-to-face communication (users may communicate via their avatars),
which many people with ASD might find particularly threatening; (c) the level and number of nonverbal and verbal features of communication can be directly controlled and manipulated; (d) behaviors and responses can be practiced and built on in a context that shares some similarities with the real world, thereby offering greater potential for generalization; and (e) a more realistic representation of a situation on a computer-screen could, in theory at least, assist with the mental simulation of events, thereby improving social problem-solving skills. Goodwin (2008) suggested that virtual environments could form the basis of sophisticated training packages that are engaging and easy to administer and that could promote learning across context.

VRTs provide three-dimensional, real-time virtual environments that can be used to simulate real or imaginary environments. The level of sophistication required for interacting with the virtual world differs depending on the type of software and hardware used, which include computer-based, computer-based with headphone augmentation, and fully immersive through headgear connected to a personal computer. Virtual environments are typically characterized by the same basic elements we observe in our physical environment: ground, sky, and other components of external landscapes; the floors, ceilings, and walls of internal spaces; and both realistic and fantasy objects that are either embedded or user-created. Virtual worlds are online, persistent, and interactive environments that can be accessed solely by the user or by multiple users. Users control their in-world actions to move, communicate, collaborate, create, or socialize within the virtual world (Dass, Dabbagh, & Clark, 2011). The inherent characteristics of VRTs are the sense of presence and awareness of others, the ability to communicate and collaborate, the provision to create, and the opportunity to learn by doing. VRTs have been used in a variety of applications, including but not limited to science, language, speech, general education, design, computer education, economics, social skills, and others. They may
potentially provide instructional strategies that would otherwise not be possible without the technology (Dass, Dabbagh, & Clark, 2011). Some applications of VRTs in the educational setting could include the ability to (a) conduct genetic experiments with virtual plants, with time sped up to collect data more quickly; (b) interact socially with others in a virtual community through community-building and other activities; and (c) create in-world artifacts within the community (Robbins & Butler, 2009).

Schmidt and Schmidt (2008) noted the importance of virtual environments in supporting the generalization of skills and knowledge between contexts, although they also noted that there is limited research in this area. Thus, overall, the convergence of views provided by virtual reality may make it especially well-suited for supporting the learning of children on the autism spectrum. However, despite numerous claims that VRTs might be beneficial in educational contexts, there are limited studies offering practical suggestions on how to apply virtual worlds to the school setting (as cited in Kim, Lee, & Thomas, 2012). Wang (2010) observed that few studies have been conducted on the actual application of VRTs within the classroom setting. Consequently, instructional designers of these emerging technologies may have difficulty finding literature that offers prescriptive instructional methods (Kim, Lee, & Thomas, 2012).

Role of the Director of Special Services

This subchapter investigates the central role and responsibilities of the director of special services. This person is often a lead decision-maker in identifying and acquiring new technologies to improve the learning experience for students with disabilities. The information presented informed the focus of this study with regard to the importance of providing teacher professional development in implementing new technologies.
While controversy continues over the root causes of ASD, there is little debate over the impact of schools on children with the disorder. In a public or private school, the director of special services organizes, implements, and supervises all programs and staff members who provide special education services. According to Smith (2009), directors face increasing pressure from vocal and savvy parents who are often informed by sophisticated autism advocacy groups. These parents insist the schools provide state-of-the-art instruction, innovative and often experimental technologies, highly trained teachers, a low staff-to-student ratio, and extensive services for speech and occupational therapy.

The Individuals with Disabilities Education Act (1990), which guarantees a “free appropriate” education to all disabled students, means different things to different parents. District administrators are faced with using limited financial resources to service the students’ IEPs, in many cases leading to costly out-of-district placements in private schools for students with autism. Administrators in both public and private school settings, particularly directors of special services, are frequently the lead decision-makers in schools with regard to overseeing best practices in educating students with ASD. Directors of special education at the school and district levels have a key role in facilitating the inclusion of all learners in typical learning environments. Several facets of the director’s role are important in protecting the rights of individuals while promoting efficacious educational systems, including researching specialized environments that meet the myriad needs of students with ASD.

Planning and programming are central to the role of the director, as is relying on “economies of scale” to design and maintain specialized environments and providing support staff and professional development to assist teachers in facilitating these specialized environments (Sonenblum, 2009).
Summary

This chapter provided an overview of the pertinent literature. It contains the following subchapters: Overview, Introduction to Understanding ASD, Exploration of the Increase in Students Diagnosed with ASD, Introduction to Educational Best Practices for Students with ASD, Overview of Assistive and Adaptive Technologies to Support Students with ASD, Introduction of Emerging Modalities in VRTs to Assist Students with ASD, and Overview of the Role of the Director. The literature is important to (a) build a solid understanding of the disorder, (b) learn how school districts are using best practices to educate students with ASD, (c) identify the role of technology in supporting life skill acquisition, and (d) provide a means of accessing the academic curriculum for these students.
Chapter III
Methodology

Overview of Research Design

This chapter describes the methods and procedures used in the study. This qualitative research study explored the perceptions of directors of special services regarding the potential impact of VRT technology on the educational experience of students with ASD. Included in this section is detailed information about the setting of the study, the population from which the data were collected, the instrument to be used, and the processes whereby data will be collected and analyzed. This study was designed to add to the limited body of research in this area, and to provide both public- and private-school administrators with critical data to make recommendations for policy, practice, and future research. This chapter is organized into the following subsections: Setting, Context, and Participants; Sampling; Data Collection; Data Analysis; and Summary.

Setting, Context, and Participants

The setting for this study was Monmouth County, New Jersey. Specifically, this study analyzed the perceptions of directors of special services from public and private schools in Monmouth County, New Jersey, with regard to the impact of VRTs in supporting the educational experience of students with ASD. Participants were limited to the 67 directors approved by the New Jersey Department of Education’s 2016-17 Directory of Directors/Supervisors of Pupil Personnel/Special Services.
Sampling

This qualitative study addressed the impact of VRTs in the educational setting for students with ASD as perceived by participating directors of special services. The researcher identified directors of special services in approved public and private schools in Monmouth County, New Jersey, as identified by the New Jersey Department of Education’s 2016-17 Directory of Directors/Supervisors of Pupil Personnel/Special Services.

There are a total of 67 public and private schools in Monmouth County, New Jersey. The researcher contacted each director via an email that included an electronic invitation link to participate in this study. Included in this invitation was a request to provide pertinent information regarding the background and experience level of the director, as well as demographic information specific to his or her current school district. This researcher used a prequalifying questionnaire to develop an cohort of eight interview participants representative of the range of socioeconomic settings, enrollment dynamics, and experience levels of directors to effectively inform the research questions.

Data Collection

In the second phase, data were collected from face-to-face interviews with eight consenting participants who together formed a representative sampling of directors. The interview consisted of open-ended, semistructured questions. A set of carefully crafted questions ensured uniformity and consistency for each participant director. A pilot interview, conducted before the study, was implemented to field-test the interview questions. Based on the pilot study, the questions were revised in an effort to strengthen their content, working with the suggestions of solicited colleagues. Protocols were established that allowed for obtaining informed consent, establishing rapport with interviewees, and recording and transcribing the data. To support
participants in better understanding VRTs, a research-based description was provided at the onset of each interview. Time was set aside for participants to ask questions to better clarify their understanding of VRTs and the application of these technologies to the educational setting.

The findings of this study contribute to the relatively narrow body of research on VRTs in the educational setting for students with ASD. Additionally, the findings assist both public- and private-school leaders in better understanding the potential strengths and challenges of implementing VRTs in the classroom setting and providing for teacher professional development.

Data Analysis

The study was a nonexperimental research and Data were obtained from recorded and transcribed interviews, which were analyzed to illuminate themes relevant to determining the impact of VRTs on the educational experience of students with ASD. Direct quotations from the interviews were included as a basic source of raw data in qualitative inquiry (Paterson, 2002), and to illuminate themes that emerge through the process. The researcher analyzed the themes to inform the research questions:

1. What are the perceptions of directors of special services regarding the ability of VRTs to have a positive impact on the educational experience of students with ASD, specifically with regard to content delivery, student engagement, and task focus?

2. What are the attitudes of directors of special services in relation to providing teacher professional development for implementation of VRTs in the classroom setting?
Summary

In Chapter III, the researcher described the methods and procedures used in the study. Included in this chapter is detailed information about the setting for the study, the population from which the data were collected, the interview instrument used, and the processes whereby data were collected and analyzed. This study was designed to add to the limited body of research within this area and to provide both public- and private-school administrators with critical data to make recommendations for policy, practice, and future research. This chapter was organized into the following subsections: Setting, Context, Participants, Sampling, Data Collection, Data Analysis, and Summary.
Chapter IV
Results and Analysis of Data

Overview

The purpose of this qualitative study was to explore the potential impact of VRTs in the educational setting for students with ASD as perceived by participating directors. ASD has become the fastest-growing disability in the United States, with current prevalence rates increasing exponentially each year. Especially striking is the fact that New Jersey has the highest reported rates nationally, with 1 in 45 children diagnosed with ASD; particular concern exists regarding the 1-in-28 rate for boys (Ryan, Hughes, Katsiyannis, McDaniel, & Sprinkle, 2014). The increase in the number of these students has significant implications for public- and private-school leaders, including eligibility, services, curriculum and instruction, and the rapidly growing market of assistive and instructional technologies that may enhance their education and life skills. Some efforts have been made to explore the impact of VRTs on the educational experience of these students. However, little research has examined the ways in which directors, who are typically one of the principal decision-makers in identifying and acquiring new technologies for special education programs, perceive the value of these technologies, as well as their attitudes regarding the strengths and challenges of providing teacher professional development to implement these types of technologies.

In this chapter, the researcher presents the results of the analyses of the data used to inform the research questions developed for this study. The researcher’s goal is to answer the following research questions:
1. What are the perceptions of directors of special services concerning the ability of VRTs to have a positive impact on the educational experience of students with ASD, specifically with regard to content delivery, student engagement, and task focus?

2. What are the attitudes of directors of special services with regard to providing for teacher professional development to support the implementation of VRTs in the classroom setting?

