TABLET TECHNOLOGY AND ITS IMPACT ON FAMILIES WITH AUTISTIC CHILDREN

A thesis presented

by

Barbara J. Cataldo

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Acknowledgements

This has been a journey that lasted longer than I expected; seven years to be exact. When I first embarked on what I thought would most certainly be a three-year activity, I soon found myself mired down by work and family demands. During this time, I changed my job and brought my parents home to live with my family. Each day presented a new and unexpected reason for letting my dissertation collect dust on my desk. Then, through a series of events, I chose to retire from my position in order to give more time to my family.

The irony of this travel is my defense took place the day before I retired. Once I made the decision to leave work after more than three decades, I found I was able to focus long enough to complete the research and the writing. However, I would not have completed my journey if not for the assistance of Dr. Karen Medwed Reiss. From the sides lines, she cheered me on even when I was sure I was out of thoughts and words. I am grateful that seven years later she was still there when I ended my journey. I am positive that no other student has been with her as long as I have been. She has lived through my trials and tribulations and stuck by me until I completed the work. I am sure she will miss me. Thank you.

I would be remiss and in not thanking my family for allowing me to steal from them the many hours I needed in order to take classes, write papers, complete research and bring closure to this monumental assignment. My beloved husband who has been by my side for more years than I wish to share, I thank him for being my cheerleader, proofreader, caregiver to our children and my parents, and the love of my life. There is no other like him. Without him, I would have never finished this journey. Now we will have time to do the things we have set aside for the last seven years.
My children, who are both in school, do not understand why I needed to do this; but they will. They are of the belief when school is finished, it is complete. They still are learning we are all life-long learners. I hope I have imparted some of that understanding to them.

My parents were in their eighties when I began this journey. Now they are in their nineties but they have remained on this earth to see me complete my dissertation. This is especially rewarding for my mother who, like myself, is dyslexic. The gift of writing has never come easy to us so I know she is pleased that I saw this to the end.

Lastly, I want to thank Russ and Mort Olin. They are no longer alive but if not for them, I might never have considered a career in special education. They were the founders of the League School along with the Vetsteins in 1966. The private school, originally located in Newton, Massachusetts is now at home in Walpole, Massachusetts where children with autism come from all over the world to learn and be challenged. Their son, Nicky, was one of my friends from the time I was very young. While I did not know he had autism, I knew he couldn’t say many words. I always found a common ground when we were together. My best memory includes swinging on the zip line in the back yard with Mort cheering us on. I only wish Nicky could have had the iPad®; his life might have been so different.
Dedication

To Nicky with love from an old friend
Abstract

The purpose of this case study was to gain an in-depth understanding about tablet technology and its impact on families with autistic children. Families, along with schools, have spent decades seeking optimal methods for teaching children language development and communication skills. Evidence has shown that the earlier a child is taught communication skills, the greater their success as they grow and develop (Prizant and Wetherby, 1993; Wan, Demaine, Zipse, Norton & Schlaug, (2010); Miller, 2008). Peter Mitchell’s (1997) research focused on the Theory of Mind, Mindblindness, False Belief Systems, Mirror Neuron System, and technology. His work offers an explanation why autistic children do not develop communication skills.

Families have invested in expensive communication tools but due to their complexity or lack of reliability were often shelved while more primitive methods of communication were sought (Lee and Wu, 2003). In 2010, the first tablet was mass marketed to an adult clientele. Educators recognized the value of the tablet and immediately found ways to incorporate it into their lessons. An application, Proloquo2Go™, was developed for the tablet making it the most important communication tool for autistic children in the twenty-first century. One family with two autistic children shared their story to help families understand there is hope. The parents addressed their family transformation over the course of six years from the introduction of the tablet until now. The family offered a glimpse of their trials and tribulations as they found their way to improved family dynamics because of increased communication.

*Keywords:* tablet technology, Theory of Mind, Mindblindness, False Belief System, Mirror Neuron System, Proloquo2Go™, communication skills, family dynamics
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Chapter 1: Introduction

Statement of the Problem

Steve Jobs, in a lecture at UCLA in 1983, highlighted that anyone born after 1947 was now a citizen of the computer generation. Jobs elaborated, addressing when the first personal computer was built in 1960, it changed the way we work. He stood at his lectern and said that just as the radio replaced the book and the television replaced the radio, the computer, one day, would replace the television, becoming the single most important medium for communication. Thirty years ago in 1983, he recognized that the technology field was flooded with young entrepreneurs in their early to mid-thirties. Apple® alone had no one employed past the age of thirty-nine. Jobs firmly believed that this was his generation’s time and, moving forward, humans would allow their lives to be dominated by the personal computer. He steadfastly believed that the computer would become the primary way to communicate with others (Brown, 2012).

After much anticipation, the first tablet device, the iPad®, burst onto the technology scene in April, 2010. The public was teased endlessly for weeks concerning the magnitude of this hand-held device; it was released to the public at large in July, just three months after its initial introduction. The concept of a tablet was not new but Apple® created a small screen tool that was multidimensional and the public considered this revolutionary. While popular among all ages, it was particularly attractive to young adults and children. Apple® was the first to market a tablet device, but many manufacturers have followed suit by producing an Android or PC version.

The cost effectiveness of the device combined with its portability made the tablet the number one selling technological device of this emerging technology generation. By October
2013, more than 170 million devices had been sold. For a technology that had never been witnessed prior to its introduction, it proved to be a device that the public found invaluable.

Hand-held tablets have left the public craving for the device along with any accessory to enhance its capability. With marketing focused on adults and especially those in business, the single greatest surprise was its use for children with autism. No matter the age, autistic children immediately adapted to the interactive screen. The portability of the tablet, its ability to carry multiple programs and the ease with which it could be utilized allowed a population of students with autism, who previously were unable to communicate with the world around them, to suddenly gain access.

Technology has long been purported to offer opportunities to lighten the load of individuals choosing to indulge in it. For others technology has served as entertainment as has been witnessed by the number of applications (Apps) that are mere games, then more than 120,000 Apps (Anonymous, 2012). Still, others, such as businessmen, saw technology as providing a competitive edge in the business world. Technology alleviated the cumbersome activity of writing or organizing activities.

Aside from the technological advances that many devices have made to improve the quality of our lives, technology has become an everyday part of our vernacular. Twenty-first century students emerging from college are a generation that has never lived their lives without some technological device in their hands. This generation has conducted their business, whether it pertains to their private life or academic world, via technology. Technology has been recognized as the medium that enhances the lives of the general public. It has also served as a tool to augment learning for the greater population. When technology was first introduced in 1947, it was to increase productivity in the business and science worlds. Designing technology
to improve the quality of life for individuals born with or who developed genetically
altering conditions was not considered among the needs or purposes. The integration of
technology for individuals with special or alternative needs became an official Act of Congress
in 1988, nearly forty years after its introduction. This Assistive Technology Act was designed to
offer individuals with disabilities the opportunity to utilize technology in order to enhance their
daily lives. The Act has been renewed four times since its inception demonstrating its
importance for any American with disabilities (http://nichy.org/laws/ata).

During the twentieth century the general population has accessed both low-tech and high-
tech assistance to improve their daily living. A growing population of individuals with
disabilities, ranging from children to adults, have also required greater assistance to live a full
life within the culture they inhabit. While big business such as Apple® and Dell have continued
developing technological devices that enhance living such as the iPad®, the iTouch®,
Macbook®, Android®, Samsung Gallery® and Dell Inspiron® to name a few, the market for
these devices to increase a disabled person’s access to their world also grew. Companies such as
Dynavox, Mayer-Johnson and Say It! SAM offered technology for individuals to be able to lead
productive, communicative lives, but it came at a cost. The typical price tag of an assistive
technology unit ranged from $7000-$9000, and the cost of insuring such devices added another
$1500, making ownership cost-prohibitive for most families.

Today the iPad® has dominated the tablet market but in the last several years companies
such as Samsung, Dell, Hewlett-Packard and Amazon have all enjoyed a share of the profits.
The benefit of the tablet has been its sleek, light and portable shell combined with the array of
Apps either free or for purchase. The tablet is easy to operate and the number of applications
focused on education made it particularly appealing for the classroom setting. The number of
Apps has exceeded two million, allowing endless opportunities for the tablet user. Conscientious consumers recognized the portability and mobility of the tablet culture. Educators also appreciated the power of the tablet and its potential learning scenarios. As a result, the tablet has been and remains the fastest growing technology tool for the twenty-first century learner (Vilches, 2012).

Educational settings, public and private, have struggled to find effective ways to teach nonverbal students to communicate. The evidence suggested that the sooner an autistic child was taught communication skills, i.e. at the preschool level, the more success they would encounter as they grow (Prizant and Wetherby, 1993; Wan, Demaine, Zipse, Norton & Schlaug, 2010; Miller, 2008). Developmentally, non-verbal autistic children have experienced better success rates at developing speech skills if taught before the age of six, when their brains begin to crystallize (Wan et al., 2010; Charlop and Haymes, 1994). Targeting preschoolers was the optimal time if they were to learn speech and communication skills.

Technology has played a big part in the initiation of communication skills. The types of technology that allowed children to communicate have been diverse and expensive. Children needed to be looked at individually in order to determine what best fits their needs to assist with communication skills. Tools such as the Dynavox and Say It! SAM ran into thousands of dollars. Sometimes these costs were covered by insurance. Despite these steep financial investments, the complexity of the tools caused many to leave the devices in storage while they searched for something more basic (Lee and Wu, 2003). Finding technology tools that would positively impact nonverbal, low-verbal, and even high-verbal students to develop or increase their communication skills was crucial. Both school districts and families sought technology
tools that would be easy to manipulate and offer the autistic child opportunities to enhance their communication abilities.

While affordability has been an issue, time remained most critical for preschoolers. The formation of the brain changes at around age six and learning those same communication skills at a later age is far more difficult (Wan et al., 2010). Combining scientific evidence about the mirror neuron system and the technology tools available today will hopefully result in effective language skill development for nonverbal autistic children. Engaging in meaningful dialogue is a critical aspect of autism. However, even after the brain has crystallized, development takes place but at a slower and less developed pace. Recognizing these differences in the brain development is critical in analyzing the appropriate technology tool.

The autism community found, anecdotally, that children gravitate to the tablet with little or no assistance from educators. No empirical research has existed to explain this phenomenon. Like their typical peers, children and adults with autism find ways to navigate through this flat tablet. With no medical or educational understanding, educators who work with autistic children discovered ways to utilize the tablet, enhancing the communication skills of autistic children, especially those with limited or no skills at all. Dr. Sydney Rice received a grant to study why autistic children were successful with the tablet technology as a means of communication when other forms of communication such as the Dynavox or paper allowed them to make connections with their world (UAMC, 2012). Dr. Rice, like others, noted the typical characteristics of autistic children. These characteristics included poor or no communications skills, prohibiting positive experiences, delayed communication and play skills, and repetitive behaviors that might be observed in children with Obsessive Compulsive Disorder.
Educators, particularly those working with the autism population, found ways to incorporate the tablet into the autistic student’s learning. In 2010, there were just a few Apps designed specifically for autistic students seeking access to a verbal world. Many more now exist, and there are still countless others that help autistic children to participate in the world around them, but have no specific content designed for their needs. The most prominent App in the last several years was Proloquo2Go™. The significant characteristic about this App has been the ability to allow students to communicate with others in their world based on a picture recognition concept. The autistic individual learned relationships between pictures and the spoken word or vocabulary. When the autistic individual desired to communicate, they pointed to the picture, pressed the symbol and it repeated the word. Children learned to string groups of pictures together and created sentences that could be recognized by those around them. The use of Proloquo2Go™ was a game changer for autistic children. Until the introduction of the tablet, other high tech tools utilized by autistic children on a regular basis included the Dynavox, Boardmaker and Say It! SAM. These high-priced items required high maintenance and manpower to produce effective outcomes. The training and constant adjustment to the pictures and vocabulary as well as their physical size was a detriment to the educational process. Parents who invested in these high-priced tools often shelved them due to the complexity of operation and the low return for the individual actually using them (Lee and Wu, 2003).

The ease in which a tablet can be set up, the variety of the Apps available for all kinds of assistance, and the price point for obtaining a device increased the popularity of the tablet in a market that might not otherwise invest in them. Once Proloquo2Go™ entered the App market, the tablet became a low-cost, high-return device that allowed students with autism, particularly those with limited or no verbal capabilities, to share in a world that prior to its invention was
unavailable to them. For example, students who previously were non-participants at recess due to their lack of communication skills, suddenly stepped into the middle of social circles because the tablet created the bridge of communication that had been lacking. Furthermore, unlike the Dynavox and Say It! Sam, tools which were designed for students with special needs, the tablet was a technological tool designed for everyone. Documenting growth and productivity employing qualitative research has been negligible among students with autism as demonstrated by the number of articles available through the peer-reviewed database at Northeastern University. For instance, between 2009-2010, the year the iPad® was released, the number of peer-reviewed articles totaled 133 with 2 articles dedicated to the special education population out of a total of 6,863 articles. One year later, 2011, the number of articles rose to 25,905 with just 953 of them peer-reviewed. When the list was honed for articles specifically focused on the tablet and direct outcomes for students with special needs, the list was further reduced. The number of articles attributed to the tablet that were peer reviewed again were limited to two. In contrast, articles that are not peer-reviewed were more abundant. The lack of documentation indicated that the field of study looking at outcomes generated by the use of the tablet was in its infancy.

The impact of the tablet for students with autism in relation to their families has not been investigated as of yet. The documentation that existed was anecdotal in nature. Newspapers and magazines authored pieces showcasing the emotions of families when utilizing the tablet as a means of communication and the new freedoms offered to their children, siblings or others. Sixty Minutes, a news program shown on the CBS network, offered a glimpse into the life of a parent who had a child with autism. USA Today covered another exposé on a family who had a child with Down’s Syndrome and Autism. The mother addressed how the use of this technology
changed their lives without any particular detail. Articles and/or television spotlights have appeared in CNN (5-5-12), CBS (7-15-12), Fox News (3-9-11), NY Times (11-29-11), and 9news St. Louis (9-18-12) to list a few. Assistiveware, the company who developed Proloquo2Go™, allowed for comments on their site. Almost all comments favored the software and described it as life altering in terms of the impact on family dynamics. Conferences such as the 1st International Conference on Innovative Technologies for Autism Spectrum Disorders focused on the autism community and shed light on the apps that work for the purpose of communication, targeting students with limited verbal skills.

This study addressed the problem of practice through a qualitative research project that investigated how a family utilized tablet technology to enhance their autistic child’s ability to communicate with family members as well as their environment outside of the family circle. The study explored in-depth how a family came to use the tablet, at what point they included the device for their child’s daily living, how it changed the family dynamics, and why this particular device met with success unlike many other devices on the market today. Was there one particular reason why the tablet allowed the autistic child to meet with more success than when given other devices such as the Dynavox or Say It! SAM? Were there particular Apps that the family found to be more successful? Interviews with family caregivers offered insight as to how the tablet enhanced the life of the autistic child in the home. In turn, these interviews offered perspective as to how one family’s life was impacted as a result of using a tablet. Evidence gathered from the family was analyzed to gain insight as to the changes that took place in the family circle. The purpose of investigating App usage is to reduce any trial and error that existed when seeking communication solutions for non-verbal autistic children. Lastly, I investigated
the type and quantity of training offered to the family so the tablet could be operated with a
seamless approach.

