Autism and Technology: Investigating Elementary Teachers’ Perceptions Regarding Technology

Use with Students with Autism

A Master’s Research Project Presented to

The Faculty of The Patton College of Education

Ohio University

In Partial Fulfillment

of the Requirements for the Degree

Master of Education

By

Mona Sulaimani

April, 2014
This Master’s Research Project has been approved for the Department of Teacher Education

Dianne M. Gut, Ph.D.
Associate Professor of Special Education

Frank H. Doppen, Ph.D.
Professor and Chair of the Department of Teacher Education

Advisor’s initials here indicate this document has been submitted and successfully cleared a plagiarism check. Supporting documentation has been provided to the Department Chair.

Department Chair’s initials here indicate supporting documentation of plagiarism check has been provided.
# Table of Contents

Abstract 5

Introduction 6

Review of the literature 8

- Autism: Definition, prevalence and characteristics 9
  - Prevalence 9
  - Characteristics 9

Computer use and social interaction 10

- Social stories 11

Special education teachers and assistive technology 13

- Teachers’ use of technology to improve student learning 14
- Teachers’ use of technology to improve practice 16

Computer and learning 18

Method 20

- Context 20
- Participants 20
- Instruments 21
- Procedure 22
- Data analysis 22

Results 24

- Demographic Data 24

Qualitative Responses 25

- Types of technology used 25
- Recommended technology 26
Impact on Student Learning 26

Academic impact 26
Accessibility and independence 28
Focus on task 28
Discussion 28

Implications 31
Limitations 32
Conclusions 33
References 34
Abstract

There is an extensive amount of literature on the use of technology in special education classroom. Although this literature provides useful insight into its benefits, little has been done to explore teachers’ perceptions towards using technology with individuals with autism. This study attempts to fill that gap by exploring teachers’ perceptions toward the use of technology with individuals diagnosed with autism. For the purpose of this study, semi-structured interviews were conducted with seven elementary school teachers who taught students diagnosed with autism. A thematic analysis was used to find emerging categories and compare them. The findings revealed that the majority of teachers (six of the seven participants) are in favor of using technology in the classroom and believe that it can have a positive impact on students' learning experiences. Identified benefits include allowing for self-expression, increasing engagement with the materials, and motivation, as well as providing alternative ways for task completion making it helpful in accommodating for individual student learning preferences.
Technological advancements have increasingly changed the landscape of education. For students, technology has made it easier to give and receive feedback and collaborate with peers. For teachers, technology has facilitated planning and assessment (Eckhouse & Rebecca, 2013) and created space for various creative activities that teachers are able to develop for their students. Realizing the role that technology can play in education, educational experts were quick to research the potential of technology in the classroom and see the potential for its incorporation into all aspects of instruction (Wu, Y. T., Hou, H. T., Hwang, F. K., Lee, M. H., Lai, C. H., Chiou, G. L., Lee, S. W. Y. et al., 2013). The use of technology has not only been prevalent with typically developing students, but has also proven useful for students with special (Tibi, 2012). In the special education classroom, technology has improved the educational experience by providing students with special needs with the opportunity to perform tasks and improve social skills (Jacklin & Farr, 2005).

Technology has demonstrated effectiveness in enhancing the quality of education by motivating students. Specifically, Krinic, Vdacek-Hains and Kovacic (2010) claim that “computer-aided education has largely proven to be more effective and efficient, primarily owing to additional motivation enhanced by the interaction with the computer” (p. 2) The use of assistive technology has also enabled students with disabilities to overcome many of the barriers and obstacles they face in their educational careers. Krinic, Vdacek-Hains, and Kovacic believe that “assistive technology (AT) can play a major role in overcoming the barriers that persons with developmental disorders have to face” (p. 2).
Students with special needs, such as children with autism, deal with barriers and obstacles on a daily basis. As a challenging developmental disorder, autism presents multiple obstacles to individuals dealing with this disorder. These challenges are not limited to the fact that autism affects the development of social skills. Fan (2012) defines autism as the result of “a neurological disorder that affects the normal functioning of the brain, impacting development in social interaction and communication” (p. 12). A lack of social skills can pose great challenges to individuals diagnosed with this developmental disorder. Because of their underdeveloped social skills, these individuals often find it difficult to interact with others. Diken and Acar (2012) assert that individuals diagnosed with autism deal with challenges that come as a result of “limitations and deficiencies in social interaction, communication and showing stereotyped behaviors” (p. 2731).

Because of the role technology can play in special education, the positive impact it can have on students who receive special education should not be ignored.