These research questions were answered through the analysis of data collected from interviews with a sample of K-12 directors in Monmouth County, New Jersey. This chapter describes the sample and the data collection, and provides a summary analysis of the data yielded from each of the interview questions.

**Description of the Sample**

The researcher used convenience sampling to create an interview cohort of eight participants. This method was selected for practical purposes, including geographical proximity and easy accessibility to the interview participants. In the first phase of the study, electronic invitations to participate in the study were sent to 67 directors of special services in Monmouth County, New Jersey. Of these, 13 (19.4%) responded. Eight participants were selected for interviews based on their district’s enrollment dynamics. This included the number of students classified with ASD, the experience levels of the directors, and the district’s socioeconomic setting—or former District Factor Group (DFG) categorization. This is an identifying marker developed and formerly used by the New Jersey Department of Education to represent an approximate measure of a community’s relative socioeconomic status. It provided a tool for comparing similarly situated school districts in other analyses. The sample in this study represented a range of district socioeconomic settings, with seven K-12 public-school districts.
ranging from B (low) to I (high) socioeconomic settings, and one private school serving students from age 5-21. Enrollment dynamics for those classified with ASD ranged from 3 to 150 students. Experience levels of participating directors in the sample varied from five months to 12 years. Table 1 shows a representation of the participants’ background. Phone calls were made to selected participants confirming their selection and determining a date and time for their interview.

**Table 1. Participants’ Background**

<table>
<thead>
<tr>
<th>Participants’ School Type</th>
<th>K-8</th>
<th>K-12</th>
<th>K-21 yrs</th>
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<td>3</td>
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<tr>
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<th>B</th>
<th>CD</th>
<th>GH</th>
<th>I</th>
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<tbody>
<tr>
<td>N = 8</td>
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<td>1</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage of ASD Students</th>
<th>&lt;10%</th>
<th>More than 10%</th>
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<tbody>
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<td>7</td>
<td>1</td>
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</table>

<table>
<thead>
<tr>
<th>Participants’ Gender</th>
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<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 8</td>
<td>5</td>
<td>3</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Years of Experience as Director</th>
<th>&lt;1 Yr</th>
<th>1–7</th>
<th>8–11</th>
<th>12 +</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 8</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Data Collection

In the second phase of the study, data were collected from face-to-face interviews with eight consenting participants, who formed a representative sampling of directors, using open-ended, semistructured questions. A set of 10 carefully crafted questions was used to ensure uniformity and consistency for each participant director. The first five interview questions informed the first research question. The next four questions informed the second research question, and the last question provided an opportunity for directors to share their general insights about their perspective of the potential impact of VRTs on students with ASD. A pilot interview, conducted before the study, was conducted to field-test the interview questions. The interview questions were revised based on the pilot study, and in an effort to strengthen the questions input was solicited from colleagues. Protocols were established that allowed for obtaining informed consent, establishing rapport with interviewees, and recording and transcribing the data. An interview protocol is an integral procedural guide for directing qualitative research (Jacob and Furgerson, 2012). To support participants in better understanding VRTs, a research-based description was provided at the onset of each interview, with time for participants to ask questions to better clarify their understanding of VRTs and application of the technology to the educational setting. To provide consistency of obtained information, all directors were asked the same questions; however, the interviews were semistructured, allowing the researcher to ask for more specific information, when necessary, to clarify particular concepts. All interviews were recorded and transcribed. Following each interview, the transcripts were reviewed and revised to ensure the accuracy of the data. The participants’ names and school districts were coded and are not revealed in the study to protect each their anonymity. Each interview typically lasted one hour.
Data Analysis

Thematic analysis is a search for themes that emerge as being important to the description of the phenomenon. The process involves the identification of themes through careful reading and rereading of the data (Fereday and Muir-Cochrane, 2006). It is a form of pattern recognition within the data, where emerging themes become the categories for analysis. Boyatzis (1998) described thematic coding as a multistep procedure that can be performed inductively or deductively. After collecting the qualitative interview data, the researcher used a web-based word and phrase frequency application to identify and analyze patterns and themes. Word and phrase frequency were used to topically or thematically code the data in each interview question. Computerized content analysis has a number of advantages, including the ability to create outputs of frequency counts and key-word-in-context listings, and to easily uncover co-occurrences of important concepts (Klenke, Martin, and Wallace, 2016). Additionally, by rereading and spiraling through the data several times, the researcher identified further conceptual patterns and themes of data on the directors’ perceptions of the impact of VRTs and their application to the educational setting. A frequency set point of 4 was established, as this represented the word or phrase being revealed in at least half of the participants’ interviews. The process of qualitative data analysis and interpretation can best be represented by a spiral image—a data analysis spiral, in which the researcher moves in analytic circles rather than using a fixed linear approach (Creswell, 2007). The final step in the analysis process was to integrate and summarize the data, which is included in Chapter V. To further support the findings, the researcher included direct quotations from the interview data, revealing in more detail the participants’ perceptions and experiences with the topic.
Qualitative Data Analysis by Interview Question

Question 1. What types of instructional technologies are currently being used in classroom settings servicing students with ASD? Given the dramatic increases and diversity of applications in instructional technologies for special education (Goldsmith & LeBlanc, 2004), the researcher began with a prompt to immediately connect the topic of instructional technologies to classroom settings for students with ASD. The most frequently used words and phrases were iPads; Smartboards; ProloQuo2Go; PECS applications, including Vizzle, Unique, and ReThink curriculums; and a variety of Google Suite applications. These included Google Docs, Google Read and Write, Google Classroom, and Google Expeditions. Figure 1 shows the word and phrase frequency for participants’ responses to Question 1.

Figure 1. Word/Phrase Frequency: Most Frequently Used Technologies
Directors’ shared their perceptions of the effectiveness of these technologies as they pertained to functionality and purpose, alignment with students’ goals and objectives, and the potential for students and parents to carry the technology over to the home setting. One director considered the iPad to be one of the most significant technologies because of this “carry-over” effect. “One of the greatest benefits of the iPad technology is the carry-over. That is one of the hardest things with this population. We can get them to do things fantastically in one setting, but we want the carryover to the home setting, as well. With the iPad, we find that parents are using the technologies at home.” A critical aspect of effective collaborative educational programming is the involvement of family members, or the forming of partnerships with families. This is because parents know their child best and can provide information to guide child study teams in making informed decisions about the IEP (Horn and Kang, 2012).

ProLoQuo, an assistive technology designed for communication-impaired students, was implemented in five of the participants’ districts as the primary technology for converting text to speech. Several directors pointed to the value of carry-over with this technology, as it could be downloaded to iPads or iPhones in both the classroom and home setting. Additionally, a number of directors referred to the importance of Proloquo’s integration of devices, such as the iPad or iPhone, as a means of connecting students across both special education and general education settings; these devices are among the most commonly used.

PECS-based technology applications, such as Vizzle, Unique Curriculum, and Rethink, were integrated into the classroom setting for students with ASD because their functionality is directly aligned with students’ goals and objectives as specified in the IEP. PECS, a picture exchange communication system developed for children with social-communication deficits uses basic pictures as the communicative referent, teaching the child to use his or her PECS board to
create a “sentence” by selecting picture cards (e.g., “I want” card plus “juice” card), and delivering the cards to a communicative partner as a request for a desired item. PECS also emphasizes teaching a child to initiate requests, respond to questions, and make social comments (Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002). Innovative curricular technologies, such as Vizzle, Unique Curriculum, and ReThink, incorporate PECS within their learning platforms, thus making them appropriate technologies often aligned with the goals and objectives in students’ IEPs. One director described the greatest value of ReThink as “its ability to guide ABA (applied behavioral analysis) direct instruction, incorporate PECS in a digital format, and provide mastery tasks, while allowing us to chart progress and data through all of our trials. It’s a data management and progress monitoring tool, aligned to the students’ goals and objectives, and it has the curriculum piece.”

The Google Suite of applications, including Google Docs, Google Read and Write, and Google Expeditions, provide educators with a breadth of technologies that have universal application across both special education and general education settings. Particularly attractive to some participants is that some of the Google apps, including Google Docs and Google Classroom, remain free to schools; premium subscriptions for others, such as Google Read and Write and Google Expeditions, are relatively low cost compared to other subscription-based applications.

Smartboards, in a variety of formats including Polyvision, Mimeo, and others, were cited by five participants as a frequently used technology. Two directors felt that the most beneficial aspect of the Smartboard was the student interactivity component, including the ability to promote kinesthetic learning through visual, auditory, and tactile activities. As one director stated, “Smartboards are particularly effective at making the thinking visible for students.”
Question 2. Which technologies contribute to curricular content delivery? The most frequently used words and phrases in the participants’ responses were iPads, Bookshare, leveling, interactivity, assessment, and standards-based. Figure 2 shows the word and phrase frequency for the participants’ responses to Question 2.

**Figure 2. Word/Phrase Frequency: Technologies Contributing to Content Delivery**

Directors shared their perceptions of using only the key components of those technologies, rather than the technologies themselves, they believed were most valuable in supporting students with ASD. iPads were cited as a key technology device for delivery of curricular content. The researcher further deconstructed these frequently used words and phrases, categorizing them into two constructs—key technologies and key features.
Six directors cited iPads as a key technology device for delivering curricular content. Directors assigned importance to the device’s functionality and portability, as well as the ability to use it as a portal for myriad web-based applications. Of the web-based applications, Bookshare was used by four participants’ districts as a curricular vehicle for delivery of text in audio, highlighted, enlarged, and Braille formats. Bookshare is free for qualifying students and educators, making it a financially attractive resource for districts. One director described some of the key aspects of Bookshare for delivery of content, stating, “Bookshare is really important because it allows the students to not simply read, but to listen to text as well. It highlights as it’s reading to students. For students with autism, it’s important to hear the intonation in the text to help derive information and make meaning. It also helps model for them appropriate social speech, how voices fluctuates, and that good readers don’t read in a monotone.”