Utilizing a case study offered an in-depth examination of a single family that chose to use
the tablet. Looking deeply into a family and the influence the technology had on the family
created a window for examining other families at a later date. The information derived from this
single family will be applicable to the schoolroom as well as in the home because it increased the
communication that enhanced the autistic child’s educational performance.

**Significance of Research Problem**

At birth it has been assumed that children would leave the hospital with their families and
grow in a healthy, typical fashion. However, not all children have been typical at birth. A
percentage of children were born with developmental disabilities that impeded their growth.
Children with autism have been no different except that the disability was not necessarily
recognized at birth. As brought out by Baron-Cohen (1997), many of these children developed
typically and then either stopped developing or even regressed in their development. It was only
when this transformation took place that the diagnosis of autism could be assigned. Even then,
there was no one prescription to assist families, as the characteristics for autism have varied
greatly.

Between birth and three, the family has been the sole provider ensuring autistic children
received the appropriate services. Hospitals and other organizations offered systematic support,
but many of these programs have come at great financial cost. Early Intervention (EI) has
offered the greatest variety of programs for families but the hours and locations limit access for
many families, especially those where the parent(s) were working. Still, it was incumbent upon
the family to search out all possible solutions for their autistic child. Primary care physicians
have been one source for help but the specialist who diagnoses the child served as a source of information.

After age three, children with autism have entered the public school system through the preschool services. They have come with recommendations from Early Intervention (EI) and, generally, had their first Individualized Education Plan (IEP) established at the entry meeting. It was here that the autistic child’s family began the road of a formalized education that would take the child through age twenty-two in most states, but as old as twenty-six in a few. Moving forward, the family relationship that has been evolving since the child’s diagnosis has taken on a more formalized approach as the communication between home and school influenced the family dynamics.

Teaching children with autism to communicate has been the primary goal of their education. The purpose of assistive technology tools has been to create a bridge between the child’s language world and their environment. The tools were meant to help them develop this language, not necessarily through verbal utterances but by allowing them to make meaning in their world. The ability to develop and increase speech has been the ultimate goal. The technology appeared to be the means by which they met with success.

Schools have been considered the bedrock of education because foundational skills around language arts and math were initiated and developed. Language, the very means by which all humans communicate, began at birth and continued into the educational realm. However, autistic children, especially non-verbal, were already disadvantaged by the time they entered school. Parents had already spent half a decade contending with ways to develop effective communication. Often, these attempts left families overwrought and frustrated by the lack of progress. Families turned to the schools as the last bastion of hope to find ways to teach
non-verbal students to communicate. Parents sought even the most rudimentary means or methods to communicate with their child and to assist them with ways to negotiate their world.

Today’s public schools typically have not been equipped to focus strictly on speech and language skills related to dialogue and discourse. The older a child with autism, the more difficult it has been to teach the child language skills that allow them to communicate. It has been particularly difficult if the child is non-verbal. Standard equipment and technology tools offered some respite for students but the complexity of the equipment often left the families of these children exasperated. Equipment was shelved in favor of more simplistic approaches of communication such as picture cards and hand cues (Lee and Wu, 2003). This has not been just a local issue but a national one that encompassed schools, the health industry, insurance companies, not to mention the multitudes of families that were not able to afford these costly solutions.

There are innumerable apparatuses on the market today to assist autistic students with their communication skills. The effectiveness of these products have been measured on implementation, portability and ease of operation. Sorting out which technology tool offered the greatest learning benefit with the smallest financial investment, emotional outlay and ease of use was important to measure moving forward. All of these factors were relevant when considering the variety of platforms that would need to be employed and the reasons for their implementation.

Little has been written in the context of research in relation to tablet use for autistic students. The limited research and what has occurred did not focus on the impact of the tablet in social and emotional theories. Specifically, Mind Theory played a critical part in the discussion when addressing how and why the tablet has been successful in the communication realm for
autistic students. This was especially compelling when looking at students who were non-verbal and then attempted to communicate within their world once given a tablet. As newspaper articles and short documentaries utilizing the tablet technology have continued to mount, now is the time to study the utilization of the tablet among children with autism in order to hone in on the “why” question.

Finding ways to communicate with children with autism perplexed many educators. Families relied on the educators to offer them methods to relate with their children. Manufacturers created some high technology gadgets that allowed the children to advance their world without direct communication but they were cost prohibitive. While the disability has multiplied faster than the technology kept up, the tablet has appeared to be the one technological device that has created a bridge between families and schools. Minimal documentation and data existed on increased speech and communication. A gap existed in both the quantitative and qualitative research evidence.

**Positionality Statement**

My interest in how the tablet changed family dynamics was the result of my employment as an Assistant Superintendent overseeing special education. The story that unfolded while I was in this position is important to my research because the students I was involved with taught me that learning happens in a variety of places and by multiple parties. The phrase, “It takes a village.” was evident here. It was the story of how I came to this point that made this research the next step for me.

In 2007 I took an administrative position in a central Massachusetts town that was home to a large number of students with autism. The number of students diagnosed with autism outpaced the current statistics, at that time, as presented by the Autism Society of America. In
some instances, parents moved to the district because of the program that had been implemented. The district contracted a world-renowned company to run a program that taught a small number of students but, also, offered families a home component. This was important because these families had stated the stress in the household was enormous. Due to demand as well as cost, it was evident that I needed to create a homegrown program that maintained quality while not sacrificing integrity.

Parents were adamant about participating only in the established program, by-passing the locally developed one. They felt the trust of the district had not been established. Parents feared a loss of home contact; something they believed was essential for them. As the founder of the program, the administration established the criteria we asserted as indispensable without the rhetoric and limitations associated with a contracted program governed by an outside vendor. A pilot program was established at the preschool level and it was decided that social pragmatics was to be the cornerstone for assisting our autistic students. In keeping with the framework for aiding students with language deficits, utilizing the preschool permitted the district to initiate the program with a cohort of students who could move through the grades until they aged out or their needs changed. It was also during that year of the pilot program that I explored how technology could serve as a positive construct in these preschooler’s lives.

Technology had been limited to desktops, laptops and machinery students could strap to their bodies. While there were games and other programming that helped the students with their communication, utilization of Proloquo2Go™ made a true difference that could be seen in their social pragmatic skills. Information about this program began to emerge. Originally, Proloquo2Go™ was a program for the computer but by 2009 it was introduced for the iPhone® and iTouch®. This was the primary program everyone began to search out due to the portability
of the iPhone®. One student’s family had opted to purchase the iPhone® along with the program in order to offer their child an added advantage. Because of this child, the faculty and administration took note of the student’s success. I realized the potential communication in the student’s surroundings was wrapped up in a single demonstration using the iPhone® loaded with Proloquo2Go™.

Multiple classrooms successfully operated during the 2009-2010 school year, and simultaneously I continued to explore technology options. I visited the student using the iPhone® regularly to watch how he communicated with the adults and students when he was in possession of the tool. Additionally, I spoke with the parents about how the iPhone® changed their lifestyle because of its use. Then, in February of 2010, I spotted a commercial for the iPad®. As I watched the commercial, I immediately thought of our many preschoolers who might be able to utilize the forthcoming iPad® even though they could not manipulate an iPhone® due to their lack of dexterity with fine motor skills. I envisioned a classroom of preschoolers able to communicate with each other provided they were all taught to use the iPad®. I contacted representatives from Apple® Computer to discuss my concept.

Unfortunately, I needed to wait several more months before I could actually observe the full capabilities of the iPad® but I continued to plan for its introduction to the classroom. When April arrived the iPad® was released to the public. Its size, portability, and assortment of Apps made it appealing for uses not even intended by its designers. Three months passed before I could order enough iPads® for the classrooms but when able, I obtained forty devices to begin the work of assisting these preschoolers to communicate with other humans. I believed every student, whether diagnosed with autism or not, needed to learn how to use the iPad® in order to create integrated learning experiences.
Two Board Certified Behavior analysts (BCBA) helped to create the structure for implementing the technology. Not only did they need to learn how to use the iPad®, they needed to teach all of the Behavior Assistants. This meant spending many hours outside of the classroom learning how to operate the Apps for the student’s use. Because the technology was so new, even Apple® had difficulty offering us structural assistance. As a group we needed to create the structure and organize the lessons. This took additional weeks to be prepared to introduce the tablet to the students.

Once the students had access to the curriculum, there was a flurry of activity throughout the day. Students used the iPad® to communicate with their peers and teachers. Almost every evening, the Board Certified Behavior Analysts (BCBA) took the iPads® home to program them for the following day.

There were positive results that had not been anticipated. For instance, when the students appeared on the playground, they were the center of attention with their typical peers. Prior to the introduction of the iPad®, the students with autism had attended recess but were relegated to the sidelines when communication became too difficult or the pace was too rapid for the non-verbal students with autism. They sat passively on the side of the play area or played with their behavior assistant and other classmates. Socialization was very limited in these circumstances. However, when they appeared on the playground with their iPad®, typical peers gravitated to them out of curiosity. The autistic students suddenly became the center of attention as they appeared with their iPad® in tow. This provided them with a forum that offered them social acceptance. For the first time, they were no longer participating in side-by-side play. Now they had a means to communicate with their peers, even if for limited periods. The social landscape
evolved over the next few months. Adult intervention was required to ensure their success but students, both autistic and typical, benefitted from the regular interaction.

The multiplicity of uses for the iPad® was not imagined prior to its introduction. However, after its inception, the educational opportunities grew rapidly both through experimentation of the Apps that could be downloaded and regular consultation with the sales force at Apple®. As new Apps were introduced weekly, the opportunities for communication increased tenfold. The iPad® was a dynamic learning instrument that created social opportunities for the students that could not be accessed through any other technology prior to its introduction. Parents took note. Some even bought their own iPads® while others turned to the schools for help. I knew we were attempting to construct something revolutionary because when it was time for the iPad II® release, Apple® came to film our program for their next commercial.

It was from here I thought about the implications for families and how the iPad® had the potential to change their interpersonal dynamics. After careful consideration and many meetings with my BCBAs, it was decided that some of the students would be allowed to take the iPad® home in the evenings, on weekends and vacation periods so they could learn to communicate with their family members. Families needed special sessions with the educators to learn how to use the iPad®.

The success of a take-home program reaffirmed the need to give access to students as many hours a day as possible. The iPad® was programmed for morning routines, evening routines as well as the regular day. Families already had a two-hour monthly meeting woven into their child’s program to discuss their individual progress. This time was used to further understand how to grow a student’s day by utilizing the apps on the iPad®. As more Apps appeared, the faculty found ways to incorporate them into the student’s day. Many families
informally remarked how the use of the iPad® was changing family dynamics. Other than making anecdotal notes in student’s files, nothing was formally recorded or studied.

Market competition and price points offered schools and families a variety of options that did not exist in 2010 when the iPad® was first mass marketed. The options available to families permitted them to make choices that were a good fit for its members as well as for the educational setting. Schools documented progress within the classroom but how the educators documented the impact of the tablet on families had not been established. Understanding the implications, both positive and negative of the tablet, allowed educators to advance to a more integrated level for educating students with autism. When the iPad® was originally released, Apple® could not have envisioned its countless learning opportunities for such a vast audience. The autism community was one of the greatest benefactors. Studying the impact of the tablet on family dynamics furthered our understanding around complex social nuances and relationships. Examining families in their own setting and working directly with parents of students with autism furthered the education community. Ultimately, the goal was to create a seamless integration between home and school that enhanced communication.

**Research Central Questions and Sub-Questions**

The primary questions of my research are: (1) *In what way(s) does assistive technology, specifically the tablet, help non-verbal and low-verbal autistic children negotiate their environments?* (2) *How do their caregivers describe the cognitive and social production in relation to their environment based on the utilization of the tablet?*

Currently, the minimal amount of research has limited use of the iPad®. The majority of newspaper and magazine articles in print are anecdotal in nature or offer stories of families who have had their lives altered by implementing the iPad®. These articles do not have a research
component examining the successes or failures in the family structure. Also, because of the
time these articles went to press, the iPad® was the only tablet on the market at the time. Today,
families and educators have a host of tablets from which to choose.

One particular characteristic of the child with autism is his/her inability to communicate with other humans through verbal dialogue. The literature that exists recognizes that the tablet helps children negotiate their surroundings and make meaning with people but then fails to cite any causes or suppositions as to why or how the technology assists the child with autism. Additionally, we can learn from the direct caregivers who must help their offspring to continue to grow and develop in a complex technologically based world.

Studying families and the impact the tablet has on the child with autism will, hopefully, create a framework for them as well as schools who work with autistic children. Thus far, it has been a trial and error process between families and educational institutions expanding techniques and finding Apps to make the tablet work for both parties. Developing common themes among families by digging deeper into why and how the tablet has impacted their lives will create a framework for other families as they enter the school system.

**Theoretical Framework**

The purpose of the research was to frame how family dynamics have changed as a result of employing tablet technology for the child with autism in the household setting. Informal observations and conversations with families who have children with autism suggested the tablet has given the child with autism the opportunity to negotiate his or her world without the requisite communication skills. The importance of this finding recognizes how families of a child with autism have been impacted. In order to develop a context that can contribute to future use, it was important to understand how the theoretical frameworks supported this research.
The theoretical framework was the foundation by which I established my research questions around the use of the tablet and the impact on family dynamics. My focus was concerned with the dynamics around familial relationships and if and how they were altered due to the employment of the tablet. If relationships were altered, understanding the implications through the frameworks was key to understanding the process. The language development of a non-verbal child with autism is different from a typical child. Families needed to learn what modifications must occur in order for the child with autism to successfully negotiate their family structure.

The two theoretical frameworks that defined this study were the Developmental Theory and the Family Systems Theory. Separately, each theory offered insight into how a child develops language, how they grow socially and cognitively in order to negotiate the family structure and the environment outside of their home. The foundation the frameworks described the development of the brain, the development of language within the brain, and how each individual in a family unit was integral to how the family operates as a whole entity. The tablet served as the tool that allowed the student with autism to communicate with his or her family members.

**Developmental Theory**

Piaget, Bruner and Vygotsky all lent purpose to this research through the explanation of cognitive development. Beginning with Piaget and his "stages of development”, logically children who developed typically passed through the initial stage of assimilation and continued until they realized their full development to accommodation. Children learn through seeing and experiencing. The storage of this information allowed them to make application to other social situations that involved language and action based
on the culture that child lived in. Piaget’s work was based, not only in cognitive
development, but in biological maturation. At some point in the child’s development, if
developing typically, they were able to negotiate human interactions that promoted social
integration. Piaget further believed that unless children passed through the stages in a
systematic order, their growth was emotionally and cognitively inhibited.

Piaget’s pre-operational stage covered children ages 2-7 years, the optimal time
when they should be learning communication skills. They were developing an
understanding of their environment and making meaning of the world around them. They
should have been able to store this information in their memory through a “mirror system”.
When this failed, as is seen with young autistic children, they required repeated exposure
to events with no guarantee they would retain the experience and call upon the
information at a later time (Miller, 2011).

Relative to his theory, children with autism were often unsuccessful in their
environment. They were unable to read social cues either through visual or verbal cueing.
Depending on the degree of impairment, their success was measured by how much
information they were able to integrate and then assimilate in their environment. Families
needed to learn how to make meaning in the world of a child with autism in order to have
their most basic needs met. Piaget’s theory of development required certain requisites to
be met in order for meaningful communication to exist.