Although research has shown the significant role technology plays in education in general and special education in particular, very little has been done to explore teachers’ perceptions regarding the use of technology with individuals diagnosed with autism. The purpose of this study was to explore teachers’ perceptions of the use of technology for students with autism, thus helping to bridge this gap in the literature. This study examined the attitudes and perceptions special education teachers have towards the use of technology with children diagnosed with autistic. As demonstrated in the following review of the literature review, scholars have looked at different issues related to the relationship between technology and autism, but very little has been done to examine teachers’ attitudes. Exploring teachers’ attitudes provides insights into how their
perceptions affect their use of technology in the classroom. It also provides insights into whether teachers’ levels of comfort with technology affect the different technological tools they use in the classroom and limit their use of others. Understanding teachers’ perceptions is also useful in determining the extent to which technological interventions are successful. Since special education teachers have different technologies they can use with their students with autism to promote and facilitate learning, exploring their perceptions allows insights into which technologies are being used and which are not. Additionally, an examination of teachers’ perceptions can aid in improving strategies or developing programs to make teachers more comfortable with a variety of technological tools to ensure the success of the educational experience for their students with autism. For teachers with negative attitudes towards technology, this study helps identify the potential reasons behind teachers’ negative attitudes or perceptions towards technology. This knowledge will enable school administrators to design professional development to address these issues and promote technology use as appropriate in the classroom.

**Review of the Literature**

In the following literature review, some of the studies that have explored the use of technologies with individuals with autism will be highlighted. Following a section defining autism, its prevalence and characteristics, the first section examines the role computers play in helping individuals with autism develop their social interaction skills. The second explores teachers’ use of computer technologies in education. The final section looks at the significant role computer technologies play in the facilitation of students’ learning. As it will become clear, a significant amount of research has explored
the use of computer technologies in education. The role that technology plays in learning, developing social skills, and helping teachers has been researched extensively. However, little has been done to explore teachers’ perceptions of technology use with students with special needs. This research attempts to bridge this gap by interviewing special education teachers in elementary schools in a rural Appalachian county to describe the range of perceptions they have towards technology use with young children with autism.

**Autism: Definition, Prevalence and Characteristics**

Autism spectrum disorder, according to Goldstein, Nglier, Rzepa, and Williams (2012) “is best conceptualized as a biologically determined set of behaviors that occur with varying presentation and severity which is likely the result of varying causes” (p. 1001).

**Prevalence.** Autism is prevalent in the United States and even more prevalent in other countries. According to Zaroff and Uhm (2012), 86-91 out of every 10,000 individuals are diagnosed with autism in the United States. The numbers are even higher in the United Kingdom where 157 out of 10,000 individuals are diagnosed with the disorder (p. 395). Laan, Ingram, and Glidden (2013) have reported statistics showing a large increase in the rates of cases of autism. These researchers report numbers from the Centers of Disease Control which show that the number of individuals with autism has risen from “1 in 150 children in 200 to 1 in 88 children in 2008” (p. 51). These statistics show that the disorder is one of the most common developmental disorders in the United States.

**Characteristics.** Individuals with autism display different characteristics depending on the severity of their case. In their book, Webber and Scheuermann argue
that those with a severe case of autism can experience “communication and language deficits, cognitive disorders, social deficits, sensory processing deficits, and stereotyped behavior” (p. 3). Symptoms are usually displayed after 3 years of age and can appear as early as 12 to 18 months of age (p. 3). Those challenged with language deficits tend to display a “lack of motivation to communication and preservation” (p. 3). The problem with language affects cognitive development as well. Because of the cognitive challenges, individuals with autism are characterized as having “here-and-now thinking” (p. 2).

Computer Use and Social Interaction

This section examines studies that focus on the role technology plays in improving the social interaction skills of students with autism. The literature also provides insights into the role of computers, specifically in the case of social stories to improve learning.

Jacklin and Farr (2005) conducted a qualitative study to examine computer use as a way to promote social skills of students diagnosed with autism spectrum disorders (ASD). The study had two phases “an initial observational period which involved 12 pupils and a main (case study) phase, which focused on the three pupils” (p. 203). After the observational phase, “informal semi-structured interviews, especially aimed at following up the observational data, were carried out with the teachers and teaching assistants who worked with the three case study pupils” (p. 204). The three case studies were meant to provide in-depth insights on students’ interactions with computers as well as with other peers (p. 204). The researcher interviewed the teachers working with these
students to obtain their views on the pupils’ interaction with computer and its usefulness in enhancing social skills.