Directors shared their insights into the features most valued in technologies for content delivery. The most frequently cited elements were leveling, interactivity, assessment, and standards-alignment. Five directors emphasized the importance of leveling, also known as scaffolding, as a key aspect of content delivery. Scaffolding strikes a balance among obtaining and maintaining a student’s engagement, simplifying the task when needed, providing confidence for risk taking, marking relevant information, and demonstrating potential solutions. It plays an important role in literacy development, as teachers consciously provide and withdraw specific supports to maximize earning. This involves a complex balance of knowledge of a student’s learning strengths and weaknesses; knowledge of the curriculum demands; and understanding how to successfully level, challenge, and withdraw scaffolds as a student progresses (Almasi, 2003). Digital text delivered through technology can also provide an apprenticeship environment to guide students in actively constructing meaning through modeling
and demonstration, reading with feedback and practice, and use of leveled scaffolds that change and gradually fade with increasing student expertise (Coyne, Pisha, Dalton, Zeph, & Smith, 2010). Directors identified the capacity of a technology to level or scaffold the content as a key feature for effective learning. One director stated, “If the program is leveled, and is of high interest to the student, they feel less frustrated and more connected to the learning.” Some of the technologies cited that offer the ability to level content were Bookshare, Read 180, ReThink, Vizzle, Unique Curriculum, Achieve 3000, and Learning Ally.

Interactivity was also cited frequently as a key feature of effective instructional technology integration for content delivery. Seven of the eight participating directors believed that the ability of the student to manipulate the technology directly in an interactive manner, not simply in a recipient fashion, added value to the technology itself. This interactive feature was attributed to iPads, Smartboards, Unique Curriculum, ReThink, Google applications, and Vizzle. In describing the interactivity of Vizzle, one director shared, “It has an interactive website that has about 15,000 lessons ranging from prevocational skills to money math to functional words in the community to APA science. It gives students immediate feedback based on their response to the question. There are interactive books that are used for morning meetings so [that] the students manipulate everything. They’ll go up and press the next page or a link to a video, or select the correct response, and feedback is always immediate.” In one director’s district, students interacted through an innovative technology using a robot named Sheldon. The robot intuitively interacted with students by giving directions, prompts, and feedback on work accomplished. According to the director, because the robot placed fairly low demands on the students, they were more likely to engage in the content with little frustration.
Assessment was a key feature valued by five participating directors. Instructional technologies had to have an assessment feature embedded in the interface to be effective. Directors valued both a teacher assessment model and a student assessment model. The latter allows students to monitor their own progress.

Six directors noted that it was important for instructional technologies to be aligned with the standards, as well as the goals and objectives of the students’ IEPs. To underscore this, one director stated, “We are trying to keep students with ASD at high levels of learning and expose them to the same content standards of their peers.” Another director shared, “While we always are mindful of the need to address a multitude of socially significant behaviors, including life skills and social skills, we are always ensuring that the academic competencies are aligned with the standards. That means that the technologies we are selecting must have that capacity, as well.”

**Question 3. Which technologies contribute favorably to student engagement and task focus?** The most frequently used words and phrases in the participant’s responses were iPads, incentives/rewards, leveling, interactivity, and choice. Figure 3 shows the word and phrase frequency for the participants’ responses to Question 3.

**Figure 3. Word/Phrase Frequency: Technologies Contributing to Student Engagement and Task Focus**
The researcher further deconstructed these frequently used words and phrases, and categorized them into two constructs—key technologies and key features.

Six of the participating directors indicated that iPads were the most impactful technology for students with ASD. This was attributed to the students’ familiarity with the device and ability to navigate its various applications. Two directors felt that this familiarity was due to the fact that students often had an iPad at home and were well-versed in downloading and navigating applications. According to another director, the highly visual and graphic nature of the device and its applications contributed to engagement and task focus. One director had reservations about the district’s use of iPads as its key technology for students with ASD, stating, “I think really we use the iPad as a motivational tool and as a reinforcer, and that's is its most consistent contribution. It’s not to say [that] that's not important. But when you think about all the money we spend on apps and things like that, the greatest use we get out of it is kids being able to watch games and YouTube videos and other stuff they like to watch.”

The key features that directors valued in technologies to enhance student engagement and task focus were embedded incentives/rewards systems, the ability to level content, offering of choice, and interactivity. Seven of the eight participating directors felt that technology applications that embedded an incentive/reward system for work completed contributed to student engagement. One director stated, “Aspects of rewards or incentives and the ability to choose the types of texts can contribute favorably to engagement and motivation. These types of technologies can level the playing field for students with disabilities. For example, if a particular software has the text-to-speech option and a student can listen, then re-listen to a text, that can certainly improve their ability to maintain focus. If there is also a reward to successfully completing a task, that adds to the student’s motivation for pushing through difficult material.”
All eight of the participating directors believed that interactivity was one of the impactful features of instructional technology in enhancing student engagement and task focus. Authentic student engagement can be viewed as being immersed in work that has clear meaning and immediate value (Schlechty, 2002). Directors reported that the greater the interactivity potential of the technology, the greater the degree of students’ engagement and ability to attend to a task with focus. Some of the technologies that directors cited as including this key feature were DT Trainer, Read 180, Vizzle, Google Expeditions, ReThink, and Unique Curriculum.

Offering choice was another key feature, ascribed by five directors to high levels of student engagement and task focus. When technologies offered students some level of self-selection—topics of interest, variety of texts, text-to-speech options, and so forth—directors noted that students were more personally connected to the learning. The technologies directors reported that include this key feature were ReThink, Vizzle, Read 180, Bookshare, Reading Ally, and teacher-created material in Google Classroom.

Finally, the intuitive ability of the technology to level or scaffold instruction was perceived by five directors as valuable in enhancing student engagement and task focus. Some of the technologies cited that offer the ability to level content were Bookshare, Read 180, ReThink, Vizzle, Unique Curriculum, Achieve 3000, and Learning Ally.

**Question 4. Describe any virtual reality technologies of which you have knowledge or experience.** The most frequently used words and phrases in the participant’s responses were Google Expeditions, video games, and Samsung. These words or phrases appeared in the directors’ responses a maximum of four times, pointing to limited knowledge and exposure to
this innovative form of technology. Figure 4 shows the word and phrase frequency for the participants’ responses to Question 4.

**Figure 4.** Word/Phrase Frequency: Knowledge of or Experience With Virtual Reality Technologies

Google Expeditions is a subscription-based application that allows users to engage in a virtual reality environment through a device such as a tablet or smartphone, or through a viewer such as the Samsung headset or Google Cardboard. This application allows the user to explore environments like the coral reefs or the surface of Mars, or to take field trips to the Great Pyramids or museums in other countries. Some video games have incorporated many of the immersive and 3D aspects inherent to the disruptive nature of VRTs. Four directors shared that their knowledge of VRTs was based mainly on what they saw their own children using in video
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gaming applications, such as Minecraft and Playstation, or what they themselves had experienced in video games with a level of embedded virtual reality.

One director had some knowledge of VRTs as they applied to the clinical psychological setting, that is, as a strategy for desensitization to feared stimuli and as an application for people with PTSD. This director had a PhD in psychology, which may have broadened his exposure to this type of information about the technology. Two directors had some knowledge of virtual labs as they applied to the science classroom. These labs incorporated a hardware- and software-based technology that allowed students to virtually participate in science labs that might otherwise be considered high-risk, costly, or unsafe in a particular setting, such as a behavioral disability class. In one director’s experience with virtual labs, students used teaming tables to enhance collaboration during experiments. The teaming tables were equipped with multiuser videos that promoted discussion and problem-solving among students. Two directors had experience with Silas Solutions, a recently developed avatar-based animation program for supporting students in speech therapy and social skills development. Three directors had no knowledge of or experience with VRTs.

**Question 5.** Provided with a research-based description of virtual reality technology, what do you consider to be factors that may impact the educational experience of students with ASD, specifically with regard to content delivery, task focus, and student engagement? Given the fairly limited market of VRTs applicable to school-based settings and the relatively narrow body of research on their impact on student achievement, the researcher provided each participating director with an in-depth, research-based description of VRTs and some of their uses in instruction and learning. The researcher then demonstrated two types of VRT hardware,
the Oculus Rift headset and Google Cardboard, and encouraged each participant to handle each one to get a feel for weight, manageability, and durability. Participants then shared their perceptions of factors that might affect the educational experience of students with ASD. The most frequently used words and phrases in the participant’s responses were experiential, sensory, generalization of skills, repetition of skills, life skills, and social skills. Figure 5 shows the word and phrase frequency for the participants’ responses to Question 5.

**Figure 5.** Word/Phrase Frequency: Factors Affecting the Educational Experience of Students with ASD

Eight directors’ expressed that the experiential aspect of VRTs made them attractive for the classroom setting, citing motivation and incentives for learning as possible inducement for student interest and engagement. Depending on the level of severity of the disability, some
students with ASD may never experience certain types of field trips or family trips that other students do. Directors reported that VRTs might be an avenue for students to experience an unlimited number of environments, lending an equalizing factor to the background knowledge of their general-education peers. One director asserted, “I think virtual reality technology could really enhance what we educators are trying to do. Many times we are trying to expose students to the outside world and to the community to help them transition to being a part of it. This type of technology, in which we could generate a variety of authentic environments, might be an opportunity to help students experience those environments in a safe, controlled setting before actually making the transition.” Another director shared a possible example for students in his school setting, stating, “I’m thinking immediately of job sites for our transition students. If they had the ability to experience walking into a store in a virtual world, getting a sense of lighting and of people around them, of orienting themselves to the layout and possibly being able to manipulate the things they would be working with, that would be an incredibly valuable experience for them.” VRTS may offer these types of realistic settings, giving students with ASD an opportunity for practice, repetition, and user control of the environment (Parsons, Rizzo, Rogers, & York, 2009).