Bruner’s developmental theory looked at the educational component of the child.
He saw learning as an active process whereby the child made meaning of their
environment based on the situation. The child needed to rely on stored information from
past experiences to make meaning of new ones (Clabaugh, 2009). Brunswick expressed that
children created mental constructs of their experiences through images he labeled as icons. Through development, a child acquired more detailed symbols. As they stored these "icons" they were able to attach meaning to conventional symbols as they occurred (Presno, 1997).

Bruner grounded his thinking in active learning. He believed that when children were presented with active learning situations they connected their prior learning with the new experiences and stored that understanding for the next opportunity. He had three stages to his theory: readiness, spiral organization, and going beyond the information given.

Bruner's theory was specific to an educational setting but the nuances of the theory was critical when measuring a child with autism’s ability to create meaning in their environment. The child still required the same underpinnings as a typical peer in order to meet with success when communicating within the family circle. Family dynamics were impeded when the child must have experiences repeated with no or limited ability to store them for reference. Sometimes a child with autism demonstrated the readiness stage and regressed when future encounters took place. Other times, the child with autism never reached the readiness stage, hampering their ability to communicate anywhere, within the family circle or the classroom.

Vygotsky, the third theorist in the developmental theory family, was interested in the child in relation to the world they lived in. Coined the “Child-in-Activity-in-Cultural-Context”, the child was looked at in their environment in relation to how they interacted and not as separate entities of child and environment (Miller, 2011). He believed that a child's ability to negotiate their social environment within the community was the “essence
of cognition”. In Vygotsky’s world, cognition was a dynamic process and not a static one relying solely on stored information. Utilizing his theory, he linked developmental changes to changes in cognition. The child was an active participant in their space, relying on the culture that consists of shared beliefs, relationships, practices, symbols, etc., they made meaningful connections. Any routine may be considered part of a culture pattern.

The child with autism, generally, did not establish a relationship with their environment. They were not able to comprehend social cues and nuances even in active engagement. They had no or limited stored experiences to rely on. They simply did not engage with the people in their environment. While it may seem egocentric in their development, autistic children did not appear to acquire the cognition necessary to make connections that could be replicated on a consistent basis. The family circle is not able to establish a typical relationship with the child, creating stressful interactions.

**Family Systems Theory**

Family Systems Theory serves as the second and final foundation of my research. There were a number of mental health pioneers who studied this area of behavior but the Murray Bowen Theory best matches my research. Specifically, he examined people’s behavior in groups, especially the family unit. He was particularly focused on the mother-child relationship but looked at triads in family structures. The triad in the family unit consisted of the father, mother and child. Based on a sequence of eight concepts, the family structure was looked at in terms of the child as the center, the nuclear family emotional process, and how the family unit related to society (Bowen, Butler & Bowen, & Kerr, 2013).

Atypical family situations would bring stress to the family unit. This theory was appropriate to include because its roots originated after World War II following soldiers
returning home with what is now classified today as Post-Traumatic Stress Disorder (PTSD). It looked at people’s behavior and emotionality in groups (Rabstenjnek, C.V.). The family unit was the smallest unit that the child could be observed for behavior. Utilizing this theory when working with the parents of a child with autism offered a greater understanding of what happens in the home.

**Summary of Theoretical Frameworks**

The developmental theory and the family systems theory served as the basis for this research in studying how the use of a tablet impacted the family dynamics. Examining how these theories approach development of the brain and language creates a foundation for understanding how the child with autism might view their world. The progression of development, as shown in the research, was not commensurate with a typical peer. Studying a single family offered insight as to how the family dynamics are affirmed or altered based on the development, both cognitively and behaviorally.
Chapter 2: Review of the Literature

The literature review was selected to support the central research questions chosen for this study: In what way(s) does assistive technology, specifically the tablet, help non-verbal and low-verbal autistic children negotiate their environments? And, how do caregivers describe the cognitive and social production in relation to their environment based on the utilization of the tablet? The first section of the literature review focuses on how children's minds develop and their acquisition of language. The next section discusses language development for children with autism. The third section considers the impact technology has on the environment of children with autism and the final section looks at how the family unit is constructed and what drives communication and relationships.

Theory of Mind (ToM) impacts communication skills in the Autism Spectrum Disorder (ASD) child

Key researchers investigating communication acquisition in children with autism, with a specific focus on preschoolers, have been varied in their approach. However, the Theory of Mind offered a framework in terms of how language was developed in the brain. The root of this work is found in the seminal work of Peter Mitchell, a British researcher. His primary work, Introduction to Theory of Mind: Children, Autism and Apes, published in 1997, for which he is most recognized, delved into Theory of Mind. While this is part of the theoretical framework, his pioneering work provided the foundation for all other research related to the Theory of Mind. Mitchell, a lecturer at the University of Birmingham, developed his groundbreaking theory that led to the current research investigating the mirror neuron system (MNS) based on the Theory of Mind (ToM).
Mitchell’s work was quite recent, just fifteen years old originating in 1997, but it provided the basis of the research today investigating language development for non-verbal children with autism with a particular focus on preschoolers. He provided an understanding about the development of the mind and the acquisition of language. His work paralleled that of Charles Darwin in that it has an evolutionary approach to the brain’s adaptation to its environment. Mitchell used the concept of social behavior and how it developed in apes. He then created a framework for the integration of mirrored behavior in humans. Mitchell used a false belief approach to understanding behavior and the concept of mirror imaging for recalling experiences. He referenced this as a state of change. By definition a false belief system is one in which the child made an assumption based on prior experience and knowledge which proved not to be true.

Wimmer and Hartl (1991) suggested that children around the age of three have no true understanding of belief and rely on their existing belief to interpret their environment. While Mitchell postulated that children do not need a specific experience to create a belief system, he recognized that any decision children make was anchored in a belief system.

Much of Mitchell’s research originated in England while most of the implementation took place in North America. The areas of research focused on the Theory of Mind, Mindblindness, False Belief Systems, Mirror Neuron System, and technology. Incorporating the five systems resulted in a complex framework of language development. The primary researchers in this area looked extensively at the relationship between the Theory of Mind and language acquisition (Perra, Williams, Whiten, Fraser, Benzie, & Perret, 2008; Begeer, Malle, Nieuwland & Keyser, 2010; Astington & Jenkins, 1999; and Perner, Frith, Leslie & Leekham, 1989).
Early research highlighted the disturbance in communication in the autistic child’s ability to relate with other humans (Prizant & Wetherby, 1993; Sparrevohn & Howie, 1995). While these children might look like they retreated into their own world, unable to communicate with humans, in reality, they needed to be trained to do so. The severity of their type of autism determined the ease with which they learned to speak or communicate with others.

The mirror neuron system of the brain proved to play a large part in a person’s ability to communicate, manage emotional tuning, and control social interactions. These particular functions were tied to the portion of the brain that houses the mirror neuron system. This is critical because up to 50% of students with autism never developed functional speech (Tager-Flusberg, 1996; Tager-Flusberg, 2000). Even if they developed language, it was compromised and generally reduced to simple labeling (Wan et al., 2010).

Normally, the brain did not crystallize until age five or six. That meant the brain had more plasticity before the age of six and could usually learn or adapt, with assistance, to its environment. Past research suggested that after the age of six the brain was hard wired and adjustments were nearly impossible (Prickett, Pullara, O’Grady & Gordon, 2009). Research now refuted this fact and even suggested that after a child reached the age of six, the brain had the capacity to adapt and learn language; however, it was more difficult (Wan et al. 2010).

The mirror neuron system (MNS) was the portion of the brain that allowed a person to register experiences and store them for future use. Individuals created a type of database that became their belief system. Each time they encountered a new experience, they built upon their MNS by comparing the novel experience to one already in the
database. If they were able to find a similar scenario, they used the stored experience to make a determination. If not, they stored the new experience while evaluating the current one.

Research determined that this was a relationship between perception and action. This relationship was due to the mirror neuron system that reflected and stored the results of perception and action. A child was able to repeat the experience because the predicted outcome had been stored. Early research performed on monkeys looked at predictors in the premotor and parietal cortices and what transpired when an event took place (Rizzolatti & Craighero, 2004; Rizzolatti, Fogassi, & Gallese, 2001). Observations were made between investigating the action by studying the reaction of the neurons through neuroimaging. Once a connection was seen in monkeys, a large body of research was established using humans. A similar relationship occurred between monkeys and humans (Buccino, Vogt, Ritzl, Fink, Zilles, Freund, et al., 2004; Gazzola, Rizzolatti, Wicker, & Keysers, 2007).

Children with Autism Spectrum Disorder (ASD) were unable to tap their mirror neuron system. While research showed it can be intact at birth, somewhere around age three it began to emerge lacking any construction (Mitchell, 2003; Baron-Cohen, 2001). ASD children failed to recognize experiences they encountered even if they were repetitive. This lack of recognition was labeled mindblindness and resulted in a failed mirror neuron system. In this situation the child with ASD existed in the environment unaware of their surroundings and unable to react to events (Baron-Cohen, 1997; Williams, Walter, Gilchrist, Perret, Murray, & Whiten, 2006; Muthukumaraswamy & Singh, 2008.). The mirror neuron system was best understood by studying the origins of the Theory of Mind.
The Theory of Mind referred to the ability to understand another person’s mental state. This encompassed their beliefs, intents and desires, separate from one’s own thoughts, experiences and behaviors. The theory directly impacted how children from infancy onward were able to communicate with others using verbal and non-verbal language. Deficits influence areas such as executive functioning and communication (Petersen, 2005; Baron-Cohen, Leslie, & Frith, 1985; Charman, Baron-Cohen, Swettenham, Baird, Cox & Drew, 2000; Astington & Jenkins, 1999).

Language and the ability to communicate through language was key to understanding the Theory of Mind. The mirror neuron system, located in the various language areas of the brain, played an integral part in children understanding expressive and receptive language skills that were the basis of dialogue and discourse. It has only been in the last decade that researchers have taken a serious look at the implications of the dysfunction of the system as a cause for limited or absent language skills (Dapretto, Davies, Pfeifer, Scott, Bookheimer, & Iacoboni, 2006). Research revealed that a possible link between autism and defects in the mirror neuron system negatively impacted how a child with autism related and communicated with others in the same fashion as a typical child (Perra et al. 2008). The specificity of the mirror neuron system and its dysfunction may have been the basis for understanding why and how some children with autism were able to communicate and why others were not.

The majority of research on the Theory of Mind had been and continued to originate out of Western Europe. Researchers such as Baron-Cohen (2001), Mitchell and O’Keefe (2008), and Frith (2003), focused their studies specifically on children with autism. These studies focused on the mirror neuron system and how it impacted language development.
Research went back about twenty years and the development of the Theory of Mind was best exemplified in Peter Mitchell’s book, “Introduction to Theory of Mind: Children, Autism and Apes” (1997). Looking deeper into the theory and the research surrounding it was pivotal to understanding how the lack of communication skills impacted the child with autism.

Research about technology and its influence on the mirror neuron system was relevant to the discussion. This portion of the research specifically focused on the connections between autism and technology. How technology impacted the mirror neuron system suggested a change in the theory of mind as the layers of the brain were altered (Francis, Mellor, & Frith, 2009).

Lastly, the research investigates how executive functioning and central coherence could impact changes in Theory of Mind (Pellicano, 2010). Social pragmatics was the elementary kernel of evidence that children with autism had difficulty relating to other humans. This returned to the seminal information of Peter Mitchell but capitalized on the findings of Baron-Cohen’s work as one of many researchers. Baron-Cohen (1997) emphasized the plight of the child with autism and their inability to recognize social relationships in their environment. He categorized this behavior as “mindblindness” and attributed it to the Theory of Mind gone wrong. He, along with others, emphasized the role of social pragmatics and how the mirror neuron system interfered with typical outcomes resulting in specific language impairment (Begeer et al. 2010; Marton, Abramoff, & Rosenzweig, 2005; Asington & Jenkins, 1999; Peterson, Garnett, Kelly & Attwood, 2009; Gillott, Furniss & Walter, 2004).
The mirror neuron system stored the experiences or allowed an individual to “mirror” an experience. If children with ASD were able to store information, they might not be able to retrieve it. On the other hand, they might not be able to store it because according to the Theory of Mind, their brain did not allow such action. In that case, the ASD child had nothing to draw upon when they encountered these social experiences in their environment. It was as if they have a void in that portion of the brain that controlled this activity. They existed within their environment but they were not a part of their environment (Mitchell, 1997). This prevented the ASD child from participating in a fashion that was conducive for communication according to the norms of the culture in which the child lived.

According to the research, from birth children learned how to negotiate their environment through trial and error. Based on the Theory of Mind, the mirror neuron system was the determinant for evaluating experiences, storing them for future use, and modifying them due to the nuances of each particular event. Children were born with a mirror neuron system but for ASD students, their system was impaired. Each child was different and these differences were not registered until the child grew and language failed to develop like their typical peers. By the time the child reached age five or six, the mirror neuron system had mostly crystalized and language output had been determined. The next step in the child’s life was to decide the best method for teaching communication skills as well as the level at which the child would be able to communicate with family and friends.

The ASD child can develop communication skills

Communication was the primary deficit with autism. Children with autism lagged in development of language from birth but sometimes it did not become evident until age two
or three (Sparrevoorn & Howie, 1995). Communication was the essence of the
disability and doctors could not explain what caused some children to have the ability to
speak and others to not speak at all. Further, some students spoke but only to themselves
while others recognized the rules of discourse and communicated, but had great difficulty
doing so. Researchers spent many years trying to establish the causes of this difficulty.
While they found some causes, they had no remedies for the deficient communication skills
that students with autism possessed.

Aside from language development that either occurred or failed to emerge, there
were still other cases in which the child with autism developed language and then,
regressed, meaning they lost their capacity to speak (Jones & Campbell, 2010). The
frequency at which this occurred was significantly less; still there was no explanation for it
(Siperstein and Volkmar, 2004; Rogers, 2004). The regression was known to happen
among children who only had single speech capacity but it could be accompanied by a loss
of language comprehension, social skills, and social interest. The problem with language
regressing was the timing. It could take place anytime in the first three years and the loss
of production could be either slow over a course of several months or quick over just a few
weeks (Baird, Charman, Pickles, Chandler, Loucas, Meldrum, et al., 2008). According to the
Center for Disease Control and Prevention (CDC), language regression in autistic children
ranged from 12.5% to 52%.

Regression of language was one setback in the development of a child with autism,
but a second setback took place when a child reached a plateau. In other words, they
stagnated in their language skill acquisition (Rogers, 2004). Not unlike regression, the
child would initially develop language as expected and then they would cease to develop
further. This was less common according to the research and, as a result, there was less information to support any assumptions as to why this took place.

The research was varied on this subject but, not surprisingly, with regression in language skills, the child also demonstrated weaker communicative and adaptive functioning skills. Other areas of impairment that might be exhibited include communication skills, poorer language, poorer adaptive play skills, and poorer social-communicative behavior (Brown and Prelock (1995); Bernabei, Cerquiglini, Cortesi, and D'Ardia (2007); Luyster, Richler, Risi, Hsu, Dawson, and Bernier, et al., (2005)).