The three teachers described the computer as “valuable” in the classroom (Jacklin & Farr, 2005, p. 208). One teacher pointed out that working with computers reduces stress by “not having the extra demands of the human-to-human contact” and can “enhance social interaction when used in a well-defined, individualized way” (p. 208). Another teacher explained how the value of the computer lies in its ability to “provide a visual impact on what they are learning” (p. 208). According to one teacher, using computers with students diagnosed with ASD “could really help enhance social skills and it was particularly useful for developing turn taking, either with the computer, or with an adult or another pupil working on the computer” (p. 208). The researchers concluded that using computers with students diagnosed with ASD makes interaction between these children and adults “more apparent, engaging and positive” (p. 209). Computers are particularly useful, according to the researchers, when “the adult followed the child’s lead, this was more likely to lead to more sustained and positive social engagement” (p. 209). Overall, the use of computer technologies was found to be useful in enhancing students’ social skills.

**Social stories.** Gray and Gerand (1993) define social stories as “short stories that describe social situations in terms of relevant social cues and often define appropriate responses” (p. 1). For these researchers, social stories have proven beneficial in terms of autistic enhancing the responses of individuals with autism's responses in social interactions.
The use of computers as a way to use social stories with students with autism has also been explored. More (2008) examined the use of digital media to help in the creation and execution of social stories. More argued that “because the stories are individualized, they can be tailored to meet the needs of each learner” (p. 170). The implementation of social stories is also easy because of digital media, as it is an “efficient and flexible method to create stories to teach social skills” (p. 171). More also found that digital stories are flexible which allows for writing about different situations. This flexibility allows instructors to focus social stories on specific target behaviors (p. 172). More also added that involving students in the creation of social stories, allows them to be more engaged, aiding in the generalization of specific social skills for individual students.

In addition to assisting in the development of social skills, computer technologies have also been used to implement social stories in order to improve students’ communication skills. Xin and Sutman (2011) explored two teachers’ use of smart boards to present social stories in order to teach two students communication skills. Their goal was to “make it possible for children with ASD to more easily observe, imitate, review, and practice each desired appropriate behavior” (p. 21). The teachers first observed their students to determine the specific behaviors that required intervention, and then designed an appropriate social story to address that behavior. After using computers and self-modeling to involve the students, the teachers presented social stories on the smart board prompting the students to engage with the story through touching the smart board. Xin and Sutman found this activity helped “students to learn and develop the desired skill” (p. 22) and indicate that the use of social stories on smart boards provides “information regarding social needs for children with ASD to learn social skills and to
increase communicative interaction with their environment” (p. 23). The use of computers (smart boards) in the presentation of social stories was also found to increase students’ motivation.

The use of computer technologies to promote social skills has received much attention. Using computers to implement social stories has also been found to be useful. Computer technologies make the implementation of social stories easy to accomplish and are effective in improving students’ social and communicative skills.

**Special Education Teachers and Assistive Technology**

Gentry (1991) defines instructional technology as “the systematic application of strategies and techniques derived from behavior and physical sciences concepts and other knowledge to the solution of instructional problems” (p. 7). This definition is broad enough to include all the varieties of technologies that instructors can use to enhance instructional experiences and facilitate learning. Gentry, however, believes that it is important to pay attention to the “message design, message delivery, and evaluation” (p. 7). It is also equally important according to Gentry, to realize that strategies relevant to certain technologies could also be used with others. The professional, however, “must internalize the idea that the selection of technology depends on both purpose and values. Some strategies and techniques are superior to others and should be chosen on that basis” (Gentry, 1991, p. 8).

Researchers have also explored the benefits of assistive technology. To test the impact of the use of instructional technology on students’ educational attainment, Atta, Jamil, Ali, Ayaz, and Bashir (2013) conducted a comparative study of elementary students in their 8th class. The participants included 30 males and 30 females. The two
groups were split into an experimental group and a control group (p. 52) using a pre-test. The post-test was conducted after a period of a month. The researchers sought to understand whether the use of technological aids influences educational attainment. Projected aids included “computer progress slides, CD’s, transparencies, multimedia, projectors and other technologies” (p. 52). The findings showed that the experimental groups whether males or females, benefited from the use of projected aids affecting their educational attainment (p. 53-54).

Other scholars focused their attention on the use of videos to teach vocabulary. Lin and Tseng (2012) compared the use of videos to the use of pictures in teaching vocabulary to English language learners. Eighty-eight junior high Taiwanese students participated in this study. The researchers conducted a pre-test, a post-test, and a delayed post-test in this study. They primarily examined the use of videos and pictures in annotations that are used to help explain new vocabulary words to students. None of the participants had prior experience with learning vocabulary through annotations (p. 348). Using a passage with 417 words, the researchers included 10 targets words that the participants had no prior exposure to and used picture and video annotations to explain these words. When clicking on an unfamiliar word, the students saw the definition in the student's native language and a picture/ a video to help explain it (p. 348). The findings showed that the use of videos in annotations was useful for teaching new vocabulary through embedding annotations (p. 351). The researcher attributed this to the videos’ capabilities of representing “form-meaning connections” (p. 351).