Repetition of skills was assigned importance by six of the eight directors. Practicing skills, behaviors, and responses affords students with ASD greater potential for generalization to real-world contexts (Parsons and Cobb, 2011). Some of the scenarios that directors felt VRTs would be particularly helpful in were the practice and repetition of life skills and social skills. Four directors strongly expressed that VRTs provided exciting opportunities for students with ASD to practice authentic life skills in a safe and controllable environment. Strickland (1996) asserted that one of the most important aspects of VRTS in the school setting for students with
ASD was the ability to program and control stimuli within the virtual environment, thus being able to offer individualized “treatments” that capitalize on each child’s unique needs and preferences (as cited in Parsons and Cobb, 2011). One director stated, “This is an area of weakness for students with ASD, the ability to practice and generalize life and social skills. So, VRTs could have a huge impact since it gives them avenues to practice skills that may help them in the real world. We need to provide maximum opportunities for repetition and relearning if we want them to successfully transfer these skills to real-world scenarios.” Another director shared an example of VRT application, stating “Students could practice life skills in these virtual environments to practice everyday hygiene, such as taking a shower, brushing their teeth, and combing their hair. Since there is control over the stimuli in the environment, it could support the student in better attending to the skill, and possibly afford greater generalization of the skill.” This feature was also valued by another director, who stated, “I think about these students’ challenges and how VRTs might minimize some of these challenges. For example, because they can practice real-life skills in virtual environments, they may show growth in their behaviors. We start our students in the middle school with prevocational skills to get them ready for vocational skills at the high school level. It would be favorable to be able to have a wider variety of settings, virtually, for students to practice these real-world skills, whether it’s setting a table, making a delivery, or going into a restaurant. This may make the transition less difficult in the real-world setting.”

Social skills were also cited as a positive aspect of VRTs. A review of the literature indicated that social stories have been a popular strategy to help students with ASD better understand social situations. The goal of social stories is to expose the student to an event requiring social interaction and to encourage a proper response (Ryan, Hughes, McDaniel, and
Sprinkle, 2014). VRTs may afford that same experience, but in a safe and more authentic scenario where students can interact with multiusers in avatar format. Two directors shared their experience with a new VRT, Silas Solutions, being piloted in their districts for use as a speech therapy and social skill development tool. Silas Solutions allows students to create avatars and scripts with the support of the specialist. This helps them better understand social situations and how to practice responding appropriately.

Directors used some words (sensory) and phrases (generalization of skills) in both positive and negative contexts as they pertain to the integration of VRTs in the educational experience of students with ASD. Although some directors believed that the sensory aspect of VRTs (detailed graphics, movement of the elements that is intuitive to the user, audio components) may prove attractive to some students with ASD, others shared their concerns that the sensory component could have an adverse reaction. Four directors felt that VRTs involving mounted headsets, such as the Oculus Rift or the Samsung Gear, may be challenging or unwelcomed by some students with ASD. “Frequently, students with ASD have heightened senses. A sound or visual that is typical for some students is often magnified in a sensory way for these students. I think there could be a high level of unpredictability with this type of technology, especially when it’s first introduced. The sensory component could be a challenge,” asserted one director. Another director shared, “We would have to be careful that the sensory nature of this type of technology did not create adverse behavior, such as stimming or flapping.” Stimming and flapping, repetitive and self-stimulating behaviors typically associated with ASD, are compensatory strategies children with ASD often use in response to sensory arousal states (Boyd, McDonough, and Bodfish, 2012).
The phrase *generalization of skills* was cited by five directors and viewed as either a potentially positive or negative aspect of VRTs. Some saw the technology as particularly beneficial in potentially affording students a greater opportunity to generalize practiced skills to real-world contexts. Two directors, on the other hand, were adamant about not ascribing the value of generalization or transference of skills to this technology. “Transfer of skills from one setting to the next is one of the biggest challenges we have with autistic children. I don’t necessarily have a great buy-in to think that virtual reality would benefit that transfer of skills, in fact, it may even be less naturalistic for an autistic individual,” argued one director. Another asserted, “I think that it might be appropriate for learning foundation skills, but I don’t think it would benefit students with ASD in the generalization of skills. There might be things that could be misperceived or misinterpreted in virtual environments.” In fact, there are limited studies of the actual application of VRTs within the classroom setting and the impact of these technologies on generalizing skills and knowledge between contexts (Schmidt and Schmidt, 2008).

**Question 6. Describe the ways in which your district explores new innovative technologies for students in the special education setting.** To better understand the ways in which directors in their districts explore the burgeoning market of new technologies, the researcher invited participants to share their experiences. The most frequently used words and phrases were parents, teachers, child study team (CST) members, vendors, county networks, and professional development. Figure 6 shows the word and phrase frequency for the participants’ responses to Question 6.
Seven of the eight directors stated that parents were the greatest advocates for their children and would frequently bring to the district’s attention new technologies that they believed would benefit their child in school. Research indicates that parent participation leads to a host of positive outcomes for children with special needs, including greater generalization and maintenance of treatment gains, higher levels of parent satisfaction, and more effective strategies for resolving problems (Spann, Kohler, & Soenksen, 2003). One director shared, “Parents can be very influential. We run special-education parent groups four times each year. Additionally, we see parents multiple times throughout the year in IEP meetings or annual reviews, so if they see a technology as necessary for their child and we find it appropriate, we will put it in the IEP.” Other directors shared similar views of parent influence, describing parents as “very sharp” and “on the cutting edge of technology.” To varying degrees, some directors believed that parents...
trusted their district in being “ahead of the curve” in exploring new technologies. Others expressed that some parents were insistent that the district purchase technologies that, although useful in the home setting, would not be academically appropriate in the school setting. All of the directors discussed the idea of the appropriateness of each technology as it pertained to the goals and objectives specified in students’ IEPs, as this is a critical consideration of FAPE (“free and appropriate education”), as guaranteed under the Individuals with Disabilities Act (2004).

Directors relied relatively equally on teachers, CST members, their county network of colleagues, and professional development opportunities to extend their knowledge of new technologies that may hold value for some students with ASD. Directors were more wary of vendor presentations as a means of identifying new technologies, preferring instead to hear directly the experience of other educators. Additionally, three directors indicated that their districts’ technology directors were helpful in exploring and suggesting new technologies.

**Question 7. What are some of the challenges your district encounters in identifying and acquiring new instructional technologies that offer potential for having a positive impact on students with ASD?** The most frequently used words and phrases were time and cost. Figure 7 shows the word and phrase frequency for the participants’ responses to Question 7.
Seven of the participating directors expressed that time was a significant factor in identifying and exploring new technologies for supporting students with ASD. Given their varying levels of administrative responsibilities, some noted that they had less time to dedicate to actively seeking new technologies, and relied on parents, teachers, and CST members to advocate for the unique needs of each student. Additionally, directors from districts with larger enrollments often relied on technology directors to stay abreast of innovative technologies and to share their insights with key special-education personnel and the directors of curriculum. Conversely, directors in districts with smaller student enrollments stated that the lack of personnel dedicated solely to technology, such as technology directors, put them at a disadvantage in identifying and acquiring innovative technologies in as timely a fashion as larger districts. Directors also shared how time, as a commodity, affected their ability to identify and
acquire new technologies. One director asserted, “We often feel pressured to explore the
different apps that are continually popping up, and there are so many, but they are not all
beneficial. In order for me to determine if an app is appropriate and to get staff buy-in, I have to
find time to actually try them. This can be very time-consuming.” Another director shared a
similar perspective, stating, “Personally, I really need to know a new technology intimately
before I will roll it out. Then I get much greater staff buy-in. Therefore, I need to find the time to
understand the program or technology.”

Seven directors assigned importance to cost as an aspect that affected their ability to
acquire new technologies for students with ASD. Many revealed a lack of knowledge about the
varying costs associated with these technologies. Directors shared that cost was less of a
consideration when a technology was deemed appropriate for students’ needs. In fact, four
directors indicated that cost was not a factor if a technology could support a classified student,
and in many cases could circumvent triggering the much higher cost of educating a child in an
out-of-district placement. One director expanded on this perspective, stating, “We need to be
able to compete with out-of-district schools and the cost for tuition and transportation, which can
run, in some cases, from $100,000 to $150,000 for a single student. So if there is something that
we can offer here that a child needs and that will positively impact their education, cost is not
something I even think about.” Conversely, the single participating director from a private school
did not indicate that cost was a factor in identifying and acquiring new technologies. In fact, the
private school’s budget for technology was reported as 20% of their operating budget.

Question 8. What do you believe to be your district's strengths in providing teacher
professional development for VRTs in the special education setting? To better understand
directors’ perceptions of the ways in which their districts effectively implemented professional
development for innovative technologies, the researcher asked each director to share their district’s strengths for potentially training teachers in VRTs. The words and phrases most frequently used were structure of professional development, youthfulness of staff, and culture of technology. Figure 8 shows the word and phrase frequency for directors’ responses to Question 8.

**Figure 8.** Word/Phrase Frequency: District Strengths for Staff Professional Development for VRTs

Six directors assigned significance to the youthfulness of staff as a factor that impacted the effective facilitation of innovative technologies such as VRTs. These directors noted a correlation in their districts between the age of staff and their willingness to embrace new technologies. One director stated, “I think that having a young staff that really buys into technology and sees the purpose of it is one of our advantages. As digital natives, many of our
younger staff are willing to try anything as long as we provide appropriate professional development.” Another director reported, “I feel we have a very energized staff, particularly because of our more youthful staff. They don’t see technology as a hurdle, but as something helpful to enhance instruction and learning. They embrace these new technologies, and the older staff learn a lot from them.” Of the six directors who cited staff youthfulness as a positive indicator of implementing professional development, some described the relatively optimistic attitude of younger staff regarding the power of technology to transform student learning, as well as to make data collection and monitoring more effective. One director described this generational barrier, or digital divide, as “an opportunity to be capitalized upon.” He described the ways in which his district partnered veteran teachers with younger, novice teachers to build on each other’s strengths, including teacher efficacy with technology. Some studies have reported greater use of technology by younger teachers, indicating that older teachers may fear or feel intimidated by new technologies (Ruthven, Hennessy, & Brindley, 2004). Teachers who work effectively together as a team may readily share innovations involving technology (Loveless, DeVoogd, & Bohlin, 2001).