Children diagnosed with ASD struggled with some facet of communication and language development. The degree to which a child might be impaired was not predictable at birth nor even at the diagnosis. A child might have demonstrated typical development until about age two and then either plateaued or regressed. In the first instance, the child stopped in their advancement but did not regress. In the second circumstance, the child regressed losing their ability to communicate. To date, there has been no known reason for why this happens and no test to predict which child might be impacted by this developmental change.

The literature has been plentiful when examining language development and communication skills among typical children. For children with various impairments such as developmental disabilities and language disabilities the research was also quite dense. However, the research was minimal when investigating language development and communication skills among children with autism. Rather than examine how children with autism developed language, the relationship between social pragmatics, self-esteem and
language impairment gave insight into how autistic children negotiated their world without the prerequisite skills to communicate.

There was no way to determine which child would develop language but language delays were common among children with ASD. Only 25% of children with autism developed typical language skills (Ganz and Flores, 2009). According to the American Psychiatric Association (2000), the following is a list of deficits that might be seen in children with autism:

- spontaneous language,
- conversational skill deficits,
- delayed grammar usage,
- echolalia, difficulty with social use of communications,
- lack of spoken language, and
- vocabulary development.

Imitation was a means by which all children could learn to communicate because it contributed to more complex socio-communicative skills. However, ASD children struggled with the ability to imitate and this impacted their learning. The body of research stated that imitation was an “early-emerging behavior that played a critical role of more complex social-communicative skills” (Meltzoff & Moore, 1977; Rogers & Pennington, 1991). They may be predictive of vocabulary in children with autism. Stone and Yoder (2001) found that setting controls for initial language level, utilizing imitation skills and reinforcing this with hours of speech therapy helped predict language skills as far as two years out. Other researchers found similar outcomes. These findings suggested that
imitation skills laid the groundwork in the development of spoken language (Ingersoll and Lalonde, 2010).

Social cognition was the foundation for communicating with others. When an individual had a command of social cognition they were able to negotiate social settings. Even when an individual had developed social cognition, unless they had developed the ability to use language, the application of social cognition would not take place rendering the individual helpless. Developing language competency was a critical step in establishing and maintaining relationships. While the lack of relationships may have led to behavior problems for typical students, the same may not be said for students with autism, depending on the degree of their language deficits. (Marton, Abramoff, and Rosenzweig, 2005).

Some researchers such as Locke (1997) believed that for language development to take place, socio-cognitive development must occur first. Still, other researchers believed this is a simultaneous occurrence but specific cognitive abilities must happen prior to this coming together. Areas of language development such as working memory, discrimination information and processing all collectively lent themselves to language development (Leslie, 1987).

The research supports a relationship existed between language development and social cognition. If a child had strong linguistic skills, they would have strong social cognition skills. In contrast, if a child had poor linguistic skills, their social cognitive competence would falter. Early language development was a predictor of socio-cognitive development (Astington & Jenkins, 1995). Again, research showed that language deficits in
autism were connected with socio-cognitive development (Baron-Cohen, Tager-Flusberg, & Cohen, 1993).

The foundation of ASD was a neurodevelopmental disorder. Attributes commonly associated with autism included but were not limited to social interaction, language and motor control. While motor control was not part of the language issues that impeded communication it was worth noting that the disease was not limited to language alone. Muscular deficiencies may also have interfered with daily living. For the sake of this argument, only the social interaction and language remained the focus.

Welsh, Ray, Weeks, Dewey and Elliot (2009) shared the same findings of other researchers that suggested the relationship between socio-cognitive development and language development were interconnected. However, they connected the information back to the mirror neuron system as the center of the breakdown. They believed that when the mirror neuron system failed, the relationship between action and perception could not be established and maintained. The individual with autism would not be able to comprehend another person’s intentions and not respond to their actions. The inherent difficulty with language development manifested itself when the mirror neuron system was damaged or underdeveloped. The autistic child would not learn the critical aspects of language development. The poor development of language skills impeded communication. When this occurred the child was unable to negotiate their environment through typical communication skills.

**Technology and how it improves the environment of the child with autism**

Technology was recognized as a device that enhanced the lives of neuro-typical people. It also served as a tool to augment learning for the greater population. When
technology was first introduced in 1947, it was to increase productivity in the business and science worlds. Designing technology to improve the quality of life for individuals who were not typical due to a variety of medical conditions that prohibited their participation in daily activities was not part of the market strategy. The integration of technology for individuals with special or alternative needs became an official Act of Congress in 1988, nearly forty years after the introduction of technology. This act was designed to offer individuals with disabilities the opportunity to utilize technology in their world in order to enhance their daily living. The Assistive Technology Act has been renewed four times since its inception demonstrating its importance for any American with disabilities (http://nichy.org/laws/ata).

All educational settings, public and private, struggled to find effective ways to teach nonverbal students with autism to communicate. The evidence suggested that the sooner a child with autism was taught communication skills, i.e. at the preschool level, the more success they encountered as they grew (Prizant and Wetherby, 1993; Wan et. al. 2010; Miller, 2008). Developmentally, non-verbal children with autism had better success rates at developing speech skills if taught before the age of six, when their brains begin to crystallize (Wan et. al.; Charlop and Haymes, 1994)). Targeting preschoolers was key if they were to learn speech and communication skills.

Technology was a large contributor in the initiation of communication skills. The types of technology that allowed children to communicate were diverse and expensive. Children needed to be looked at individually to determine what best fit their needs to assist with communication skills. As noted earlier, tools such as the Dynavox and Say It! SAM cost thousands of dollars. Sometimes these costs were covered by insurance. Despite these
steep financial investments, the complexity of the tools caused many to leave the devices in storage while they fended for something more primitive (Lee and Wu, 2003). Finding technology tools that positively impacted nonverbal, low-verbal, and even high-verbal students to develop or increase their communication skills was crucial. Both school districts and families were seeking technology tools that were easy to manipulate and would permit the child to learn to communicate.

Combining scientific evidence about the mirror neuron system and the technology tools available today hopefully resulted in effective language skill development for nonverbal autistic children. Engaging in meaningful dialogue was a critical aspect of autism. However, even after the brain had crystallized, development took place, but at a slower pace. Recognizing these differences in the brain development was critical in analyzing and choosing the appropriate technology tool.

The autism community found, anecdotally, that children gravitated to the tablet without any assistance from educators. No empirical research exists currently to explain this phenomenon but research studies noted students chose the tablet when given the choice. Like their typical peer counterparts, children and adults with autism found ways to navigate this flat tablet. With no medical or educational understanding, educators who work with children with autism discovered ways to utilize the tablet enhancing the communication skills of autistic children, especially those with limited or no skills at all.

Educators, particularly those working with the autism population, found ways to incorporate the tablet into the learning of students with autism. In 2010, there were just a few software applications designed specifically for students with autism seeking access to a verbal world. Many more exist today, and there are still countless others that help autistic
children to participate in the world around them, but have no specific content designed for their needs.

The ease with which a tablet can be set up, the variety of the Apps available for all kinds of assistance, and the price point for obtaining a device has dramatically increased the popularity of tablets in a market that might not otherwise invest in them. Once Proloquo2Go™, a symbol-supported communication app, entered the market, the tablet became a low-cost, high-return device for allowing students with autism, particularly those with limited or no verbal capabilities, to share in a world that prior to its invention was unavailable to them. For example, students who previously might have limited contact in general settings due to their lack of communication skills, suddenly were able to participate because the tablet created a bridge that had been lacking. Furthermore, unlike the Dynavox and Say It! SAM, tools designed specifically for students with special needs, the tablet was a technological tool developed for the general market. However, documenting growth and productivity among students with autism employing qualitative research has been slow to expand. This lack of documentation indicated the field of study looking at outcomes generated by the use of the tablet was still in its infancy.

The impact of the tablet for students with autism in relation to their families was just beginning to emerge (Cardon, 2012; Hayes, Hirano, Marcu, Monibi, Nguyen, & Yeganyan, 2010). Much of the documentation that existed was anecdotal in nature. Newspapers and magazines authored pieces showing how families felt about employing the tablet and the new freedoms offered to their children, siblings or others. Sixty Minutes, a news program shown on the CBS network, offered a glimpse into the life of a parent who had a child with autism. USA Today covered another expose on a family who had a child
with Down’s Syndrome and Autism. The mother addressed how it had changed their lives without any particular detail. Articles and or television spotlights have appeared in CNN (5-5-12), CBS (7-15-12), Fox News (3-9-11), NY Times (11-29-11), and 9news St. Louis (9-18-12) to list a few. Conferences such as the 1st International Conference on Innovative Technologies for Autism Spectrum Disorders were focused on the autism community shedding light on the apps that work for the purpose of communication, targeting students with limited verbal skills.

According to Johnston (2011), the world’s data and information was doubling every two years. It would be difficult to keep up with the explosion of data that continued to face us each day. Exponentially, students with special needs were at a disadvantage in comparison to their typical peers. They needed to find ways to negotiate their world just to meet their daily needs. This was compounded by the needs for typical members of families to continue to grow with the existing technology around them. There was little evidence as to how the use of the tablet for children with autism was impacting family members, the process would continue to be trial and error. Finding commonalities among the families of children with autism would help the field to develop. Because of the unique characteristics of each child diagnosed with autism, the realm of possibilities was limitless.

One study involved the iPad® with a focus on augmentative and alternative communication (AAC). The research investigated the differences between a Picture Exchange Communication System (PECS) and one that was animated on the iPad® (Flores, Musgrove, Renner, Hinton, Strozier, Franklin, & Hil, 2012). The studies that examined the benefits of the iPad® suggested the outcomes for individuals with disabilities were positive. A review conducted by eight researchers from around the world examining five realms of
learning showed the advantages of employing such devices (Kagohara, van der Meer, Ramdoss, O’Rielly, Lancioni, Davis, Rispoli, Lang, Marschik, Sutherland, Green, & Sigafoos, 2013). Even though each piece of research approached the utilization of the tablet from its own lens, the gap in the research presently existed because the tablet had only been on the market for less than five years and both educators and non-educators were constantly discovering new ways to utilize its versatility.

The body of research examining the impact of the tablet and other wireless devices continued to grow. Investigations looking into the functionality of the tablet, specifically, showed positive results for helping students with autism. Ironically, the intent of the tablet was to assist the neuro-typical adult with functionality in their day-to-day operations. However, the tablet proved to assist students with disabilities and allowed them to negotiate their environment in a way not predicted. Students with disabilities due to cognitive, physical and sensory difficulties were limited in their ability to communicate. Past history showed that these students had a unique communication system comprised of pictograms or pictures that allowed them to describe their needs. The most substantial factors impeding these students were perception, memorization and attention (Barkley, Cross, & Major, 2005). Specific activities directed at these areas can help to increase capacity. Through the work of Fernandez-Lopez, Rodriguez-Fortiz, Rodriguez-Almendros, and Martinez-Segura (2013) we were helped to see that when multimedia technologies were included in the work process of students with developmental delays, they demonstrated a greater interest in the task.

The use of augmentative and alternative communication (AAC) strategies was in existence for more than three decades. The purpose of the technology was to offer an
improved life style for individuals with disabilities. But some now believed we were in a paradigm shift in AAC for individuals with autism. This belief was the result of the proliferation of handheld devices on the commercial market that combined with the affordable applications made the use of such devices both acceptable and ubiquitous (Shane, Laubascher, Schlosser, Flynn, Sorce, & Abramson, 2012).

The history behind AAC devices originated from a no-tech nature meaning the devices were man-made with no technology. This manual signing approach required training but had little sophistication. Low-tech devices emerged as a natural progression. The difference was they lacked an integrated circuit and their sole purpose was to enhance communication. The technology ranged from pointing-based or exchange-based approaches, which resulted in the first Picture Exchange Communication System (PECS). The assistance was considered state of the art offering more acceptance of low-tech AAC approaches and allowing the autistic child to have a means to communicate with those around them (Bondy and Frost, 2001).

High-tech AAC devices followed but now the devices included both hardware and software. They were designed with the purpose of enhancing the communication skills of students with autism. They offered synthesized speech mechanisms allowing for two-way communication (Schlosser and Blischak, 2001). These devices expanded the ability to communicate but the equipment was often expensive, bulky and time-consuming to program. Rather than allowing the autistic child to become integrated, in actuality, they were stigmatized.

In the last decade tools have appeared that provided low-cost options geared to the general market. Devices such as the laptop, DVD players, and tablet computers have
generated a consumer-friendly market that has benefited the disabled population in ways never thought of before. Programs such as Proloquo2Go™ and My Talk function as AAC systems. Other programs like Steps, First-Then, and PicCalendar offered opportunities for organization and choice making. The explosion of apps offered a plethora of choices.

Shane et al. (2012) noted that the trend in these AAC devices is that non-technical individuals such as caretakers could program the appliances. Their user-friendly platform made them an easy choice because they offered more meaningful content with greater variability for customizing the programs for each user. This means they were accessible by more individuals than just educators; now caretakers and others would have meaningful interchanges with the autistic child.

In the world of no-tech, low-tech, and high-tech devices, they could best be sorted into the three categories by identifying them as manual signing (MS), picture exchange (PE), and speech generated devices (SGD). Manual signing was labor intensive requiring anyone who used it to have stringent training. It was based on memorization of symbols that were signed to deliver speech. Picture exchange could be utilized through machine made pictures or through high-tech devices that have the various pictures a part of a program. The Speech generating devices were the most complex. They were high-tech devices with hardware and software. They required programing but they could be truly customized for the user. Van der Meer et al. (2012) recognized that students may actually have a preference for using one of these approaches. If they did, their learning might improve. The authors found that when students were given their preferred mode of learning, they did so with faster acquisition and had better retention. This study utilized parents as well as teachers as both served in some teaching capacity. The secondary
finding of the research reaffirmed previous findings that the students were attracted to the SGD versus the other AAC devices. When this occurred their retention was markedly increased.

More research was emerging utilizing the iPad® when teaching students with autism communication skills (Achmadi, Kagohara, van Der Meer, O’Rielly, Lancioni, & Sutherland et. al, 2012; van der Meer, Kagohara, Achmadi, O’Rielly, Lancioni, Sutherland & Sigafoos, 2012; Neely, Rispoli, Carmargo, Davis, & Boles, 2013; and Kagohara, van der Meer, Ramdoss, O’Rielly, Lancioni, Davis, Rispoli, Lang, Marschik, Sutherland, Green, and Sigafoos, 2013). One such use included video imitation training. The level of severity of the child with autism could be directly correlated with the impairment of imitation skills. This was important because increased imitation skills corresponded with increased language development (Stone, Ousley, & Littleford, 1997).

Imitation skills generally had been taught in a static environment. In other words, the student was taught these skills in arrangements driven by the adult in discrete settings (Cardon & Wilcox, 2011). Unfortunately, teaching the child with autism to generalize the skills had been met with limited success. Researchers now recognized that generalization was vastly greater when the imitation skill building took place in naturalistic settings driven by the child’s output (Ingersoll, Lewis & Kroman, 2006).

Video Modeling (VM), another approach to teaching communication skills, had been in existence for many decades. Technology allowed its use to advance more quickly. Research completed by Charlop-Christy et al, (2000) compared VM to live modeling. The researchers found that productivity was higher when employing VM versus live modeling. Autistic children were able to generalize target behaviors after VM. They did not realize
similar results with live modeling. They concluded that VM is a more effective way for teaching behaviors that encompassed play skills, expressive language, and self-help skills. Utilization of the iPad® allowed for an increase in opportunity for VM.