**Teachers’ use of technology to improve student learning.** This section focuses on studies that examine teachers’ use of technological tools to improve performance and
enhance the learning experience for students with autism. Hess, Morrier, Heflin, and Ivey (2008) surveyed “249 special education directors and autism consultants/autism specialists in 159 counties, representing all school districts in the State of Georgia” (p. 963). The purpose of the study was to identify the different strategies teachers in the state of Georgia use with students identified with autism (p. 962). The researchers attempted to determine whether the strategies teachers used were effective. Their findings indicated that less than 10% of the strategies for students diagnosed with ASD, used in the public schools in Georgia had a scientific base. In their view, the study was useful in helping gain some insight into the different strategies that teachers implement with their students with autism looking at the different treatments that have been implemented without scientific support. (p. 962). The researchers argue that educators have a tendency to utilize strategies well before they have been evaluated and have demonstrated their effectiveness. That being said, the study shows that special education professionals are willing to try new strategies with their students, which is a useful finding for the present study as it is designed to explore teachers’ attitudes towards the use of technology for students diagnosed with autism.

The use of iPad with students with autism has also received some attention. In their study, Flores, Musgrove, Renner, Hinton, Strozier, Franklin, and Hil (2010) compared the use of iPads in communication systems to one that used pictures. (p. 74). The participants in this study were five elementary school children. The study was conducted during the students’ snack session. In these sessions, the teachers did an activity that lasted 15 seconds (p. 78). The teacher asked students to point out the type of food they wanted and gave them five seconds. If the students responded in this time
frame using a picture or an iPad, they received the requested item. If not, the teacher moved to another student. For the last 10 minutes, students were able to make requests for food without any limits. The iPads had pictures of the snacks, and students could also use traditional pictures to request the foods. The study primarily wanted to determine students' preferred method for making requests among these students with autism. The findings showed that while the results were mixed, students communicated more when using the iPad (p. 81).

In another study, Alves, Marques, Queiros, and Orvalho (2013) investigated the use of an iPad app for LIFEisGAME in order to determine its impact on the facial and emotional cognition skills of students with autism (p. 191). Working with 11 children, the researcher allowed these individuals to play the game for a period of 15 minutes and recorded the game sessions. The participants' parents were asked to answer a questionnaire regarding their use of technology and their child's expressive facial expressions (p. 201). The findings showed that “all participants enjoyed the prototype game and used the 15 minute of play time” (p. 202). Not only did the iPad motivate students, but the researcher found that it was “intuitive to start and navigate the game” (p. 203).

**Teachers’ use of technology to improve practice.** Other studies have explored educational caregivers’ use of technology. Lowdermilk, Martinez, Pecina, Beccera, and Lowdermilk (2012) examined the use of educational games in providing “parents and caregivers with an opportunity to learn and practice reinforcing skills for behavior they want to see increase, and to use extinction techniques to reduce rates of behavior they would like to see decrease” (p. 30). In a study focusing on the intervention, *Behavior*
Breakthroughs, a game designed to teach appropriate behavior management techniques to individuals who work with children with autism, researchers gave a pre and post-game survey to 89 undergraduate students who played this game to determine its impact on their knowledge of behavior management. In playing this game, the participants worked with a virtual child (named Asa) with severe behavior problems. The researchers found that “participants’ recommendations for Asa were more significantly in line with the consulting BCBAs’ recommendations” (p. 33). While the pre survey showed that participants were more likely to ask Asa about what is wrong following an undesirable behavior, the post survey showed that more participants focused on trying to protect Asa from hurting herself instead of focusing on the behavior. The researchers extolled the potential of these educational games because they provide caregivers and teachers an opportunity “to hone their skills working with a digital child exhibiting challenging behavior without harming the actual child” (p. 34).

While the previous scholars looked at the impact of the educator’s use of technology on the educational experience, other scholars have examined the use of technology to enhance teachers’ performance. Nepo (2010) examined the effect of technology on the performance of teachers who worked with students with autism. Using Bluetooth technology, the researchers collected data from 26 to 34 teachers. Bluetooth, according to Nepo, reduced the reactivity that can result from the presence of an actual supervisor and reduced the financial cost (p. 138).