Directors reported that the ways in which their districts structure professional development for implementing new technologies was a positive factor affecting teacher efficacy and sustainability of the technology initiative in the classroom setting. Numerous studies speak to the challenges teachers face when they try to implement newly learned skills in their classrooms. Teacher mastery of a new skill takes, on average, 20 separate instances of practice and that number may increase if the skill is exceptionally complex, as in the case of an innovative technology (Joyce & Showers, 2002). Crafting a structure of professional development with this research in mind can benefit districts in moving away from traditional
single workshop models to longer, more extensive periods of professional development and teacher practice time. Directors echoed these findings, stating, “We’ve learned from our mistakes. When we roll out a new initiative, especially with technology, we bring in the experts and then ensure we provide extended opportunities for support with administration and collaboration among teachers.” Directors reported that time for professional development was key to effective structuring, and, when possible, building consistent time within the master schedule. One director stated, “We provide considerable time in our teachers’ schedules that allow them to work with new technologies. We also routinely select staff members to attend out-of-district professional development opportunities, like Techspo, where they can really explore innovative technologies.”

Four directors reported that their districts embraced a culture of technology. This was evidenced in the ways in which they motivate their staff to explore and utilize new technologies, the district values and builds time for professional learning communities, and teachers are not afraid to take risks with new technologies. Directors perceived such factors as dedicating personnel to technology roles—such as technology directors, technology coaches, and media specialists—were indicative of embracing a culture of technology. Those who reported a culture of technology in their districts perceived a more positive outcome of implementing VRTs and other innovative technologies.

**Question 9. What do you believe to be the challenges your district would encounter in providing teacher professional development for VRTs in the special education setting?** The most frequently used words and phrases directors used in response to this question were insufficient time, fear, resistance to change, and funding. Figure 9 shows the word and phrase frequency for directors’ responses to Question 9.
Six directors reported that insufficient time for sustainable professional development was a barrier to effectively facilitating such development, particularly with regard to an innovative tool like VRT. Some expressed that fear is also a barrier. However, with robust and extensive training beyond the typical three annual in-service days most districts provide, more teachers would increase their self-perceptions of efficacy with technology. Districts often provide staff wide training on the first days of school, assuming all teachers can benefit equally from a designated concept or initiative rather than mediating with attention to how those concepts or initiatives manifest within the particular content taught. One director reported, “Sometimes teachers don’t see how certain technologies apply to their grade level. In my building I don’t think age is necessarily a factor in embracing technology; it’s more about the teacher’s perception and comfort level with technology and the way they see its applicability to their
class.” Another director commented that when it came to districtwide staff development, directors of curriculum were given priority since they oversaw, in a broader sense, the direction of professional development for both general and special education. The director perceived this as a challenge to dedicating sufficient time for facilitating professional development for technology-based interventions unique to special educators.

Six directors reported that fear and resistance to change were barriers to effectively implementing professional development for innovative technologies such as VRTs. While fear of a new technology is a factor that may be mitigated with robust, ongoing, and sustainable professional development over time, resistance to change is a teacher characteristic that is reportedly more problematic. Without a doubt, instructional technology and its potential to improve instruction have progressed more rapidly than acceptance and utilization in the classroom. Directors reported that one of the biggest factors affecting the adoption of new technologies is teacher resistance. Fullan (2001) described the mix of negative and positive terms teachers use to describe change: on the one hand, fear, danger, panic; on the other, risk-taking, exciting, and energizing. This dichotomy requires a strong leadership presence. One director commented, “The challenge is those staff members who will fight any change tooth and nail. A lot of these people are excellent at what they do, but trying to change at all is almost impossible. They are extremely resistant. I have unrolled some really cool technology initiatives, but I have had to carefully select who to involve because I knew who would flounder with it and who would not. It comes down to leadership, understanding human nature, and knowing your staff well.”

Finally, four directors cited funding as a potential barrier to effectively facilitating professional development for innovative technologies like VRTs. While three had regularly
scheduled time within their teachers’ schedules for professional development and believed they could roll out a technology initiative with a fair degree of effectiveness at a manageable cost, others reported that the logistics of funding substitute coverage for teachers to attend professional development was problematic. Additionally, several directors identified the relatively high cost of bringing in vendors for professional development, averaging $2,500 to $4,000 per day, as another barrier to ongoing training necessary for sustainable technology innovation.

**Question 10. What else would you like to share that would provide further insight into your perspective on implementing VRTs in the special education setting for students with ASD?**

The researcher invited each respondent to share any additional insight he or she had regarding the potential impact of VRTs for students with ASD. The words and phrases most frequently used were consistent with Question 5, including the phrases life skills and social skills. Some directors, having had an opportunity to more thoroughly consider the implications of VRTs from both students’ and teachers’ perspectives, shared additional perceptions. Figure 10 shows the words and phrases most frequently used in response to Question 10.

**Figure 10. Word/Frequency: Additional Comments and Insights about Implications of VRTs**
Five directors reiterated that life skills would be a valuable intervention afforded by VRTs. They provided additional examples where virtual environments would be an appropriate opportunity for students to safely practice skills such as riding a bus, navigating a walk through their community, shopping in a grocery store, or eating in a restaurant. While real-world environments such as these may induce certain fears and phobias, particularly with uncontrollable stimuli, directors reported that simulating these environments and allowing students with ASD to become desensitized over time to some of their fears may prove exceptionally valuable. Two directors expanded this further to offer that VRTs might be carried over into the home setting. This would allow parents to utilize the technology to prepare students to go out to dinner with their families or to go on family trips to unfamiliar places—situations that are typically problematic, if not impossible, for some families with a child with ASD. Numerous studies supported directors’ perceptions, suggesting that VRTs have many advantages over traditional instructional practices in educating students with ASD. These include strong visual presentations, systematic control over real-world visual scenarios, the ability to capture detailed performance data, user control, and the fact that children with ASD find visual technology and their ability to control their environment highly appealing (Parsons, Rizzo, Rogers, and York, 2009). Additionally, these technologies support individualized learning, can introduce or remove distracting stimuli, and provide a high degree of realism for teaching life skills that may contain an element of danger, such as crossing the street, building with machinery, and so forth (Ennis-Cole, 2012).

Six directors reinforced their perceptions about the value of VRTs for practicing social skills. Individuals with ASD often have difficulty exhibiting facial expressions, controlling body posture, and using gestures to regulate social interactions, and they tend to use nonverbal
communication to request rather than to engage in a shared experience (Haney, 2013). Directors found value in VRTs for practicing appropriate social interactions in a virtual environment in which students can interact with an avatar, or with other users. Several directors voiced concerns about the potential of VRTs to increase the ability for students with ASD to become more isolated or solitary within the virtual environment. Therefore, they believed that a multiuser environment facilitated by a specialist would be advantageous. All of the directors involved in this study stated they would be willing to pilot VRTs in their district, provided the technologies proved appropriate for the unique needs of certain students with ASD, the interventions aligned with the goals and objectives specified in their IEPs, and the cost would not be burdensome.

Summary of Results

In chapter IV, the researcher used a data spiral analysis to answer the research questions. In the first phase, a word and phrase frequency counter was used to identify common terms among directors’ responses. A frequency set point of 4 was established as a baseline, which translated to 50% of directors responding in a common manner. In the second phase, to illuminate themes the researcher topically coded frequently used words and phrases, assigning a favorable or unfavorable value to terms supported by direct quotations. Data revealed several themes connected to the perceived potential for integrating VRTs as a technology-based intervention for students with ASD, and provided for effective staff professional development for implementation of these innovative technologies.

Data from questions 1-3 provided a broad overview of technologies currently used in the districts of participating directors, as well as their impact on content delivery, student engagement, and task focus. Additionally, the data from these questions illuminated the aspects most valued in technologies currently being used in the classroom. Questions, 4, 5, and 10
revealed directors’ knowledge and exposure to VRTs as they applied to the educational setting, and allowed directors to consider and share their perceptions about the potential effects of these technologies on the educational experience of students with ASD. The findings of this data informed Research Question 1: What are the perceptions of directors of special services regarding the potential of VRTs to positively affect the educational experience of students with ASD, specifically with regard to content delivery, student engagement, and task focus?

Data from Questions 6-10 provided insight into the perceptions of directors about the ways in which their districts manage the exploration of new, innovative technologies and their capacity for providing for effective teacher professional development. The findings of this data informed Research Question 2: What are the attitudinal dispositions of directors of special services with regard to providing for teacher professional development for implementation of VRTs in the classroom setting?

**Findings for Research Question 1**

The first research question examined directors’ perceptions about the potential of VRTs to positively affect the educational experience of students with ASD, specifically with regard to content delivery, student engagement, and task focus. Analysis of the data that informed this question revealed several themes.

**Life Skills and Social Skills As A Priori**

Academic competencies were clearly valued, and directors expected teachers to expose students with ASD to grade-level content similar to that used with their peers. Yet directors assigned considerable importance to life skills and social skills as valuable “content” and reported, in some cases, that these were a priori to standards-based content. Technologies used in
the classroom setting for students with ASD were expected to be appropriate vehicles for delivery of content supporting not only academic skills, but life skills and social skills as well. Directors valued current technologies that incorporated visuals and highly graphic features, consistent with the research on PECS-based interventions. A total of 63% of respondents also used assistive technology, such as Proloquo2Go, to support students whose diagnosis of ASD was comorbid with communication impairment. The spiraling themes of life skills and social skills appeared multiple times throughout the data. This validated directors’ perceptions of the value of VRTs for improving the ways in which teachers and specialists could support students with ASD in the practice and repetition of these critical skills. Parents of students with ASD, directors reported, were key stakeholders in identifying new technologies that might prove beneficial for their child. In addition, they provided valuable feedback about their child’s educational experience and what they considered to be priorities. According to directors, parents heavily favored a curriculum that incorporated life skills and social skills, as well as academic content. In fact, directors reported that some parents considered life skills and social skills to be more important. Directors perceived VRTs as a potentially effective technology for practicing these skills, both at school and at home. However, some were conflicted about the generalization of these skills to authentic scenarios, as there is limited research available about the ways in which VRTs could improve these outcomes. A total of 25% of directors shared their reservations about students’ ability to actually generalize skills to their real world. At the same time, they looked favorably on the technology for initially building foundational skills and affording opportunities for repetition of these skills.
Interactivity and the Experiential Nature of Technology