Charlop-Christy et al. (2000) investigated if caregivers could create effective VM on an iPad® in order to facilitate increased imitation gains. They concluded that the caregivers made excellent teachers of VM. Charlop-Christy was not alone in her conclusions. Dawson, Rogers, Munson, Smith, Winter, Greenson, Donaldson & Varley (2010) and Ingersoll & Gergans (2007) also came to similar conclusions. Most importantly, this research supported the use of iPads® in the home environment. Both caretakers and students were motivated.

Technology was a natural link between the environment and the child with autism. The tablet was one device that has offered versatility in assisting students. The portability of the device combined with the versatility of its tasks created a tie between the child with autism and their environment. Furthermore, because the tool was first marketed for a general audience versus a developmentally delayed population, it was automatically accepted among the public. The possibilities along with the capacity of the tablet as a learning tool were boundless. Educators and guardians continued to find new ways to improve communication skills for students with autism.

The impact on the family unit

The Murray Bowen Theory studied behavioral aspects of groups. His original purpose in examining the family was to study post-traumatic stress syndrome (PTSD) of soldiers returning home following World War II. His goal was to analyze behavior and emotionality in groups. His emphasis was on the family unit in which he was particularly
interested in the mother-child relationship. In addition, Dr. Bowen focused on the
triad in the traditional family unit consisting of the father, mother and child. Utilizing eight
concepts of family he studied the interrelationships of the family placing the child at the
center. Positioning the triad at the center, he placed other members around it in concentric
circles. He examined the interrelationships within and between the concentric circles
(Bowen, 1978).

Bowen recognized that behaviors, even those out of the ordinary, drove the
construct of the family unit. When a child with Autism Spectrum Disorder (ASD) was a part
of the family unit, the question might arise as to the impact that child had on the day-to-day
and long-term functioning of the family unit. Not surprisingly, there was a great deal of
research on families of children with ASD and how this diagnosis impacted the family unit
for good or bad.

The quality of life among families with children with ASD was plagued with issues
stemming from the relationships in the family circle. Not only were parents affected but
the siblings of ASD children were also impacted. Rilotta, Kirby, Shearer and Nettlebeck
(2012), Moyson and Roeyers (2012), Schalock (2004), and Gardiner and Iarocci (2012)
have all looked at the Family Quality of Life (FQOL) both for families with typical children
and for families with children with developmental disabilities. FQOL gained importance
more recently as the subject matter began to examine families with children with
developmental disabilities. Family Quality of Life had been researched since the beginning
of the twentieth century. With the onset of society choosing to keep families intact,
including raising children with developmental disabilities versus institutionalizing them,
there was greater interest in the field. Including the family in the Quality of Life was
considered a way to broaden the field so as to encompass these more complex family structures.

According to Schalock, the Quality of Life comprised eight core domains. Each of these domains had indicators that further explain and define the domains. They consisted of emotional well-being, interpersonal relations, material well-being, personal development, physical well-being, self-determination, social inclusion and rights and were thought as the basis for one’s personal well-being. Schalock emphasizes a series of indicators that explained the domains and defined them with specific references to a person’s particular situation. With continued emphasis on providing improved home environments for families caring for children with developmental disabilities, these domains and indicators served as the fundamental structure.

Rillotta et al. 2012, studied the outcomes for families seeking services to improve their family structure. Utilizing the same set of domains and indicators as Schalock, these researchers examined families of children with some type of developmental disability as the service providers. More recently than in previous years, the differentiation between home and school or home and outside services became blurred. Today, increasingly, families were servicing their own developmentally delayed children as opposed to relying on outside venues and vendors to provide opportunities to increase skills and learning. The family environment took on a more substantial role than in previous years when an individual’s environment was the focus. Now the family environment replaced the individual perspective offering a deeper understanding of FQOL (Brown and Brown, 2004).

Simultaneously, while Rillotta et al (2012) recognized the need to study FQOL among families with children that sustained some type of developmental disability, there
was a need to address family satisfaction within the family unit. Browne and Bramston (1996) found that families with and without children with a developmental disability shared the same priorities. However, they also found families that had a child with a developmental disability were less satisfied with their quality of life within the immediate family.

Families who accepted assistance to improve their Family Quality of Life were better able to cope with the difficulties that arose from having a child with a developmental disability. Contemporary researchers found that increased support lowered stress levels and improved the overall FQOL within the family circle (Skok, Harvey & Reddihough (2006); and Davis & Gavidia-Payne (2009).

A theme that emerged among the literature was the impact of the developmentally delayed child on relationships both inside and outside the family circle. Repeatedly, stress in the family circle compromised FQOL. Stress increased when certain behaviors occurred or services were missing. In contrast, stress declined when services were provided that enhanced family dynamics. Gardner et al. found in some instances when children were placed in residential care, only then was stress reduced. Parents were able to offer attention to other areas in their lives such as siblings who remained at home, their spouses and their jobs (Rillotta et al.). Still, the burden placed on families raising an ASD child increased stress in the family circle and caused parents to have a more emotionally onerous experience (Hastings, 2007; Petalas, Hastings Nash, Dowey, & Reilly, 2009).

Parents were not the only ones who experienced stress in the family circle; children, too, were negatively impacted. How siblings were affected is complex and varies according to gender, placement in the birth order, socioeconomic status, personality,
culture, and coping mechanisms to list a few (Giallo & Gavida-Payne, 2006; Gold and McCabe, 2012; Macks and Reeve, 2007; Mascha & Boucher, 2006; Rivers & Stoneman, 2008; Ross & Cuskelly, 2006). Additionally, children of siblings with ASD might be reluctant to share this information with peers for fear of rejection (Petalas et al. 2009). While the researchers concluded there was no finite instrument for measuring outcomes that presents reliable determinants as to the causes for behavior, the quality of life for siblings was more difficult when they had a brother or sister with ASD versus those that did not.

The theme of stress in the family circle impeding the family quality of life was resounding in the literature. Steijn, Oerlemans, van Aken, Buitelaar, and Rommelse, 2014; Rivers and Stoneman, 2003; Smith and Elder, 2010; Hayes and Watson, 2013; and Rao and Beidel, 2009 investigated the impact of stress on the marital relationship. Notations made included increased negative-child interactions, more stringent parenting style, child behavior problems, and inability to consistently execute interventions. Further, the above-mentioned researchers focused on the marital relationships of the parents and consistently found the strain of raising a child with ASD resulted in marital dissatisfaction and reduced intimacy. The stress on the parental relationship fosters itself in poorer adjustment, a proliferation of behavior problems, instability and dysfunction in the family circle.

Families with children with autism found themselves in a quandary. The child with autism created a negative momentum impacting the family quality of life. Marital relationships were strained and this, in turn, affected the entire family. The lack of communication between the parents and the child with autism and siblings created a tense environment that elevated the stress and minimized positive interactions. While some
families were able to institute interventions that reduced the overall stress, the child's lack of communication skills and the family's continual adjustments to meet the needs of the child with autism taxed the overall family quality of life.

The research, thus far, examined the child with autism in the family structure, the technology that may assist the child, the communication skills of the child, and the neurological basis of the autism spectrum disorder through the Theory of Mind. A gap in the literature existed integrating these four areas together. Researchers had not examined how using technology, specifically the tablet, could increase communication in the family circle and, in turn, improve the family quality of life. The research I proposed was to examine how families were impacted when technology was introduced for increasing communication. The hypothesis suggested the quality of life improved because the family relationships were purposeful and meaningful. While family stress, particular among the parents might not disappear; the reduction of marital discord will increase more typical family dynamics and increase family quality of life through improved communication.

Conclusion

The child with autism could be an enigma to families who desperately sought to find ways to be a family unit. When in the mother's womb, no parent imagined their child would be born with autism. Often, it was not until long after the child had left the hospital that parents were made aware their child was not developing typically. While physicians were becoming more skilled at diagnosing autism, finding the cause for the child's lack of development could be a challenge, especially for the unskilled and uninformed parent.

Understanding how the brain developed and looking for cues during the language development cycle could be key to identifying language flaws early enough to seek
appropriate assistance. When a child began to develop language and then retreated into their own world, parents were left guessing what they might have done wrong. In reality, the disruption in communication skills was the malfunction of the mirror neuron system (Mitchell, 1997). The mirror neuron system began to develop and then deconstructed as the child reached around the age of three or it never developed at all (Mitchell, 2003; Baron-Cohen, 2001). Language regression tormented parents of a child with autism. The statistics were staggering in terms of the percentage of children who experience this outcome ranging from 12.5% to 52% according to the CDC. In either situation, the parent(s) are left scrambling for assistance and direction.

Technology was purported to be a vehicle for helping a child with autism to communicate with others. The sooner the child was offered assistance utilizing a technological tool, the better the opportunity for the child to communicate their needs (Prizant and Wetherby, 1993; Miller, 2008). Children younger than age six stood to make the most substantial gains in developing speech if the learning process was established early (Charlop and Haymes, 1994). Past history showed technology had been complex, expensive and difficult to maneuver (Lee and Wu, 2003). The tablet revolutionized how children with autism communicated with other human beings requiring minimal assistance. The use of Proloquo2Go™ revolutionized the pictogram approach to help students with autism to communicate with the world. This sleek hand-held device changed how students communicated and allowed families to be active participants with the child in a way in which they previously needed to be observers.

Families have grappled with ways to embrace their child with autism. The struggles families have contended with today were not terribly different from the ones families
coped with when men returned home from WWII with PTSD. In both situations, the family dynamics were disrupted. The inability of the child with autism to communicate with family members is driving the construct of the family unit (Bowen, 1978). The Quality of Life is infringed upon and all family members are negatively impacted by this; especially the parents (Moyson and Roeyers, 2012; Schalock, 2004; and Gardiner and Iarocci, 2012). The better prepared the family unit was to accept and welcome the child with autism into the inner circle, the better the overall quality (Skok, Harvey and Reddihough, 2006; Davis and Gavidia-Payne, 2009).

Examining how the tablet impacted the family dynamics was essential to understanding what type of supports families needed to be a cohesive unit. In order for this to have meaning, knowing how language developed in the child with autism and how they moved in and out of their environment offered insight into the family dynamics. The goal of communicating with the child with autism was to have a richer environment and improved communication skills reducing stress and increasing pleasure in the family unit.
Chapter 3: Methodology

Every day the family unit has been challenged by confounding factors in the environment. Distractions, commitments and disagreements all created stress and dysfunction among family members. Compounding this structure when one of the family members, in this case, a child with autism, the stress increased exponentially. While the stress increased, family enjoyment decreased as all members worked to negotiate around the child with autism. Finding communication devices, too, that mollified the child with autism and allowed for better communication was the challenge. For practical matters, whatever device, low technology or high technology; as long as it worked, families welcomed it.

The tablet has become a part of the culture world-wide. While originally designed for typical adults to utilize for work and pleasure, tablet technology revolutionized the world. The concept included utilizing the device for educational purposes but did not include how it could transform the autistic child’s ability to communicate with the world. With thousands of Apps on the market to serve students with autism, the uses of the device continued to expand. This study was designed to learn how assistive technology, specifically the tablet, helps non-verbal and low-verbal children with autism to negotiate their environment, but especially while under the supervision of their caregivers. Their caregivers might refer to their parents, guardians or any other adults who have direct responsibility for the child with autism.

In this chapter I discussed why I chose to conduct an interpretive case study. The chapter included information concerning participant recruitment, selection and access. Next, the process for data collection, storage and confidentiality of the qualitative
interviews was delineated. This was followed by description about the trustworthiness and reliability of the data collected through the interviews. Lastly, I discussed my role as the researcher as it relates to this study.

**Methodology**

Utilizing a case study was the ideal method chosen to understand the various ways assistive technology, specifically the tablet, helped non-verbal and low-verbal children with autism to negotiate their environment. First, it allowed the participants to offer their perspective on if and how the tablet contributed to social and cognitive production in their family unit. Second, the case study limited the number of participants but allowed for a wide lens when seeking an understanding of the family unit.

Emphasis here was placed on the family unit defined by the adults. Further the research looked at how the caregivers of the child with autism describe social and cognitive production as it relates to their environment or family unit while utilizing the tablet. Lastly, working with the parents and/or guardians of the child with autism, the family dynamics were probed so as to understand if the tablet had improved or worsened family relationships based on its use.

Finding answers to questions around family dynamics and how the tablet influenced these outcomes was the mainstay of my research. The tablet was often an integral part of existence for the non-verbal child with autism.

The basis of the research questions was to look at the family dynamics and how the tool changed the way individuals interfaced with each other. How the child’s behavior was altered because they used the tablet as a means of communication was the second part of the questions. A child with autism may have their social environment altered by the
presence of the tablet. Because the tablet was a universal device, meaning anyone could find a use for the device; it, too, could serve to impact the social dynamics of individuals. In this instance, the spotlight was on the child with autism. As the device was a part of the child’s communication with the family, recognizing the impact of the device and understanding the caregiver’s perspective answered the research questions.

The use of the tablet was central to learning how family dynamics were impacted through its use. Examining the social and cognitive production through the lens of one family offered insight about the child’s world both in school and outside the educational setting.

Creating a structure with anticipatory questions to gain understanding of the social and cognitive production of children with autism provided a basis for examining the nuances of family life. The educational setting may have contributed to the outcomes in the home environment; including questions around possible influences from school needed to be considered. Allowing modifications during observation and questioning periods produced a richer understanding. A framework developed that permitted flexibility in the questions and observation structure. (Maxwell, 2005).

**Research Design**

For the purpose of evaluating how the tablet influenced the social and emotional dynamics of a child with autism, a qualitative approach was utilized to gather data. The qualitative approach allowed for flexibility and variability that could not be achieved using any other method. Using this method permitted restructuring based on outcomes during the data collection period. Most importantly, using a qualitative approach allowed a single
family to be selected without tainting the outcome to gather information on a child
with autism and the impact of the tablet on that child’s social and cognitive production.

The theoretical frameworks sited earlier, Developmental Theory and Family
Systems Theory, served as the foundation that informed the research. Based on this
premise, studying a single family allowed probing the social and cognitive issues that
define the world of a child with autism. The natural setting, the child’s home, was the ideal
location for gathering information. Further, qualitative research required collecting
multiple sources of data and not restricting the setting to a formulaic outcome seeking a
single result. Rather, the researcher adjusted the direction of the research while it was in
progress having not committed to a finite set of questions or experiments. (Creswell, 2013;
Yin, 2014).

**Research Tradition**

The research tradition chosen for this research was the case study. The case study
was chosen because it allowed the researcher to step into a real-life setting without
compromising the participants. The case study methodology allowed for a bounded system
by collecting information through multiple sources. The characteristics of a case study
demonstrated why the use of this methodology best answered the research questions.
Creswell segments the case study into several areas. First, the case study is the best
research approach for this situation; a single family was chosen. The point of selecting one
family was to dig deeply and understand the outcomes according to the research questions
developed.