Other scholars have addressed the use of technology to improve teachers’ performance by looking at the use of teleconferencing to provide feedback. Machalicek, O’Reilly, Rispoli, Davis, Lang, Franco, and Chan (2010) examine the use of video
teleconferencing in providing teachers with feedback. Observing six teachers dealing
with students’ inappropriate behaviors, the researchers evaluated the use of video
teleconferencing in providing feedback. After watching teachers handle a behavior, the
supervisor would provide real time feedback via video teleconferencing. Their findings
suggest that video teleconferencing “may provide university supervisors with an effective
way to provide instruction and feedback to teachers without being physically present” (p. 212)

Technology has also made it easier for teachers to share information with their
professional networks. To examine this aspect of technology use, Kilham (2009)
explored teachers’ use of wikis as a means to share information. Ten postgraduate
students enrolled in a master’s program in Australia responded positively to the use of a
Wiki. They did not only find it flexible, but also their use of a Wiki helped them “develop
a community of practice- that is, a group who share a common interest and engage in
collaborative learning” (p. 124).

**Computers and Learning**

The use of computer technologies to enhance the overall learning experience has
received some attention. Specifically, scholars have looked at the role that computer
technologies play in the education of students with a variety of disabilities. Moore and
Calvert (200) explored the use of computers in teaching vocabulary to individuals with
autism. Comparing a behavioral program to a software program, the researchers sought to
understand the positive influence the use of computers has on teaching vocabulary.
Fourteen children diagnosed with autism were randomly assigned to the study. The
researchers highlighted the “promise of computer technologies as a supplement to
traditional behavioral techniques in teaching vocabulary to children with autism” (p. 361). They concluded the use of computers is not only cost-effective but also “gains children’s attention, motivate them, and promote their learning of vocabulary” (p. 361).

Other scholars examined the use of technology in teaching language skills. Shane, Laubscher, Schlosser, Flynn, Sorce, and Abramson (2011) provided an insightful framework for exploring alternative communication techniques (p. 1228). After providing a historical account of the different strategies that have been used with individuals with autism, the authors concluded that "learners with ASD have relative natural strengths in visual processing” (p. 1230). The use of technology in teaching language has also proven effective. Using static scene cues has helped “learners understand symbolic meaning of individual symbols and the rules governing their syntactic configurations” (p. 1231). Because of the adaptability of technological tools, the researchers argue that “possibilities exist for the use of technology to effectively support and improve every day communicative exchanges for learners with ASD and their communication partners” (p. 1234).

The use of computers in storytelling has also been explored. Scholars have compared the use of computers for storytelling as compared to a traditional storybook. Armstrong and Hughes (2012) explored the use of computers and storybooks as an intervention to improve students’ reading skills. Five students participated in this study. Students listened to stories and were asked to retell them after they listened to them. The findings demonstrated no major differences between the use of storybooks and stories on computers when it comes to impacting reading skills. The research indicates that both tools can be useful effectively to accomplish similar goals.
Although there is extensive literature on the use of technology with individuals with special needs, a little has been done to explore teachers’ perceptions towards the use of technology. Learning about teachers’ attitudes can provide some insight into how technology is perceived and used to help improve the educational experience. Obviously, positive and negative perceptions towards using technology would impact whether or not teachers use it. Perceived utility would also influence the different types of technologies that the teachers recommend using with autistic individuals. These kinds of theoretical concepts drive this study in an attempt to provide the gap that exists in the literature.

Method

Exploring the literature, it has become apparent that there is little research focused on teachers’ perception and attitudes towards technology for use with individuals with autism. The purpose of this study is to fill that gap by examining teachers’ perceptions towards the use of technological tools to teach autistic students.

Context

For the purpose of this study, interviews were conducted with teachers at two elementary schools in the state of Ohio. The interviews were conducted at the elementary schools where these teachers worked full-time and were conducted over a period of a semester to due to scheduling issues related to cancellations caused by the weather.

Participants

For the purpose of this study, seven special education teachers who teach students with disabilities at two elementary schools in the Appalachian region of the United States were recruited to participate in this study. To take part in this study, the participants were required to have had some experience teaching children identified with autism. All
teachers that were interviewed were currently teaching students with autism except for one. The participants in this study were all female teachers between the ages of 40 and 60 except for one teacher who was in her early 30s.

**Instrument**

Semi-structured interviews were used as the method of data collection for this study. This method was chosen because it allows the researcher flexibility to begin with a standard set of questions, but to be able to probe for additional information during the interview if the researcher determines it is relevant, which is something that could not be accomplished with surveys or questionnaires.