Directors shared their insight into the features most valued in technologies for content delivery. The most frequently cited features were interactivity, leveling, assessment, and standards-alignment, all of which correlate with aspects of VRTs. Directors also perceived value in the potential of VRTs for improving student engagement and task focus. VRTs reduce distractors or stimuli in an unlimited number of virtual environments and offer the ability to control the interaction of the student with other users, thereby decreasing potential social threats. Therefore, directors perceived that the technology would provide students with an incentive and motivation. Interactivity was cited most frequently as a key feature of effective instructional technology integration for student engagement and task focus. All of the directors perceived the highly interactive feature of VRTs as an added value. Additionally, 100% of directors found the immersive and experiential nature of VRTs valuable, in both the academic setting and the application for life skills and social skills. There were, however, significant concerns about the highly sensory nature of the technology, as well as the practicality of the headgear required for some VRTs. Directors reported that some students may have an aversion to having headgear touch their heads, as well as hardware covering their eyes or ears. Many believed that VRTs would have to be implemented slowly, with vigilant teacher observation to ensure that students were not having adverse reactions to the sensory aspect of the technology. Finally, directors cited the value of the “carry-over” effect of VRTs on home-based applications, an aspect valued in existing technologies such as iPads and Proloquo2Go. Several suggested that parents may also see the value in VRTs and reinforce the application in the home setting, thus increasing the opportunity for transference of skills. A number of directors expressed enthusiasm about the possibilities that VRTs could afford specific to the needs of their district. These included the creation of environments that mimicked their own schools so that students transitioning from
elementary to middle school, or from middle school to high school, could practice navigating these environments in a safe, manageable, and highly experiential manner. Another facet of VRTS that directors valued was its facility in developing environments that desensitized fears and phobias, common for many students with ASD. For example, two directors commented that environments that mimicked riding the bus, using a water fountain, or going to the cafeteria would be helpful in de-escalating anxiety for some students with deficits in those areas. Directors reported having minimal-to-no exposure to, knowledge of, or experience with VRTs as a technology-based intervention for supporting students with ASD. However, two directors planned to pilot an augmented VRT, Silas Solutions, in the upcoming 2017–2018 school year to support social skills and speech therapy for students in the special education setting. One director reported that his district had begun to explore Google Expeditions for students in these settings, but were still in the preliminary stages of implementation. Directors reported having gleaned most of their knowledge of or exposure to this new technology from television commercials for the Samsung Gear and advertised professional development opportunities, including publicity Google Expeditions during professional conferences. Overall, 100% of the participating directors saw value in VRTs for delivery of content, whether academic, social, or life skills, and for student engagement and task focus.

**Findings for Research Question 2**

The second research question examined the attitudinal dispositions of directors in providing for teacher professional development for VRTs. Several themes were revealed in the analysis of data that informed this research question.
Fear and Resistance to Change

Directors reported that fear and resistance to change are frequently barriers to effectively implementing professional development for new technologies. Although fear could be mitigated by robust and sustainable professional development, resistance to change often proved problematic. Most directors (75%) reported this to be the case in their districts. They believed that teachers understood the potential of instructional technology to improve instruction and learning, but that some still had mixed feelings of fear, panic, and persistent obstinence. Directors shared that strong leadership is critical in facilitating professional development for new technologies, particularly in a culture of fear or resistance to change. This includes dedicating personnel to technology roles, such as technology directors, technology coaches, and media specialists, in an effort to support staff in moving past these resistant characteristics.

Importance of Professional Development Structure

Directors reported that a critical factor in facilitating effective professional development for new technologies such as VRTs was its structure. This includes moving away from single workshop models to more extensive periods of sustainable training. Structure also involves funding substitute coverage so that teachers can work together in teams throughout the year to share progress in technology innovation. Developing robust, long-term funding plans increased the number of directors who viewed successful building of teacher efficacy important for effectively implementing new technologies. These plans included revising master schedules to allow consistent weekly time for professional learning communities and collaboration. Directors also indicated the need for annual professional development days, including contractual in-service days. They emphasized the need to carefully craft training to ensure that it is specific to special education teachers, and not simply broad, districtwide initiatives. Directors emphasized
that professional development for implementing innovative technology-based intervention such as VRTs requires a thoughtful, well-structured plan for sustainable training for teachers in the special education setting.

**Culture of Technology**

Directors reported that when a culture of technology was evident in their districts, there was greater potential for facilitating effective professional development in regard to new technologies such as VRTs. A hallmark of this culture was a youthful staff who were more comfortable experimenting with new technologies than veteran teachers, and leadership that assigned importance to the hiring of key personnel, such as technology directors, technology coaches, and media specialists. Directors also said that setting aside the time to become experts in new technologies themselves was critical to success, and that teachers felt more comfortable with these technologies when their supervisors were proficient in their implementation as well.

Directors shared that hiring younger staff allowed them to use the differences in staff age demographics as a strength for professional development. Partnering more youthful teachers with their veteran counterparts was seen as a way for teachers to support each other, and to learn from each other’s strengths to build a more vibrant culture of technology.

Chapter V will include an Introduction, an Overview of the Study, Summary of Findings, Conclusions and Implications, and Recommendations for Future Research.
Chapter V
Summary, Conclusions, and Recommendations

Introduction
This study examined the perceptions of special services directors with regard to the potential effects of VRTs on the educational experience of students with ASD. Also explored were, their attitudes toward for providing effective professional development to implement these innovative technologies. Chapter V will include an Introduction, an Overview of the Study, Summary of Findings, Conclusions and Implications, and Recommendations for Future Research.

Overview of the Study
The purpose of this qualitative study was to explore the impact of VRTs in the educational setting for students with ASD as perceived by participating directors. It also examined their attitudes toward providing effective professional development to implement these innovative technologies. In 2000, the Centers for Disease Control and Prevention estimated that 1 in 88 children were diagnosed with ASD, more than a 68% over the prior eight years. In 2014, the number of reported diagnoses increased to 1 in 65. Particular to this study was the fact that New Jersey’s statistical rates were at approximately 1 in 45. ASD has had an impact on school districts across the country that have struggled to meet the high level of need for support and services, ensuring a “free and appropriate public education (FAPE)” as guaranteed under the Individuals with Disabilities Act (2004). Students with ASD are more likely than other special-needs students to receive out-of-district placements, and parents of these students increasingly demand more intensive, innovative, and expensive services and technologies that offer their child the best opportunity for educational success (Smith, 2009).
Advances in technology for special education have exploded over the last decade. An increasing number of studies have investigated the diverse applications of technology-based interventions for students with ASD (Goldsmith & LeBlanc, 2004). Parents and clinicians routinely report that children with ASD are drawn to technological devices (Colby, 1973, as cited in Goldsmith & LeBlanc, 2004). Of the newest technologies, VRTs show a great deal of promise for helping students with ASD improve their communication, social, independent functioning, and even academic skills (Burton, Anderson, Prater, & Dyches, 2013). Professional development to train teachers in mastering new technologies is a key consideration in effective implementation. Therefore, the study further examined the ways in which directors’ perceived their district’s ability to sustainably provide professional development for staff. The limitations of this study were the relatively narrow body of research about VRTs in the educational setting, as well as the limited market for these technologies. As such, participating directors had a fairly limited knowledge base about this innovative technology. To support participants in better understanding the frameworks of VRTs, the researcher provided each director with a research-based description of the technology and demonstrated two types of VRT hardware: the Oculus Rift and Google Cardboard.

**Summary of Findings**

A data spiral analysis, including word and frequency counts, as well as topical coding revealed several themes that informed each research question.

Research Question 1 of the study revealed the themes of life skills and social skills as a priori, as well as interactivity and the experiential nature of technology, as important considerations in evaluating the potential success of VRTs for improving the educational experience of students with ASD. Consistent with the research, directors perceived that
educational interventions had focused primarily on a scope and sequence of learning outcomes considered most appropriate for students with ASD. However, they emphasized the continuing need to determine whether these students need to be readied with life skills and social skills as a priority to the teaching of the academic curriculum. Behaviors commonly exhibited by students with ASD were aggression and self-injury, both of which pose major obstacles to full participation in meaningful educational activities (Durand, 2005). Additionally, directors perceived that VRTs may present an opportunity for students with ASD to practice important life and social skills in safe, virtual environments. At the same time, whether this practice and repetition could be generalized to real-world scenarios remained controversial due to the relatively narrow body of research.

Research Question 1 also illuminated the theme of interactivity and the experiential nature of technology. Directors cited the highly interactive and experiential nature of VRTs as a favorable aspect for improving student engagement and task focus. This aspect was a determining factor in the decision of whether to acquire the technologies for classroom settings serving students with ASD. Directors believed that the primary outcome of the most frequently used technology, the iPad, had over time become less experiential and more of a rewards-based incentive to play games and video clips once students had completed by their work. The research suggests that virtual and immersive technologies have many advantages over traditional instructional practices in educating students with ASD, including strong visual presentations and systematic control over real-world visual scenarios (Parsons, Rizzo, Rogers, and York, 2009).

Consistent with this research, directors perceived as a benefit the ability of VRTs to capture detailed performance data and afford unique user control. Another advantage cited was the fact that children with ASD find visual technology and the ability to control it highly appealing.
Directors perceived the immersive nature of VRTs as producing both favorable and unfavorable outcomes, depending on the unique needs and behaviors of the student. VRTs may be particularly helpful for people with cognitive and perceptual impairments, including ASD, because the technology can assist in planning, problem-solving, and management of behavior, and offers powerful communicative facilities for people with limited expressive language (Parsons, Rizzo, Rogers, and York, 2009). Yet directors expressed concerns about the ways in which the highly sensory nature of the VRTs could trigger adverse behaviors, such as stimming, flapping, or other self-stimulating outbursts.

Research Question 2 of the study revealed the themes of fear and resistance to change, the importance of professional development structure, and the culture of technology as important considerations influencing directors’ attitudes toward teacher professional development to implement VRTs in the classroom setting. Participants consistently reported the dual teacher characteristics of fear and resistance to change as problematic in attempting to facilitate teacher training. However, consistent with the research, they believe that fear may be mitigated by robust, consistent professional development and embedded teacher practice time; resistance to change was viewed as possibly being more complicated to overcome. Consistent with Fullan’s (2001) research on the feelings of fear, danger, and panic teachers experience when encountering new instructional methods and new technologies, directors perceived teachers’ resistance to change as a barrier to implementation of VRTs.