Focusing on one family emphasizes how the subject was impacted in a specific
situation. The study looked at the tablet and how it impacted the child with autism both
socially and cognitively. Creswell (2013) initiated this differentiation in case study methodology recognizing a case presented an unusual set of circumstances. Creswell (p. 102) established that if using a single case, making the ultimate decision as to which case best lends itself to the study ultimately decided an outcome that might have been different had another case been selected. This was important since a myriad of cases existed in real-life settings. Selecting one case to use in this study provided a window into understanding the social and cognitive production of a child with autism.

Lastly, Merriam (2009) defined a case study according to the special features that identify that particular case. In this instance, the focus of this study was particularistic because the attention was on a specific situation or event. Using a single family created a collection of data rich for this particular case and identified what it represented in relation to the subject matter. Using this approach, according to Merriam, was ideal for this type of case study since it allowed the researcher to dig deep for information and create a specific focus on the study questions. (p. 42)

Participants

The desired participants for this research were to comprise one family with two parents and/or guardians and a child with autism. The child with autism could have siblings but the family chosen did not dictate that a sibling must be part of the family constellation. If the family selected had multiple children, birth order was not a requisite. Rather, the children with autism were the focus of the study and where they sat chronologically among the members of the family unit did not enhance or discriminate against the use of a particular family. The parents or guardians were the direct contact in this research. While the children, age to be determined based on family selected, was a
part of the research indirectly. The goal of the research was to use a single family and work specifically with the parent(s) or guardian(s) for information around the research questions.

When it came time to choosing a family, the family selected had three children. The two youngest children were diagnosed with autism while the oldest child was diagnosed with PDD-NOS.

Choosing a single family versus multiple families allowed for a deep investigation of the subject matter. While using multiple families might have provided a benefit to seeking answers for the research questions, in an initial study, a single family provided a foundation of answers. The choice of a single family was purposeful because the time required to observe the family in their natural setting, review documents and interview family members offered an initial understanding for the research questions. According to Creswell, the best samplings were when the researcher uses multiple levels to view the event such as the site level, event level, and the participant level (Creswell, p. 156). While the first two levels factored into the research, the third level, the participant, provided the greatest contribution.

Choosing which strategy also presented a conundrum. Miles and Huberman (1994) offered a typology of strategies from which to choose when contemplating qualitative research. The most important sampling strategy employed was the combination or mixed approach. Specifically, this sampling strategy focused on the triangulation of information. Because only a single family served as the source of the case study, triangulating information provided a purpose. Using the three theories delineated in chapter 2 and considering the development of the children with autism, any information gathered needed
to be triangulated in order to understand the outcomes and how they applied to
further research.

The second sampling strategy that was used with this research design focused on the
critical case. It was important to understand how the data gathered from a single family
could be applied and compared to future studies, especially if the number of families
involved in this research were to be expanded.

Utilizing a single family also presented limitations. The ability to compare data based
on a number of outcomes was inhibited because only a single family was chosen. Having
multiple families studied would have enhanced the study if a predetermined outcome were
elicited from prior studies. Since this was not the case, using a single family reduced the
opportunity for finding commonalities among families. Assumptions gathered from the
single family will only be able to be confirmed when multiple families are included in the
sample.

**Recruitment and Access**

Choosing a family to participate in this case study was based on a simplified
protocol that defined the family as a unit that resides under a single roof and had a
minimum of one parent or guardian and a child with autism. The family may have had any
quantity of siblings. The child with autism could be anywhere in the birth order and be
either gender. There was only one criteria for the child with autism: they must have access
to a tablet to communicate with family members. The initial objective was to select a child
that had access to the tablet for a short period of time, not exceeding six months. This part
of the criteria required an adjustment. Considering a time frame for use with the tablet was
due to the developmental growth of the child with autism both socially and cognitively.
The family chosen to participate had two children with autism at the elementary years and an older child diagnosed with PDD-NOS. The purpose in selecting a family with at least one child within this age range meant the child had not had years working with the device. This allowed for a comparison of a pre-tablet environment versus one in which the tablet was in use. The children with autism attended a public school and a specialized private school or program for students with autism. While the children with autism were not the subject of the research, the purpose of the study was based on students with autism.

The researcher spent more than thirty years in the field of education with the majority of years specifically in the area of special education. As a result, the researcher had access to all private schools in the New England area that are dedicated to students with autism or had specific programs designed for students with autism. For the directors who were already contacted concerning the research, they had generously offered to recruit potential families to participate. An introductory letter was delivered to the potential families so they could decide as a family if they wanted to participate in the study. Depending on the number of families who volunteered, meetings with the parent(s) or guardian(s) would be arranged to determine their suitability.

In addition to access to the private schools and programs, the researcher had access to a multitude of public school programs including the program started by the researcher six years ago. Again, like the private sector, the potential public school parent(s) or guardian(s) were given an introductory letter to decide if they would like to participate in the research. Depending on the number of families who volunteered, meetings with the parent(s) or guardian(s) were to be organized in order to vet appropriate candidates.
In this study children were not the focal point. Rather, the parent(s) or guardian(s) drove the data collection. The first part of the process was to obtain an informed consent from the adult(s) involved with the study. A consent form was provided to the participants identifying the purpose of the case study, their contributions to the topic, and their ability to volunteer for the case study. The volunteers were informed that no names, pictures, identification of their locale, their child’s name or locale, school name or locale and any other extraneous material that could serve to identify the volunteers by name or place would be open to the public. The family chosen for the study would remain anonymous and their identity would be secured. This was critical since children were involved and their anonymity needed to be guaranteed. Further, retaining their anonymity allowed the family to share without prejudice. Because the research is expected to take place within the home or in the area of the home, it was essential that the family’s name and address not be disclosed.

Families would not be given any incentives for participating in the research. Upon completion of the case study and defense of the dissertation, a copy of the document was to be provided to the family for their records. Intermittently data collection such as transcripts and conclusions based on the data would be shared with the parent(s) or guardian(s) to ensure fidelity and a mutual understanding of the outcomes.

Prior to choosing a family, all materials were submitted to the IRB for approval so the research could proceed. Once the IRB approved the research, families were sought based on the criteria established through the introductory letter.
Data Collection

The researcher of this study was the only individual collecting data. Three data collection approaches were used for gathering data for the case study. First, observations were the foundation of the study. Observation was critical to understanding the family dynamics. It required the researcher entering the family’s home to observe how members interacted when the children with autism were present with the tablet. While the expectation of the study was the researcher would function more frequently as an observer, throughout the observation periods, there might be an occasion when the researcher was drawn into the social milieu and interacted with family members.

Field notes were kept of all observations. When the researcher visited with the family multiple times, a familiarity would develop. The researcher might be integrated into the family by virtue of occupying the same space as the family. The quantity of data collection and the richness of the data increased with the family’s familiarity with the researcher. All field notes gathered from these sessions were transcribed and made available to the family for validation of events.

Observations took place in the family’s home. Observations typically lasted no more than one hour. The maximum number of visits were to be ten but resulted in four visits. In the event more data was needed, the parent(s) or guardian(s) would be contacted and asked if they would permit further observations. There would be only one visit per week in order not to disrupt the family constellation unless the researcher was invited to attend a specific event. The actual number of hours the researcher was with the participants would be based on family responses but was not expected to exceed ten hours.
Interviews with family members were crucial for understanding the social and cognitive production of the child with autism. Initially, interviews were unstructured using open-ended questions that allowed the participants to produce their own thoughts. Interviews could be with both parents together as well as individually to vet more personal thoughts. Interviews were face-to-face unless the interviewees requested that some of the questions be completed via email or by phone. In these instances, the completion of questions was due to scheduling difficulties or illness. Depending on the interviewee’s comfort level, a request would be made to audiotape the interviews when they were conducted in person. Some of the interviews would be semi-structured. These interviews would be the result of an observation or a prior conversation and questions would be specific to those events. Again, the interviewee was asked permission to record the conversation for the purpose of assisting with note taking. The interviewees had the option of refusing to be audiotaped. All sessions were audio tapped and they will be destroyed upon completion of the study.

Interviews were approximately one hour in length and took place in the home. The children were present and could be observed but they were not a part of the interview process. All interviews were informal and no member of the family was required to answer any questions if they were uncomfortable. In the event a family member was uncomfortable during an interview; the interview would be halted and continued on another day. If the family member chose not to answer a question, either that question would be eliminated from the data collection or adjusted for the interviewee.

The researcher kept a journal during the course of the study. The purpose of this journal was to follow the development of the research and ensure that all possible
questions had been asked, documents had been either collected or reviewed, and progress was verified based on entries. The participants would not be asked to maintain a journal. However, during the course of the study, a change may have been made based on the participant’s response to research questions. Data collection such as photographs and videos were not planned for the research but if the parent(s) choose to share either form of media and allowed these items to be entered as part of the data collection, first, they would need to sign a release allowing for submission of such materials and second, the case study would note a change in the plans.

**Data Storage**

All storage of data was the sole responsibility of the researcher. The data collection was to be retained for twenty-four months in a locked file in the researcher’s office. The only individual having access to the data would be the researcher who conducted the study. The data would remain locked in a file cabinet. The participants would be notified the details of storage of data through the participant agreement. All paper contents would be shredded. All audio material would be permanently erased. Any artifacts given during the process would either be returned to the participants or destroyed in accordance with the original agreement.

**Data Analysis**

Data analysis was necessary to organize the data collected from the interviews and observations. The data was analyzed following each collection to gain an understanding of the information. To be efficient, the data was coded in order to find meaning. The information was best suited using the formats of Miles and Huberman (1994) and Wolcott (1994). Huberman and Miles have a systematic approach that encourages the data
collector to keep notes in the margins of field notes and, then, follow this task by writing reflective passages within the notes. This helped create connections and showed patterns in the data. The authors further suggested the researcher create a draft summary sheet of field notes, a third approach to examining the data. Choosing codes was critical so there was consistency when examining the data. Making meaning of the information should occur as the researcher counts the codes and develops themes. Using this approach allowed the researcher to compare and contrast the information while finding relationships among the outcomes.

Wolcott (1994) had a simplified version of Miles and Huberman (1994) but his work was directed specifically at data collection for case studies. He recommended delineating ideas followed by identifying patterns that occurred in the data. He believed that data should be related to the frameworks chosen to understand the original questions. The data could be displayed however best it represents the outcomes such as charts, tables, diagrams, etc.

Both approaches for data analysis were used to draw upon outcomes. Much of the data collected was through interviews with the parent(s) with the goal of finding themes or patterns related to the research questions. Initially, the data was to be coded by hand. This is important because it allowed the researcher to connect with the data by drawing out the categories. Computer programs were not utilized to help code and mark up text. Even though a program is employed for this function, the researcher still needs to make the associations with the data finding ways it has commonalities and answers the research questions.
Trustworthiness

Determining the rigor of the data collected was a key element for assessing the trustworthiness of the data. Qualitative research was often confounded by the lack of statistical fact data. Rather, the researcher examined the data collection and penetrated the information through a variety of strategies to ensure it was credible and useful. Readers could assess the validity and credibility of the data only if enough detail was given. Fortunately, the engagement of multiple strategies will create a trustworthiness achieved through the triangulation of multiple sources of data. This approach offered multiple lenses. Collecting and comparing data will confirm the findings to satisfy the research questions. (Baxter and Jack, 2008)

As the researcher, I expected to spend time with the family selected for the study. The extended exposure with the family enhanced relationships and reduced any concerns or mistrust. This let the researcher collect data from multiple perspectives. Using this approach allowed for rich descriptions of events, emotions and understanding about the social and cognitive development of the children with autism who had the opportunity to use the tablet as a means of communication.

Reflection of the researcher’s field notes further validated the data collected in the study. The expectation that field notes and transcripts would be rich with nuances, coding was replicated to ensure validity. This required a first coding of information followed by a “cooling off” period. The researcher returned to the original data and recoded them. The results of the comparison achieved trustworthiness.
I have worked with children with autism and collaborated with families for three decades. As the technology has advanced, so has the possibilities for assisting students who struggle to communicate due to neurological issues such as autism. Having had the opportunity to work with a single family and explore the very nature of how communication evolved in a family with a child diagnosed with autism, hopefully, offered insight into the basis of how the tablet improved communication among family members, but I was not prepared to meet a family that had three children with various levels of diagnoses related to autism. This family presented a vantage point that was not expected since my focus has been on a single child in a family. Each child offered a different point of view permitting me to gain insight into my research question.

The story of the Talbots is one that may be repeated in other homes but with three children, two who have a diagnosis of autism and one who has a diagnosis of PDD-NOS and specific to their own constellation of needs, offered a perspective not necessarily available among other families. In addition to seeking responses for my research question, I learned something more than I thought could be understood utilizing my question. I found a family of extraordinary strength and resiliency bound by love and joy. The five of them were interdependent on each other’s support and affection. The parents of the three boys were a remarkable couple. They had more love to give and share than they were offered in return. Their compassion for each other as well as their children was exceptional. Despite the obstacles in their immediate family circle, the parents were kind, loving, compassionate souls who shared a love for their children that was profound. They were not bothered by a lack of material possessions. Rather, anything they chose to do always had a direct correlation with improving the lives of their children.
The story began 16 years ago in the year 2000 on St. Patrick’s Day. That is the day Robert and Liza met. Introduced through mutual friends, they established themselves as a couple and married in 2002 when Robert was 33 and Liza was 28. Robert grew up in a suburb of Boston having been raised there while Liza spent the first 11 years of her life just outside the city. However, her father was a military man and that meant the family needed to move about the country fairly regularly. This gave Liza the opportunity to see and learn about other parts of the country. Once married they settled in Massachusetts in a small town not far from where Robert grew up and they began a family.

The first of Robert’s and Liza’s three children, Jonathan, was born April, 2003. David followed in November, 2004 and Connor came along August, 2007. Within four years, this couple had three active boys all of whom had some level of diagnosis of autism. The ages of the boys did not prohibit them having strong relationships. All three of them got along very well. The youngest two, David and Connor were close and liked to wrestle. All three of them liked the same music and liked to dance. David and Connor liked to watch similar programs on television and play with the same kinds of toys, but generally they did not play with one another. Rather, they enjoyed parallel play. They played board games together but they required the support of others such as Mom or their big brother Jonathan. They have not been able to maneuver the complexity of a board game independent of these resources. Not surprisingly, Jonathan was protective of his younger brothers. However, there were moments that left the brothers feeling stressed. For instance, there were times when David was aggressive or cried and yelled and this made Jonathan and Connor feel anxious. These instances left the two brothers feeling stressed and upset.
The boys all participated in the public schools at one point or another. Jonathan began his school career at a private Catholic preschool at age 4.5. Several months after his arrival, his teacher shared with his parents that he was having some learning difficulties and suggested he be tested by both his public school and family pediatrician. As a result of testing, Jonathan was diagnosed by his developmental pediatrician with PDD-NOS. The family next turned to the school for an education evaluation. The testing determined that Jonathan needed both Occupational Therapy and Speech and Language Services. The services were delivered through the public school but the schools offered the parents an opportunity to participate in a three day per week half day program within the public school. The family chose to decline the preschool program while accepting the OT and Speech services. Jonathan’s parents felt that he was already almost in a full day, (8:30-1:30), full week program where he was getting assistance with academics in pull-out and inside the classroom. Remaining in his outside program afforded him more playtime for the purpose of working on social skills. Liza still took Jonathan to the public school after he left preschool in order to receive assistance in OT and Speech. Also, because he was chronologically young, he remained in the private preschool setting for an additional year while continuing OT and Speech services in the public schools. At that point Liza and Robert decided to have Jonathan evaluated at a private multi-service pediatric facility that focused on social skills and developmental skills in the areas of OT, PT and Speech. He then began receiving services in the area of OT and Speech at the beginning of his second year of preschool. Once he entered kindergarten, he joined a social skills group at the private facility.