The following researcher-generated interview protocol was developed based on the literature and used to guide the semi-structured interviews:

1. How long have you been teaching?
2. What grade(s) have you taught?
3. How many students have you taught with autism?
4. What are your views regarding the use of technology with students with autism?
5. If you have used technology with students with autism, what specific types of technology have you used? Have they been effective? Why and why not?
6. What specific types of technology would you recommend to others?
7. How does technology impact student learning? (Please give an example)
8. How does technology impact completion of student assignments?
9. How does technology impact student engagement and focus on tasks?
Procedure

Permission was first obtained from the university’s Internal Review Board (IRB) for the use of human subjects. Permission to contact the local teachers was gained from school district administrators. After administration permission was granted, the researcher personally went to each of the schools to explain the study and invite potential participants to participate in the study. At that point, the process of conducting data was begun. The researcher went to each school and talked to the participants about the study and asked about their availability. After determining instructors’ schedules, the researcher met them individually to conduct the interviews. The interviewers took place at the institutions where the participants worked. The time for the interviewers lasted between 15 to 20 minutes.

An audio recorder was used to record the interviews to ensure participants’ responses were accurately captured. At the end of each interview, the researcher carefully transcribed the interview while the information was still fresh.

Data Analysis

All interview transcripts were read through repeatedly and the researcher began the coding process to determine common themes among the responses. The researcher relied on Corbin on Strauss's understanding of how to code and analyze data. Corbin and Strauss (1998) argue for the importance of starting by looking at individual cases in order to “open up our minds to the range of possible meanings, properties, dimensions, and relationships inherent in any bit of data” (p. 88). Through doing this, researchers are able to see the similarities between the following cases and are sensitive towards the new things that can be learned from the following cases (p. 88). The researcher started by
looking at one case and read it extensively multiple times, and then moved to the other cases looking at the similarities and the differences. This type of comparison allowed the researcher to understand the cases better. This theoretical coding, according to Strauss and Corbin, is a form of coding on “the basis of concepts and how they vary according to their properties and dimensions” (p. 88).

The researcher mainly relied on close-in and far-out comparison looking at “opposite or extremes to bring out significant properties” (p. 94). In doing this kind of comparison, according to Corbin and Strauss (1998), we more interested primarily in how a concept/phenomenon emerges and not in the number of people who believe in it (p. 95). During the open coding, according to these scholars, data ought to be broken into small and discrete parts that are then examined looking at the similarities and the differences.

Axial coding was also useful in the analysis. This strategy was employed to reassemble the findings from the data looking at “the nature of relationship among the various categories and subcategories” (Strauss & Corbin, 1998). Using memos was also helpful in discovering the different categories. The researcher recorded what the participants said about the use of technology and highlighted significant words, which helped in the search for broader categories that encompassed the different concepts. After similarities were established between the concepts, the researcher named the different categories.

Using thematic analysis, the researcher was able to identify common threads and determine the similarities and differences in participants’ perceptions towards the use of technology with students diagnosed with autism.
Results

The data was analyzed using a thematic analysis. The results are presented in the sections below. The participants were numbered to distinguish between their answers and were labeled P1 to P7.

Demographic Data

Participant 1. Participant one had been teaching grades kindergarten through sixth for 18 years. During that time, the teacher reported teaching eight students diagnosed with autism. Interestingly, the teacher indicated being against the use of technology for these students.

Participant 2. Participant two had been teaching for 14 years. During these years, the participant taught 3rd and 6th grade students. This participant reported having taught eight to 10 students with autism and was in favor of using technology for students with autism.

Participant 3. Participant three had been teaching for 34 years. In these years, the participant reported teaching infant and preschoolers. Participant 3 reported teaching 20 students with autism over the years and was in favor of using technology.

Participant 4. Participant four had been teaching for 37 years. During these years, the participant reported teaching Kindergarten through 12th grade. This participant worked with 15 students diagnosed with autism and was in favor of using technology with them.
**Participant 5.** Participant five had been teaching for 19 years. During this time, the participant taught kindergarten to 6th grade and worked with eight students diagnosed with autism. This participant was supportive of the use of technology.

**Participant 6.** Participant six had been teaching for 3 years. In these three years, the participant reported teaching preschool and elementary students. During the three years teaching, this participant worked with three students with autism and was in favor of using technology with them.

**Participant 7.** Participant seven had been teaching for seven years. During this time, the participant reported teaching kindergarten to 2nd grade students and worked with 20 students diagnosed with autism. This teacher was also supportive of the use of technology.

The results indicate that all participants had experience working with individuals with autism. This experience ranged from three to 37 years. Five (more than half of the participants) had over 14 years of experience working with students with autism. Four participants had over 18 years of experience, and two had more than three years. Participants also had a wide range of expertise in terms of age/grade levels taught. Grade levels ranged from infant to 12th grade. Six of the participants did not teach students above 6th grade. Six of the seven participants taught at least eight students with autism in their teaching career, and one participant taught three students.