Research Question 2 also revealed the theme of the importance of professional development structure. Directors perceived that time, in a variety of ways, directly impacts effective facilitation of staff training. Consistent with the research, directors suggested that professional development for new technologies for special-education teachers should be
distinguished from the larger technology initiatives that are rolled out districtwide, including those aimed at for general-education teachers. Districts often provide staff wide trainings, assuming all teachers can benefit equally from a designated concept or initiative, rather than mediating with attention to how those concepts or initiatives manifest within the content a taught. Directors reported that to successfully facilitate professional development for an innovative technology such as VRTS, the structure of staff development is important. It requires a thoughtful action plan that moves away from single workshop models and focuses on ongoing, sustainable training embedded in professional learning communities with colleagues, and in regularly planned workshops during the school day with year technology specialists.

Research Question 2 also illuminated the theme of culture of technology as a determining factor for facilitating professional development for VRTs. Directors perceived that staff youthfulness was a positive indicator of implementing professional development, lending itself toward a district culture of technology. Some studies have reported greater use of technology by younger teachers and have indicated that older teachers may fear or feel intimidated by new technologies (Ruthven, Hennessy, & Brindley, 2004). Directors were relatively optimistic about harnessing the power of their more youthful staff. They indicated that partnering veteran teachers with their younger, more digital-grounded counterparts could build teacher efficacy with a new technology such as VRTs. This concept was supported by research showing that teachers who work effectively together as teams may readily share innovation involving technology (Loveless, DeVoogd, & Bohlin, 2001).
Conclusion and Implications

As new and more innovative technologies continue to permeate educational programming, practitioners need to identify the most promising and helpful tools that can be deployed readily within classroom contexts to assist in supporting the education of students with ASD (Goldsmith and LeBlanc, 2004). Nally, Houlton, and Ralph (2000) suggested that many parents of children with ASD report their child’s fascination with and propensity for learning from visually based media such as computers (as cited in Ayres, Mechling, and Sansosti, 2013). Although there are no fixed solutions for students with ASD, the burgeoning development of innovative technologies, including VRTs, may offer alternative supports in the educational experience. These technologies claim to provide a particularly facilitatory environment for students with ASD that offers structure, opportunities for repetition, affective engagement, and control of the learning environment. VRTs may offer the ability to provide realistic settings, visual representations, and user control that students with ASD find highly appealing (Parsons, Rizzo, Rogers & York 2009). While these innovations in technology offer promising benefits, they are still fairly limited in development and availability, and there is equally limited availability of studies that offer statistically significant evidence of their impact on educating students with ASD.

Data from this study can have a profound influence on the current practice of identifying and implementing VRTs appropriate to the unique needs of learners with ASD. Directors shared common perceptions regarding the priority of learning skills for these students, as influenced by the feedback of teachers and parents. Data demonstrated a shift to include life and social readiness skills of equal, if not greater, curricular importance to academic competencies. VRTS, according to participating directors, afforded aspects highly valued by educators in improving the educational experience of students with ASD. These included the interactive and experiential
nature of the technologies, and the seemingly unlimited ability to replicate real-world environments in which students could practice functional life skills, social interactions, and academic competencies. Further, the data evidenced utilization concepts that directors believed beneficial for students, including desensitization to fears and phobias surrounding normal daily events. VRTs shared the carry-over effect valued in other technologies that allow parents to assume a role in facilitating therapeutic benefits in the home setting. Therefore, directors perceived the technology as having value that extended beyond the school walls, such as opportunities for students to practice eating in a restaurant, going on a family trip, or self-hygiene skills. Finally, data evidenced the importance of creating purposeful professional development structures that employ long-term action plans. These plans included sustainable, embedded time for teachers to master the relatively sophisticated nature of VRTs in order to effectively implement the technologies in instruction and learning. By harnessing the influence of younger, digitally familiar staff members, districts could build potentially powerful partnerships for teacher implementation of VRTs and lessen the persistent teacher characteristics of fear and resistance to change.

**Recommendations for Future Research**

Given the exponential growth of technology and its use in education, the focus and importance of scholarly research on the impact of educational technology has increased significantly. Yet the body of research on one of the newest innovative technologies, VRTs, is particularly narrow. Thus, this study should be replicated in a variety of ways, broadening the research base to provide a more comprehensive understanding of the ways in which VRTs could impact the educational experience of students with ASD. Replications should also explore
further the ways in which district leaders could effectively provide for teacher professional development to implement these new technologies.

1. This study should be replicated in other counties and in other states. The researcher used convenience sampling. Extending future studies to include a greater number of counties and states, socioeconomic standings, geographic locations, enrollment dynamics of students with ASD, and directors’ experience levels could produce additional results.

2. This study should be replicated with a larger sample size to produce a larger body of perceptual data. A larger sample size could produce additional results.

3. A study focused on the perceptions of special education teachers may reveal priorities of instruction and learning for students with ASD. Such research may further illuminate aspects of teachers’ fear of technology and resistance to change when attempting new technologies. This perceptual data could benefit district leaders in making decisions about acquiring VRTs, and inform strategies for effective facilitation of teacher professional development.

4. A study that focused on the perceptions of parents of students with ASD may reveal priorities of instruction and learning, particularly with regard to the prioritizing of life skills, social skills, and academic competencies.

5. Empirical research is recommended to study the impact of VRTs in the classroom for supporting students with ASD. Specific to the research should be case studies of students who have been afforded the use of VRTs as a technology-based intervention to support the acquisition of academic competencies, life skills, and social skills.

6. Further study is recommended on possible strategies to help teachers overcome their fear and resistance to change when mastering and implementing new innovative technologies.
It is evident from the findings that these characteristics have a significant impact on the professional development of teachers and their ability to successfully implement technology in the classroom. Case studies could be selected and analyzed to support educational leaders in more effectively facilitating staff professional development for new technologies.
References


Jacob, S. A., & Furgerson, S. P. (2012). Writing interview protocols and conducting interviews:
Tips for students new to the field of qualitative research. *The Qualitative Report, 17*(42), 1–10.


Appendix A

NIH Certificate

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that Lisa Gleason successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 10/25/2016.

Certification Number: 2220912.
Appendix B

Implied Consent Form for Online Surveys

Dear Director of Special Services:

I am a doctoral candidate in the School of Education at Saint Peter’s University. I am employed by the Belmar Board of Education, Belmar, New Jersey, as the Principal and Director of Curriculum at Belmar Elementary School. You are invited to participate in a research study for my doctoral dissertation, Virtual Reality Technologies and Autism Spectrum Disorder: Directors of Special Services’ Perceptions. The purpose of this study is to explore the potential impact of virtual reality technology in the educational setting for students with ASD. The findings of this study will contribute to the relatively narrow body of research on this topic. In addition, the results may assist both public- and private-school leaders in better understanding the potential strengths and challenges of facilitating virtual reality technology in the classroom setting. The study may also and provide for teacher professional development for effective implementation of these new technologies. You were selected as a possible participant in this study because you are identified by the New Jersey Department of Education’s 2016-17 Directory of Directors/Supervisors of Special Services in Monmouth County, New Jersey, which is the setting for this study.

If you decide to participate, I ask that you please complete the following prequalifying questionnaire, which will assist me in developing a representative sampling of participants. You will then complete a one-hour face-to-face interview. Your completion of this questionnaire indicates your consent to participate in this research study. In the questionnaire, you will be asked to answer questions about your district’s enrollment numbers regarding general education and special-education students, as well as provide demographic information related to your district District Factor Groups. Additionally, you will be asked questions about experience as a director/supervisor of special services. This questionnaire will take approximately 30 minutes to complete. No benefits accrue to you for answering the questionnaire, but your responses will be used to develop a representative sampling of participants for the second phase of the data collection, which is based on face-to-face interviews. Any discomfort or inconvenience for you will be minimal and, but are not expected to be any greater than anything you encounter in everyday life. Questionnaire data will be collected using the Internet; no guarantees can be made regarding the interception of data sent via the Internet by any third party. Confidentiality will be maintained to the degree permitted by the technology used.
Please feel free to ask questions regarding this study. You may contact me if you have additional questions at Igleason@mail.saintpeters.edu, or by phone at 732-915-5766. You may also contact my Dissertation Mentor, Dr. Robert Andrews, at drands@gmail.com. Thank you for your time.

Sincerely,
Lisa J. Gleason

By clicking the link below, I confirm that I have read this form and agree to participate in the project described above. Its general purposes, the particulars of involvement, and possible risks and inconveniences have been explained to my satisfaction. I understand that I can discontinue participation at any time. My consent also indicates that I am at least 18 years of age. (Please feel free to print a copy of this consent form.)

Questionnaire Link: https://goo.gl/forms/lxpqDENgj8SQuPyG2
Appendix C

Electronic Invitation and Pre-Qualifying Questionnaire

Thank you for agreeing to be interviewed for my research study, "An Exploration of the Perspectives of Special Services Directors of the Impact of Virtual Reality Technologies for Improving the Educational Experience of Students with Autism Spectrum Disorder"

Please complete the following confidential questions:

Your name *

Short answer text

Your school district *

Invitation and Pre-Qualifying Questionnaire

Form description

Email address *

Valid email address

This form is collecting email addresses. Change settings

Are you be willing to participate in a face-to-face interview in which you would answer 10 questions about your perspectives of the impact of virtual reality for improving the educational experience of students with Autism Spectrum Disorder? (Interviews are estimated at 1 hour and will be held in the conference room at Belmar School District, 1101 Main Street, Belmar, NJ 07719).

☐ Yes

☐ No
Public or Private School

- Public school
- Private school

What is your District Factor Group (DFG). If unsure, please write DO NOT KNOW.

Short answer text

District grade span (i.e. K-5, K-8, K-12, etc)

Short answer text

How many total students are currently enrolled in the district for the 2016-17 school year?

Short answer text

How many students in the district are currently classified with special needs?