As Jonathan got closer to kindergarten the family determined that keeping him in the private school as the complexity of the work was about to grow exponentially, would be detrimental to his development. They opted to have Jonathan enrolled in the public schools
where he could receive more of the type of supports that would allow him to be successful. The decision was the right one for Jonathan as he received an array of services for the first few years. While physical therapy was terminated at the end of first grade, he continued to receive speech and occupational therapy through the end of fifth grade. Even now, in his teenage years, he continues to receive speech for social skills support and reinforcement with language skills for English Language Arts. He remains on an Individualized Education Plan with support in the language arts area.

Since entering the public schools, Jonathan has participated in a full inclusion classroom with the exception of some pull-out for support services. He is a solid student receiving good grades as well as he is admired by his teachers and peers. He has never had behavior issues interrupt his learning. He did not need to sustain services in the areas of speech and OT. His remarkable growth in these areas precluded him from needing any further assistance.

David, age 11 and the middle of the three boys, was given a preliminary diagnosis of PDD-NOS by his general pediatrician when he was just 26 months old in order to allow him ABA services right away. Four months after that he went to Early Intervention (EI) and was evaluated by an outside developmental pediatrician. At that point his diagnosis was changed from PDD-NOS to one of autistic disorder. When he turned three he entered a five day a week 20-hour program in the public schools. While he participated in that program, he was still separate from the other students in order to receive the appropriate attention. Approximately, eight months later David showed little improvement and the skills acquired thorough the services of Early Intervention began to regress. As his skills declined, his negative behaviors increased. His mother pushed for extended services in order to help David’s development. The district relented, allowing him the additional hours that totaled six hours because their BCBA consultant
from a private school, dedicated to teaching students with autism, recognized that the basis of David’s regression required more time in the classroom. The negative data collection was demonstration that David was not progressing and required the additional time in order to remediate the loss skills and add the foundational skills needed for the classroom setting.

While participating in the program, David had specific behaviors that included bolting (mostly for light switches), aggressive behavior towards others at times (mostly the adults in his classroom), lacked the ability to sit in a group for any extended periods, minimally developed self-help skills and academic skills, and continued his escalation of negative behaviors. Additionally, his summer program was only half time and his regular staff and program structure changed. This caused additional problems because not only did he regress over the summer months due to the immense changes, it would take him several months during the regular school year to gain back the lost skills. This reduced his learning capacity overall as so much time needed to be devoted to help David stay on track.

When David reached kindergarten he moved into a substantially separate classroom for grades K-2 at his elementary school. David had been introduced to an iPod® early on and his teacher capitalized on the use of his Augmentative and Alternative Communication (AAC) device along with other forms of technology. This allowed him to be more successful with his communication as well as his academics. David’s behaviors began to decrease while his academic skill levels increased along with his self-help skills. He was able to attend whole-group instruction. This was a benefit for David because he was able to be surrounded by typical students who could demonstrate behavior when bound by a group activity.

Despite the positive upticks in his academic program, David continued to have aggressive outbursts and he bolted even though it was with less frequency. His aggressive episodes, vocal
outbursts such as screaming and yelling were attributed to changes in his schedules and routines, interruptions of repetitive patterns (stereotypy), and denied access of preferred items David liked in his possession. The bolting was directly related to his obsessive compulsive behavior with lights. David had to see the different way lights worked and was drawn to the various lighting in each classroom. At the end of kindergarten, David was placed in a summer program to help prevent regression. However, he was placed in the middle school because that was the chosen building by the school district. The size of the school, the opportunities for distractions, the new staff unfamiliar with his needs, a change in academic structure that included his computer-based reading program and a teacher not trained in any of the programs David used during the school year resulted in him regressing in his behaviors once again. He became very aggressive and his bolting increased. When he returned for first grade in the fall, he was able to negotiate the curriculum. His mother attributed this success to her input. She had provided David with worksheets for all his subject areas and utilized the hard copies of his computerized reading program in the hopes of helping him maintain his skills from the prior June until that fall. Additionally, Mom was able to give him further reinforcement outside of the classroom setting.

Just like the prior summer, David lost some ground. Particularly with his behaviors. He remained aggressive and his bolting did not dissipate at all. It was not until December of that year David was able to return to the levels where he was in the previous spring. The remaining months of the program that year were productive. However, David suffered by losing all the months of learning. The time between his departure from school in June and return in September was enough to negatively impact his regular classroom routines. Mom explained it could take as long as five months for his skills to be commensurate at the level he graduated with the previous June. Nearly half a year passed without the true structure he required.
The summer between first grade and second grade was a similar situation to the prior summer. David was placed in a new school with new staff. His behavior escalated and he became aggressive, screamed and bolted. In order to keep David safe, the BCBA had to be placed in his program for most of the summer and he was given his own 1:1 aide to keep him and his classmates safe. The school recognized the difficulty he experienced and suggested to Mom she remove him for the remaining two weeks of the program. Despite the attempt to assist David by including his computerized reading program and paper materials to meet his needs, the program did not prove fruitful.

David’s entry into second grade was not remarkable. Like the prior year, he made gains in his academic program but it took months for his behaviors to get under control. Mom noted the one positive outcome of his summer program was David’s reduced reliance on his AAC device. He became so frustrated trying to utilize the device in the moment, he finally started using words to be understood.

By spring Mom decided to visit a number of out-of-district schools because she felt she could not experience another summer or fall for both her family and the school, considering what had transpired in the two previous summer programs. Mom shared with the school her decision to look at these private schools. She had been receiving outside speech and OT services and these individuals gave her supporting documents that stated he was a child in need of consistent routines in order to be successful and to keep his behaviors down to a minimum. The Special Education Director and the Board Certified Behavior Analyst (BCBA) for the district tried to develop a program that would keep David in district but the staff and parents agreed that the options were limited and the choices available would probably not lead to any success. The
district finally relented and gave permission to the family to seek an out-of-district placement before the start of David’s third grade year.

The family visited a number of schools before settling on a special school dedicated to students with autism located fifteen miles northeast of their home. The school offered a year round program that included no more than a week off from the classroom at any given time during the regular school program and two one-week breaks in the summer—one at the beginning in July and the other at the end in August. David was able to start in July allowing him to become acclimated to the school fairly quickly. The parents were surprised by how quickly he settled into his new environment. Mom believes the school had many therapeutic things in place which David took to quickly and this helped with his transition (sensory equipment, swing, small ball pit, Zumba once a week). Both Mom and Dad believed they found a home for David.

Since his arrival, David has grown in all areas; academically, socially, emotionally, and his verbal abilities have flourished as well. His bolting has also decreased significantly. Mom attributed this to the controls in place for students in the school. David has limited access in school unlike when he is out in the community and has many stimuli. There has been a significant reduction in his aggressive behaviors and vocal outbursts. If his behaviors should escalate it usually can be attributed to a drastic change in his schedule or, perhaps, denied access to a preferred item or activity. As time has passed David seems to be more flexible about changes in his schedule even when he suffered from anxiety.

Mom was positive much of his success may be attributed to the constants in his life. His outside services, those not provided by the school, began in the area of speech when David was just four years old. Occupational therapy began six months after that. During the last seven years he has only had two speech therapists and his OT teacher had been the same throughout his
time receiving services. He was able to stop his outside OT service a few months after he arrived at his new school due to his success acclimating to the environment. Mom took advantage of the opening in his schedule and added another speech session to assist with his communication skills.

Connor is the youngest of the three children. He was referred to Early Intervention at just eighteen months by his mom and his pediatrician. He received a diagnosis fairly quickly from the psychologist and this was later confirmed by the developmental pediatrician. He attended Early Intervention until age three when he was evaluated by the public schools and placed on an Individualized Education Plan that included a four-day program. His day was divided into two distinct units of education. In the morning he attended an integrated preschool and then, in the afternoon, he moved to a substantially separate classroom for the remainder of the day. Unlike his brother David, Connor transitioned into a summer program with different staff with no difficulty. He was given OT, speech and PT to help with his development. He has required these services up until now with no intent to remove them from his schedule.

When he returned to the integrated preschool for a second year, he was given a full day program. Ten months later, both his mother and the team decided he had not made the measurable gains expected of him. He was unable to generalize skills, failed to be potty-trained, and sustained a large amount of echolalia language. The faculty were using his iPad® as an AAC device to help him communicate. They also incorporated a number of Apps but they did not use the technology to teach any concepts. He was not able to utilize the valuable technology because the team of teachers failed to recognize the power of the technology. Until now, Connor had utilized the Apps on his iPad® as a mechanism to meet success in his educational environment.
His team of educators suggested to the parents that because he was an August baby, they did not want him to advance to a sub-separate classroom. Rather, the team felt his best placement would be another year in the integrated preschool for five full days. The family agreed with this decision recognizing that another year would help him reinforce skills. However, after the second year in his preschool program, this time as a full time student, he was struggling at the end of that year academically and socially. He showed no signs of generalizing the skills he was being taught. During the course of that year he was potty-trained but sustained accidents periodically. While the plan was to send Connor to the Pragmatic Language Classroom, he needed to move to the sub-separate program that his older brother had attended for three years. No doubt the additional years gave Connor a boost in some of his skills but his progress was not enough to move him in the direction the family had desired.

When Connor concludes his second grade year, a decision will need to be made whether he remains in his current program or transitions to the Pragmatic Learning Classroom. If he is able to transition, it will demonstrate he has made enough growth, which his parents believe is the situation. According to Connor’s mother, he generalizes skills for the first time, plays appropriately with toys, and is much more social than the previous year. His mom recognizes his self-help skills are at an independent level requiring only occasional assistance. In terms of his academics, his parents believe he has made significant gains in his English Language Arts and his handwriting has improved enormously. Connor still struggles with math, but his weaker area is beginning to show growth, although at a slower pace. It is important to recognize this growth because if he remains in the sub-separate program, he will be required to change schools and teachers. This might result in another period of regression or at the very least, an adjustment period that negatively impacts his learning.
Mom and Connor’s teacher collaborated for three years to incorporate assistive technology into his learning by using the pre-teaching of skills utilizing video modeling, working on the classroom smart board before independently attempting assignments on paper, story previews on YouTube® and/or recording themselves reading a story. Mom feels this is one of the reasons Connor has met with so much success. YouTube® has served as a primary resource for him. He has learned his play skills by watching videos on YouTube® that toy companies have made of children playing with toys. Mom reports he is developing skills that have improved his conversational skills allowing him to answer questions with greater accuracy when asked.

The children’s parents recognize the importance of technology in their children’s lives. This is best seen in their dedication to speech and language services for all three boys. Mom realized early on that the boys required speech and language and then acknowledged that what was offered to them in the public school setting could not satisfy their needs. She was determined to offer them the best possible opportunity in life so she began doing her own research online seeking out occupational therapy and speech services. With the technology that exists today, she found what she believed would be an appropriate match in a location not far from where she lived. Independent of the school, she scheduled an appointment with the office for an evaluation for her two sons. She was drawn to this particular office because of their depth of knowledge of Augmentative and Alternative Communication devices. The individual she worked with familiarized her with Easter Seals and their loan program for AAC devices. Her particular therapist introduced her to the Proloquo2Go™ app for the iPod®. The family did not desire to put out the money themselves in order to find out if her son would use it. She arranged to get approval from the school district to purchase an iPod® and the App which would have
cost her hundreds of dollars. When she saw it worked very well for her son, she purchased an iPod® and the Proloquo2Go™ app herself not wishing to debate the value of the need. This became the turning point for David. It transformed his world.

The therapist also utilized the technology with Jonathan. She used online story boards for him to make narrative stories working independently and collaborating with her to increase his language skills. Additionally, she used video modeling and/or cartoons in her Social Thinking curriculum she utilized for his social skills group. These videos taught the students how to identify expected and unexpected behaviors. A benefit of this approach allowed him to recognize when he was experiencing an expected and/or an unexpected behavior.

Mom expressed the history of technology and how it influenced her children’s ability to communicate with the immediate family circle as well as when they were at school. While Jonathan had a skill base that did not require any technical assistance to negotiate with his social environment, both David and Connor required supports. David initially worked on large bulky technical devices such as the Dynavox and Say It! SAM. Both were cumbersome and the return on productivity was negligible. Mom said that using the PECS system, a system of pictures to describe one’s thoughts using Velcro and a board were the most advantageous for David because he could get the fastest results for the purpose of communicating with others. Also, his placement at that time did not promote either the Dynavox or Say It! SAM. He tried the Go Talk device when he first started the public school but due to its inefficiency, he switched very quickly. Within the first year he was in school, he was utilizing the iPad® but only after using the iPod®, its predecessor.

Initially, Liza had learned about the iTouch® through a visit to Boston’s Children’s Hospital. David was visiting the hospital for an outpatient evaluation and they suggested he try
one with the Proloquo2Go™ App uploaded. When Liza queried the school about incorporating it into David’s school day, they were not able to support the purchase financially even though they agreed to use it if it was provided to them. Liza was anxious to try the recommendation so elected to make the purchase herself. However, before allowing David to use the iPad®, she first had additional information added to David’s IEP that protected the device from damage. Additionally, she chose to purchase a special protective cover for the iPad® to ensure its safety while it was in school.

Liza expressed that in order to ensure the viability of the iPad®, she collaborated with the classroom teacher and speech therapist in the school. When Connor came along and required the technology, she did the same thing for him as she had for David. What she has now found is that success breeds success and Connor did not require the intensive work with Proloquo2Go™ he once did. He actually uses the iPad® more as a keyboard mechanism. Also, Liza has put social stories on the iPad® in order to work with the children. An example of this is toileting skills. She had paper pictures and put them on the iPad® to make it more engaging for them. She put a variety of apps on the device that were similar to video modeling. She cited one example called “Go With Me” that provides different stories for a variety of places the student might go such as the doctor or the dentist. These special stories teach the boys about interactions between people.

David’s teacher has employed the device for specific curriculum activities such as reading. She is able to integrate the stories with discreet trials in order to teach him conversational protocols as well as a set of skills related to the subject area being introduced. The videos are used to show David the expected behavior and he uses this as a cueing system.

Even now as both David and Connor have grown and matured, they both retained the use of their iPad®. In Connor’s case, he will choose to make direct conversation with another
person. David still uses his iPad® more as a device for communication but will initiate a conversation with individuals. Liza feels the children have become more flexible as a result of using the technology. Today, the iPad® can be used as a means to help David take his medication or perhaps help on his ride on the school bus.

Both boys have used their technology as a mechanism for the family to be able to communicate with each other. They have worked diligently over the years first with the Dynavox and then the Say It! SAM devices to help the boys communicate. Through the mother’s own diligence to seek help, she purchased the first iPod® and then went back to the school to support the additional needed devices. Mom has served as a real advocate for her boys. Dad has been there in partnership. Incorporating the devices into the children’s world to increase communication skills has proven beneficial. Today, the family cuddles on the couch, eats dinner as a group and enjoys outings to restaurants. There is no doubt they have much ground to cover as the boys pass through their adolescent years but it is apparent that the parents have been the greatest advocates and worked in conjunction with the public schools as well as outside therapists to provide a structured learning environment for both academic and social development. The result of their hard work is a family constellation that communicates in a more typical fashion. The overall stress has been reduced but not eliminated. The work moving forward will remain constant but the parents are comfortable with this plan. The Talbots have a future of promise as Mom has and will continue to seek any and all possible outlets to help her children progress.