**Qualitative Responses**

**Types of technology used.** In terms of their views regarding the use of technology, six of the seven participants were in favor of technology use. Only six used technology in the classroom while one declared that she never uses the computer in her
classroom. The results also show these instructors use a variety of technological tools. The instructors reported the use of computers, iPads, visual timers, smart boards, flashcards, books, and apps.

Six of the instructors used computers, and four used iPads. Five used smart boards, and four used flashcards/pictures. Three participants reported using educational games, and two reported the use of visual timers. Two stated they use apps. P1 was consistent with her views reporting that she only used books in her classroom.

**Recommended technology.** In response to the question regarding what technology tools teachers would recommend, participants recommended the use of a wide variety of technological tools. Two recommended the use of apps, and two others encouraged the use of smart boards. Three recommended the use of computers, and three recommended the use of iPads. Four instructors recommended the use of cards, and four recommended the use of pictures. Finally, one recommended the use of a communication device.

**Impact on Student Learning**

**Academic impact.** In response to a question asking about the impact of technology on learning, few categories emerged. It became clear from the instructors’ responses that technology positively influenced self-expression. This resulted in technology improving students' writing and communication skills. Two of the respondents highlighted the importance of technology for improving students' writing abilities, and one respondent pointed out its importance in improving their communication in general.
Another category that emerged was students’ motivation. Technology, as pointed out by three of the participants, increased students’ engagement and focus. Two of the respondents reported using technology leads to boosting students’ motivation while one respondent highlighted the importance of using technology to help them focus as well. The use of technology also was reported to help with students’ engagement with classroom materials. Using technology was reported to have an impact on students’ comprehension, understanding, and participation in classroom activities. The researcher also identified smaller sub-categories from participant responses. Technology was reported to help improve the learning of skills such as note taking and keyboarding. Respondents also pointed out the importance of using technology to help with different learning styles. One of the instructors pointed out the importance of incorporating technology to help with visual learning.

The respondents had positive views regarding the use of technology to impact students' learning. Different categories emerged from instructors’ responses. Two instructors spoke of the role technology can play in providing students with alternative tools to express themselves and answer questions. Students, as one of the respondents put it, “do not need to verbalize their answers. They can simply use pictures or click and point techniques to answer questions.”

The respondents had positive views regarding the use of technology to impact students' learning. Different categories emerged from instructors’ responses. Two instructors spoke of the role technology can play in providing students with alternative tools to express themselves and answer questions. Students, as one of the respondents put
it, do not need to “verbalize” their answers. They can simply use pictures or click and point techniques to answer questions.

**Accessibility and independence.** Technology can also be used according to one of the participants as a reward. Convenience was also a category that emerged as response. Three of the respondents highlighted how technology is accessible, fast, facilitates assessment, and encourages independence. Technology's accessibility and utility was made clear by one of the instructors. Technology, as she pointed out, is the “new backpack.”

Additionally, participants elaborated on the importance of using technology to engage parents in the child’s learning experience. Technology, in the form of email, can be used to send extra materials to parents to help with the child’s homework. Another category that emerged is the ability of technological tools to ensure better quality work.

**Focus on task.** In response to a question asking about the importance of technology in helping with task completion, three categories emerged. Technology was seen as a useful tool in accommodating learning styles. It was also pointed out that technology helps with students’ motivation through encouraging engagement and focus on tasks. Related to this category is the fact that technology is interesting to children and grabs their attention, which aids in task completion. Technology also provides alternatives for going about the task, which also facilitate task completion.

**Discussion**

The purpose of this study was to examine teachers’ attitudes toward using technology with students diagnosed with autism. The results showed that despite the length of their experience-teaching individuals with special needs, teachers were mostly
in favor of using technology with their students. Interestingly, despite their positive views towards the use of technology in the classroom, teachers reported the use of different technologies. High-tech technologies were used by most of the participants. All of the participants who were in favor of using technologies used computers in their classrooms. More than half of the participants (four) used iPads in their teaching, and five reported using smart boards. Using high-tech technologies was more common than using low-tech technologies. Only three participants reported using educational games, and two others stated they use visual timers.

In their recommendations, the teachers provided answers that differed to some extent from their actual practice. Although six of them used computers in their classrooms, only three participants recommended using them. Four participants used iPads in their classroom, but only three recommend using them in their classrooms. Teachers’ use of iPad suggests that they see its potential in improving students’ learning experience. Recommending the use of an iPad with individuals diagnosed with autism is consistent with previous findings. Flores (2010) found that using an iPad with children with autism helped them communicate more effectively, while Alves, Marques, Queiros, and Orvalho (2013) found the iPad motivated children to engage with the materials.