Short answer text

How many students in the district are currently classified with Autism Spectrum Disorder?

Short answer text

How many years have you been in your current position as Director/Supervisor of Special Services?

Short answer text

How many total years of experience do you have as a Director/Supervisor of Special Services?

Short answer text
Thank you for providing this valuable information. A representative sampling of 8-10 participants will be contacted to participate in the second phase of this research study. Please provide the following information so that I may contact you should you be selected.

Your Name *
Short answer text

Your email information *
Short answer text

District phone number *
Short answer text

Cell phone number *
Short answer text
Appendix D

Informed Consent Form for Participation in a Research Project

INFORMED CONSENT FORM FOR PARTICIPATION IN A RESEARCH PROJECT


PRINCIPAL INVESTIGATOR: Lisa J. Gleason
MENTOR: Dr. Robert Andrews

INTRODUCTION
You are invited to consider participating in this research project. Please take as much time as you need to make your decision. Feel free to discuss your decision with whomever you wish, but remember that the decision to participate, or not to participate, is yours. If you decide to participate, please sign and date where indicated at the end of this form.

PURPOSE
The purpose of this study is to explore the potential impact of virtual reality technology in the educational setting for students with ASD as perceived by directors of special services. The findings of this study will contribute to a relatively narrow body of research on virtual reality technology in the educational setting for students with ASD. Additionally, the findings may assist both public- and private-school leaders in better understanding the potential strengths and challenges of facilitating virtual reality technology in the classroom setting, and providing for teacher professional development for effective implementation of these new technologies.

PROJECT PLAN
You are being asked to take part in this research because you are a director/supervisor of special services with the necessary knowledge and insight to inform the research questions. About 8-10 participants will take part in this research.

If you decide to participate in this research, you will complete a face-to-face interview in which you will answer 10 semistructured questions. Additional questions may be asked to further clarify your answers, and to illuminate themes specific to the nature of the topic of virtual reality technologies for supporting the educational experience of students with ASD, as well as the
strengths and challenges of providing for teacher professional development in implementing new technologies.

The interviews will be held at the Belmar Board of Education offices in Belmar, New Jersey, at a time that is convenient for you. The interviews will take approximately 1 hour to complete.

The interviews will be audio recorded with a Sony Voice Recorder and I will be taking notes, as well. Once the interviews are recorded and transcribed, the audio recordings will be erased.

Interview transcriptions will be maintained on the Google Drive server for Saint Peter’s University. After defense of this dissertation, the transcriptions will be deleted and destroyed.

RISKS
There are minimal-to-no risks associated with participating in this research.

BENEFITS
If you agree to take part in this research, there will be no direct benefit to you. However, the findings of this study will contribute to a relatively narrow body of research on virtual reality technology in the educational setting for students with ASD. Additionally, the findings may assist both public- and private-school leaders in better understanding the potential strengths and challenges of facilitating virtual reality technology in the classroom setting, and providing for teacher professional development for effective implementation of these new technologies.

CONFIDENTIALITY
Every effort will be made to keep any information collected about you confidential. However, it is impossible to guarantee absolute confidentiality. All interviewees will be assigned a number, and all recorded interviews and transcriptions will be identified by your assigned number only.
In order to keep your information secure, audio recordings and notes will be kept in a locked file cabinet maintained at the Belmar Board of Education offices until they are transcribed. Once the interviews are transcribed, the audio recordings will be permanently erased. Interview transcriptions will be maintained on the Google Drive server for Saint Peter’s University. After defense of this dissertation, the transcriptions will be deleted and destroyed.

RISKS
In order to keep information about you safe, audio recordings and notes will be kept in a locked file cabinet until they are transcribed. Once the interviews are transcribed, the audio recordings will be permanently erased. Interview transcriptions will be maintained on the Google Drive server for Saint Peter’s University. After defense of this dissertation, the transcriptions will be deleted and destroyed.

YOUR RIGHTS AS A RESEARCH PARTICIPANT
Participation in this research is entirely voluntary. You can choose not to participate at all, or to withdraw at any point. If you decide not to participate, or to withdraw, there will be no penalty or loss of benefits to which you are otherwise entitled, or any effect on your relationship with the researcher, or any other negative consequences. If you decide that you no longer want to take part in this research, you are encouraged to inform the researcher of your decision. Any
information already obtained through your participation will not be included in the data analysis and final report for this research.

QUESTIONS OR CONCERNS
If you have any questions or concerns you may contact me at lgleason@mail.saintpeters.edu or by phone at 732-915-5766. You may also contact my Dissertation Mentor, Dr. Robert Andrews, at drands2@gmail.com. Please contact the Saint Peter’s University IRB at 201 761-6137 or pvvek@saintpeters.edu if you have any questions about your rights as a research participant.

STATEMENT OF PERSON OBTAINING INFORMED CONSENT
I have fully explained this research to the participant. I have discussed the purpose and procedures, the possible risks and benefits, and the fact that participation in this research is completely voluntary. I have invited the participant to ask questions, and I have given complete answers to all participants’ questions.

_________________________________________ ______________________
Signature of Person Obtaining Informed Consent Date

STATEMENT OF CONSENT
I understand all of the information in this Consent Form. I have gotten complete answers for all of my questions. I freely and voluntarily agree to participate in this research project. I understand that I can withdraw at any time. My signature also indicates that I am 18 years of age or older and that I have received a copy of this consent form.

_________________________________________ ______________________
Participant Signature Date

_________________________________________
Printed Name of Participant

Once you sign this form, you will receive a copy of it to keep and the researcher will keep another copy.

I understand that I will be audio recorded as a part of this research.
Please indicate whether you agree to be audio recorded as a part of this research.
_____YES (If you change your mind at any point, please inform the researcher.)
_____NO

_________________________________________ ______________________
Participant Signature Date

_________________________________________
Printed Name of Participant
Appendix E

Oral Script for Face-to-Face Interviews

Researcher: "Good afternoon. It is a pleasure to meet you, and I truly appreciate your time and input. As discussed on the phone, this is a semistructured interview that will take approximately an hour. To ensure consistency of information, I will be asking all participants the same questions. Depending on each participant's response, I may ask for clarification or a follow-up question to better understand the response. Also, please do not hesitate to ask me for clarification if you are unsure about what the question is asking. Please be aware that the conversation is being recorded via a digital voice recorder. To ensure confidentiality, each participant will be assigned a number that corresponds to a specific interview. I will take notes, and the recording will be transcribed using the assigned number as an identification. Participants will be offered the opportunity to listen to the recordings or read the transcripts. If you are ready, I would like to begin with the first question." (Proceed with Questions 1-10).

After the questions are completed: "Thank you for participating in this interview. I truly appreciate your time. Have a great day."
Appendix F

Interview Questions

1. What types of instructional technologies are currently being used in classroom settings servicing students with ASD?

2. Which technologies contribute to curricular content delivery?

3. Which technologies contribute favorably to task focus and student engagement?

4. Describe any virtual reality technologies of which you have knowledge or experience.

5. Provided with a research-based description of virtual reality technology, what do you consider to be factors that may impact the educational experience of students with ASD, specifically with regard to content delivery, task focus, and student engagement?

6. Describe the ways in which your district explores new, innovative technologies for students in the special-education setting.

7. What are some of the challenges your district encounters in identifying and acquiring new instructional technologies that offer potential to have a positive impact on students with ASD?

8. What do you believe to be your district's strengths in providing teacher professional development for virtual reality technologies in the special-education setting?

9. What do you believe to be the challenges your district would encounter in providing teacher professional development for virtual reality technologies in the special-education setting?
10. What else would you like to share that would provide further insight into your perspective on implementing virtual reality technologies in the special-education setting for students with ASD?
Appendix G

Research-Based Definition of Virtual Reality Technology

Virtual reality technology encompasses a variety of software or web-based 3D virtual worlds in which the user enters the space through either through a representative avatar, or fully immersed in a first person perspective. These technologies can be accessed in a variety of ways, including computer-based, computer based with headphone augmentation, or fully immersive through headgear connected to a personal computer. Virtual environments are typically characterized by the same basic elements we observe in our physical environment: ground, sky, and other components of external landscapes; the floors, ceilings, and walls of internal spaces; and both realistic and fantasy objects that are either embedded or user-created. Virtual worlds are online, persistent, and interactive environments that can be accessed solely by the user or can be accessible by multiple users. Users control their in-world actions whether to move, communicate, collaborate, create, or socialize within the virtual world (Robbins & Butler, 2009; Dass, Dabbagh, & Clark, 2011). The inherent characteristics of virtual reality technologies are the sense of presence and awareness of others, the ability to communicate and collaborate, the provision to create, and learn by doing. Virtual reality technologies have been used in a variety of applications, including but not limited to science, language, speech, general education, design, computer education, economics, social skills, and others. They may potentially provide instructional strategies that would otherwise not be possible without the technology (Dass, Dabbagh, & Clark, 2011). Some examples of virtual worlds could include the following:

- Students can conduct genetic experiments with virtual plants with time sped up in order to collect data that would normally take much longer (Clark, 2008).
• Students can interact socially with others in a virtual community, including community building activities, social interaction, and the ability to create in-world artifacts within the community (Robbins & Butler, 2009).
Appendix H

Approval to Use District Facilities for Interviews

BELMAR ELEMENTARY SCHOOL
1101 MAIN STREET, BELMAR, NEW JERSEY 07719
WWW.BELMAR.K12.NJ.US

MR. DAVID R. HALLMAN
SUPERINTENDENT
732-681-8888

MRS. LISA J. GLEASON
PRINCIPAL / DIRECTOR OF CURRICULUM
732-681-2388

MRS. SARAH WILTON
SUPERVISOR OF INSTRUCTION
732-681-2388

December 1, 2016

Lisa J. Gleason has been granted permission by the Superintendent and Belmar Board of Education to use the district board offices to conduct face-to-face interviews with participants in her research study for Saint Peter’s University. The board recognizes the importance of a discretionary space to conduct confidential interviews for the completion of Lisa Gleason’s doctoral dissertation.

Sincerely,

David R. Hallman

Mr. David R. Hallman, Superintendent
On behalf of
Members of the Belmar Board of Education