Interestingly, participants recommended using low-tech tools that they did not report using in their own classrooms. Four of the instructors recommended using cards even though they did not use them in their classroom. This may suggest that special education professionals still find certain tools useful even when they do not implement them in their own teaching.
The data also showed that technology has a positive impact on students’ self-expression, motivation, and engagement with classroom materials. As reported by two of the instructors, using technology positively influences students’ ability to express themselves through improved writing skills. Engagement with classroom materials is enhanced through using technological tools in the classroom and teachers reported that using technologies improves students’ comprehension and participation in classroom activities. The findings suggest the importance of incorporating technological tools to make class materials more interesting in an effort to engage students.

Using technology was found to be useful in terms of facilitating task completion. Because of their flexibility, technological tools accommodate different learning styles. These findings are consistent with findings reported by Moore (2008). In his study, he found the flexibility of technological tools makes it possible to create social stories that fit different learning needs. Participants also reported that technology use provides alternative ways of addressing the task making it easier for students to complete their tasks. As P2 pointed out, technology can “help students that have difficulty with writing (or do not like to write) with their frustration levels by giving them an alternative way to express their ideas/answers.”

Because of its ability to provide students with alternative ways of completing tasks, technology incorporation is crucial not only for students with different learning styles, but also those with special needs. The convenience of technology use is greatly crucial for task completion. Technology makes it easier for students to finish their tasks in a timely manner and with independence, and it makes it easier for the teacher to provide useful and timely feedback.
Technology was found to assist students with task completion through its ability by accommodating different learning styles, providing alternatives ways of going about the task, and boosting students' motivation. These findings were consistent with the earlier findings regarding the role technology plays in impacting task completion. The role technology plays in improving students’ motivation has been established as Xin and Sutman (2011) found the use of smart boards in implementing social stories as motivating for students. Calvert (200) also found that using computer technologies with students with autism is not only cost-effective but also motives them to learn.

This study is significant in terms of its ability to provide useful insights into how teachers perceive technology use and the difference between the tools they use and those they recommend. Unlike the literature cited earlier, this study points out the importance of using technologies to provide alternative methods to influence task completion.

**Implications**

The findings in this study show that sample of special education teachers in this study are incorporating technologies in their classrooms. Low and high-tech technologies are being used to help enhance the educational experience. The instructors pointed out many benefits to the use of technology in the classroom. These benefits include the ability of technological tools to enhance students’ motivation and allow for students engagement with the materials. Six of the seven participants also recommend the use of technology in the classroom. One of the implications of these findings is that school administration needs to ensure teachers are provided with the tools they need to achieve the desired outcomes that result from technology use. Although teachers are comfortable with using technology, only four of the instructors reported using an iPad as an
instructional tool. As new technologies appear, administrators may want to make sure their teachers are provided with the opportunity to receive training on how to use these new tools to ensure their integration into the school curricula.

Because of the ability of technological tools to engage students and provide alternative methods for learning and self-expression, students with special needs can benefit greatly from them. Technology allows students to respond to questions without the need to verbalize their answers, which is useful for those who experience difficulty with communication. The benefits of technology ought to be further explored to ensure that students are able to participate and actively take part in the lesson.

**Limitations**

Although the current study provides useful insights into teachers’ perceptions towards the use of technology, there are some limitations. A bigger sample size would have provided better insights into the different tools that are used by special education teachers. Because only two schools participated in this study, it would have been useful to interview instructors from more schools to see if there are differences in the types of tools that are used. Differences across grade levels would also be useful to explore to determine if the type of technology use differs by age of the students.

Although instructors use a variety of technological tools, it would be useful to find out the factors that influence their choices by asking instructors to comment on the pedagogical basis for their choices.

Time was also a problem. It was difficult to schedule appointments with the participants, and interviews had to be canceled many times due to the weather. These
cancellations may have affected the interviews. It was also difficult to interview the teachers outside their workplace, which may have affected their responses.

Future research should examine the different factors that influence teachers' choice of technology with a larger sample. Interviewing parents may also be useful to see if parents notice the impact that technology contributes to their children’s learning experience.

**Conclusions**

The purpose of this study was to explore teachers’ perceptions regarding the use of technology with students diagnosed with autism. Conducting semi-structured interviews with seven elementary teachers, a thematic analysis was conducted to sort the results into categories. The findings revealed that most participants hold positive attitudes in regards to technology use in their classrooms.

Using technology was found to be useful in increasing for students' self-expression, engagement with classroom materials, and providing them with alternative ways to complete their tasks. Although the data reveals a positive viewpoint from participants regarding technology use, future research should focus on studying the factors that influence teachers to use specific technological tools over others.
References