Themes

Three themes emerged from the data contained in the interviews that described tablet technology and its impact on families with autistic children. This was most interesting because
two siblings shared the same diagnosis but present two different impacts on the family. The parental involvement with the children and their understanding of each child’s needs offered two distinct views. One child required more assistance and, hence, technology warrants a greater part of their world as they negotiate relationships among the family members. The other child, required less assistance and capitalized on dialogue or at the very least is able to establish a dialogue with his parents in order to have his needs met. Still, both children required the tablet technology to make their needs known at various times in their lives. The degree to which they utilized the technology determined how their needs were met.

**Advocacy**

The first theme addressed the topic of Advocacy. Specifically, who advocated for the children’s voices? How was this advocacy done? What benefit was this advocacy to the children? According to Webster’s Dictionary (2016), the definition of advocacy is “the act or process of advocating or supporting a cause or proposal.” In sync with this is the actual advocate who is a person who argues for or supports a cause or policy or one that supports or promotes the interests of another. Webster’s definition is most fitting for this particular family.

Mom repeatedly demonstrates her dedication to her children through her ability to advocate for them. She might not have planned to advocate in such a manner, but the needs of her children and her personal motivation to offer them the very best opportunities to negotiate the world demonstrated her desire to make their lives more typical. Each time we met and discussed the children there were opportunities that highlighted how she advocated for them as well as why she felt compelled to get out in front of their learning situations. As Mom brought out, she was never intrinsically aware of any medical issues for her first child. She recognized a speech delay around twenty months but didn’t attribute it to anything specific. She notes, “He
(David) still wasn’t talking. He said a few approximations of words, but he wasn’t talking at the time. I didn’t know they were sensory behaviors but he was exhibiting a lot of like fascinated by things that spun around and he would bump into things.” She continues. “I didn’t realize. He was always a very happy, content kid so, no red flags except for the speech delay.

She noted her first son (Jonathan) had a speech delay. “He had a speech delay and he ended up talking and everything so I thought, maybe he’s just blooming a little bit later.” When she visited her son’s pediatrician for his twenty-four-month visit, it was Mom who brought up the topic of her son’s speech delays, not the pediatrician. It was only then, the pediatrician said “he should go see early intervention”. So even from a very young age, Mom needed to initiate the questions in order to receive the help.

When it came time to supply David with the technology, mom states that he started with technology, utilizing an early version of the tablet but a significantly smaller one. When asked if the technology was supplied to her, she responded that she needed to supply it herself. She states,

“Yes, with David I was the one that had brought up the iTouch®. I had heard about it through Boston Children’s Hospital. David was going there to see their speech department just for outpatient evaluations. They suggested the iPod® Touch with the Proloquo2Go™. I had suggested this to the school and they said, “Yeah, we can use it but, we don’t know if we can pay for that type of thing.” Back then I was like, “I’m not going to wait. I want him to get going on this so I’ll purchase it.””

She continues, “The only thing I did is, in the IEP, I put a clause in there because I know the type of students he was with that could be violent and stuff. If it was damaged
while in their possession due to negligence of watching the other kids or whatever…that they would replace the device.”

Even now she states that David’s tablet cover is falling apart and she must replace it. Her responses generate a pattern of advocating for her eldest autistic child.

Numerous times, Mom referenced her participation in the process of programming devices for her son. For instance, the researcher inquired about a particular aspect of programming-social stories. The mother responded that she did some social stories. She made paper copies of stories and programmed the tablet for her son to reflect the same content. The school followed by adding to her choices only after she began the process.

Mom addressed the topic of Extended School Year (ESY) services for her children. During one summer, in order for David to participate in summer session, he was required to change schools, teachers and curriculum. At one point the BCBA said to him, “David I know this isn’t what you’re used to and I know this isn’t what you like but, you’ve got to get over it. ‘I’m like, that’s the point. He can’t get over it. I don’t know why but, he can’t get over it.’” Mom recognized that change is hard and sometimes very difficult and needed to deliver that message to the educator. The educator may have been expected to initiate this communication since she is the education specialist but it is Mom who needs to highlight a significant learning situation for the educator.

The researcher queried Mom about the types of Apps she used to assist her children with the communication. She mentioned two specific apps, Educreations and a scheduling App. Both of these Apps were found by her and loaded on to the tablet. Mom is now advocating for her children by finding appropriate Apps to help them negotiate their environment. She also addressed how she made videos of things along with the teacher to help teach social situations.
She highlighted this when asked about the use of social stories to teach. Mom said, “Yes. I used to make a lot, laminate them with pictures of him and I know when they both went into from early ed[ucation] to the elementary school program…” The researcher noted her lack of familiarity with parents taking on the challenge of creating social stories. Mom responded, “Well, I learned it because I wanted something that David could use. At that time, I think we were just either starting to use the iTouch®. We were either still on the GoTalk® or we might have just started using the iPad®, so I had been learning things from when he was at Children’s Hospital about that and also the school. The school wasn’t really using it that much, the social stories, but I found that using the real life pictures was more engaging for them.”

When the boys were both in public school, the communication between home and school was inconsistent. Mom needed to stay on top of what was happening in order to ensure both her boys were receiving the needed education. However, once one of her children moved to an out-of-district school, it was expected the educators in that school would initiate the tools and technology to assist the child. According to Mom when asked by the researcher if she needed to coordinate the conversations between her private schools and outside therapists, she replied in the positive. She described this was in terms of her level of advocacy, “What I do is, I give them each contact information and I also sign releases so that they can communicate with each other and usually, it’s the outside therapists are contacting the personnel, usually.” The private school, like the public school, depend upon themselves for curriculum and training, relying less on the family and outside therapists.

Mom demonstrated her need to advocate for her children once again describing an IEP meeting. She attended the parent teacher conference where she addressed the teacher concerning
the next placement for her youngest child. Mom described the encounter as, “She’s like, “Well, whatever you do, neither one of these programs, they’re not into the technology.” I’m like, “I know,” and she goes, “You’re really going to have to be on top of them to keep up with that,” and she goes, “And I’m trying to say you have to do it.” I’m like, “No, I can do some of it,” I said, “But yeah, they will have to.” The essence of this encounter validates the mother’s need to not only remain involved but help lay the course of action for her children.

Continuing on the topic of advocating for her children, mom suggested wording on her son’s next IEP to solidify his needs. She says, “It’s in his IEP, for video modeling, but we were talking about, I think his three year re-eval[uation] is coming up and even if he’s not getting another assisted tech, because it’s been a few years since he’s had one, just so we kind of have that on there saying, “This is the way he learns the best and pre-teaching skills through that.”

The researcher raised a question about technology and who makes the purchases. Mom had an extensive conversation about various faculty members who contribute to the district for either regular education or special education. She was referencing the connections in school and while doing so, demonstrated her advocacy once again.

“What it is, it’s a lot of inconsistency unless the parent knows, like myself, what their kids are doing and what they need. I don’t know. That’s why I’m having a difficult time because it’s…. He’s not going to get the same type of attention as he’s been getting. Maybe with a one to one, because that’s what I said it’s going to take, is having him have a one to one now, because he has been sharing an aide with somebody. It’s been on his IEP, but there’s another child that’s at the same level and his teacher said, “I don’t even know if they’re going to end up in the same program together going forward.”
While Mom is able to describe all the ways she advocates for her two boys, her attitude about success is best exemplified in her thoughts about David when he was first diagnosed. She said,

“It took me a good year from the time of the diagnosis to really get my head on straight that I needed to do everything possible, no matter what, to get him to the best place possible for him. No matter what it be. Whether he never talked, and just really get more involved in the process at school. Because I remember when he was in EI everybody was like, “Oh, when he goes to public school they’re going to do this. They are going to do that.” I’m like, “We get to public school.” No. Not all that stuff happened. I questioned a lot of things, and they were like, “Why are you questioning this?” I’m like, “I need to understand how this works and how we get him to the next level.” I think I got it initially, a lot of pushback like, “Why are you asking to have him learn this? Why are you pushing for him to do this?” Almost like I had unrealistic expectations.”

The researcher concurs with her statement and adds “that’s what drove you”. Mom responds with “Right. I was like, Okay. I have to stop having the pity party and I need to be involved in the education and make sure I’m pushing the limits.” She continued, “That’s what I have done.”

Mom sums up her total philosophy of where she wants her children to go. She says simply, “My biggest thing has always been to get them to the best place I can for them in their lives.”

Mom has served as her boys’ greatest advocate not only for their academics but for acquiring the necessary technology that permits them to communicate more effectively. Some of her advocacy evolves from the need to procure the appropriate technology so the children can learn and communicate with increased complexity. However, she recognized that even with all
the opportunities that exist with new and improved technology and specialized schooling in a private setting, she still must remain deeply involved (Committed) to ensure her children are receiving an optimal education. Her advocacy has contributed to their advancement allowing them to have increased and deeper relationships with the immediate family members.

**Impact of the device at home and school**

The second theme addresses the impact the device has had in relationship to home and school. Mom has been the stronghold for ensuring the appropriate technology is available to her two children. Repeatedly, she expressed her need to take control of the technology because either the school did not supply the needed device(s), the teachers assigned to teach were not necessarily technological equipped to handle the responsibilities and/or her independent therapists provided learning environments after the regular school day that required the boys have the needed technology in order to meet with success.

The impact of owning the device can be viewed from several lenses. First, utilizing the device vastly changed the family dynamics. Prior to ownership, mom presented a difficult picture attempting to work with her sons but their overwhelming frustration incapacitated their ability to succeed. Once the boys were given the device and taught how to utilize it, the relationships in the classroom allowed for greater learning. At home, it was clear from discussions with Mom that the technology lent itself to positive family dynamics. But, it also had an impact on other aspects of the boys’ lives. Technology is now a large part of the boys’ worlds both at school and home. The impact technology has had on relationships in the home as well as in the community solidify the importance of the tool.

Mom shared that in the beginning when the boys were diagnosed, technology did not play an integral role in their educational platform. She said, “They had their own low tech
As for technology that involved actual devices, she said, “It was still like a lot of the Dynavox and other similar kinds of technology.” She stated the boys used the Picture Exchange Communication System (PECS) to start out. While this may have been the most primitive form of relating language, words and thoughts; it was a resource that met the family’s needs. The family advanced to a photo album whereby the pictures talked. Mom explained, “You could record what the item was so that kind of was the first technology thing we used.” They moved to their first real device, the Go Talk. Mom was not enamored of the Go Talk because it required too much programming. As mom further talked about the use of the device, she said it was “within the first year he was on to the iPad®”. He began with the earlier version of the tablet, the handheld device because it was the precursor to the larger version commonly used today. She noted the greatest difficulty for David using the smaller version was the physical dexterity in manipulating the buttons and taps. She goes on to say “It took a little bit longer to come along because he’s less advanced but, it didn’t take him that long to get the finger movements in and what he needed to do.”

Following these more primitive devices, Mom stated, “Then I started hearing about the iPod® touch and augmentative communication, the Proloquo2Go™…and I think we might have even done a trial. Yeah. We did. Because he had an outside speech therapist, too, by that point that was also pushing for the augmentative communication for him (David).” “…he totally took off with that and loved that for the longest time…He could easily navigate the device and make requests on there. Where I could see him starting to communicate verbally, we started pushing for him to do more verbal speech, so they started pushing away from the augmentative and
started pushing more verbal speech, both at [his private school] and his outside speech therapist.”

Today, she said, “Connor doesn’t really need the Proloquo2Go™ anymore. He likes it just more to type. He uses it more for the keyboard aspect of it, to spell out words…. But David, they do pretty much most of the programming on there now. Like I had started them out with it and then they’ve added things along the way.” This has reduced Mom’s daily involvement with programming the device and allowed her more time to satisfy her role as mother. Still, she suggests it is continual work. She said concerning David’s ability to function with greater regularity, “…I have been thinking about it from some of our conversations and then just some of his frustrations and aggressions and his inability to communicate sometimes verbally.” Mom made a plan to have two iPads® for David. One will be specific to the communication skills and the other will be dedicated to entertainment only…. They lock it (one of the iPads®) into Proloquo™ for him to communicate and they use their school’s iPad® for the entertainment, for the reinforcers. It’s just bringing that extra step to the house because at home all he wants to do is play on it.” She noted, “He doesn’t really use the Proloquo™ too much, anymore and I think if we use a combination between his verbal communication and the …., that it’s going to reduce his frustration level.”

The positive impact the tablet has had on the family was the increased communication that takes place. Mom highlighted that David was “completely nonverbal until he was probably right around five or six. He started saying some words that were more clear. Really, using the Proloquo2Go™…. I really saw him being able to put things together, even if it was two words together, more effectively than with the PECS pictures or the GoTalk®. He was more engaged. He wanted to communicate with it more than with the GoTalk® or PECS.” This increased
understanding of communication benefited the family dynamics as stated by Mom and Dad and observed by the researcher.

Mom recognizes that there have been times of frustration due to the lack of understanding. The parents are well intended but not always able to understand the communication with David and Connor. She noted, “Yeah, it was frustrating for him, for David and for Connor when we couldn’t understand what they were saying or what they wanted, especially with David.” That is not the situation today. While there are moments that they are not able to understand the boys, their increased communication skills combined with the devices allows almost all dialogue to be processed. She reinforced this by saying, “Just communication ability, frustration level has gone down with the use of the iPad®…. Yeah, just being able to effectively communicate, whether it be a one-word utterance or a couple words utterance, verbally or through the iPad®.”

The researcher inquired about trips into the community as a family. She asked how the family negotiated those adventures and what level of technology was needed to have a successful trip. Mom said their interactions are different but they have learned dialogue skills as demonstrated in this thought by Mom, “He’ll (Connor) just go up and talk to them (strangers) but, David will either use his iPad® or he will verbally engage them. David he’s a big comedian so, he will usually go up to them and say something silly to get attention and things like that. That’s how he starts his interactions a lot of times with people.”

Family activities expected in a typical family must be planned, negotiated and executed in this family. As she said,

“It was kind of like, for a few years, I couldn’t do too much and then it got to a point where we could do some things. What I used to do and I sometimes will do this
occasionally still is I used to have almost like a PECS board but now I can do it on the iPad®. It’s like a shopping list where the kids could go and pick out. Okay, you get the apples. You have your board. You’re going to get your items. That type of thing. I could never take them along…. It had to be very planned out, get in and get what you need to get out. Nothing too long in the store.”

Going food shopping is not easy but Mom has shown they designed a system that works for their family unit. Longer ventures such as family vacations have taken work as well. They are able to go away but they must give great thought to this. They consider renting a house versus going to a hotel, length of car rides, types of activities available, etc.

A typical family may be expected to have schedules, run chores, visit the doctor to name a few expectations that can take place in a day. For the Talbots, technology has been the cornerstone for that to happen. Mom explains that social stories are put together for everything they need to do as a family. For instance, Mom has either written or found Apps for tasks such as visiting the dentist. She explained that while David will look at them they are a tremendous help for Connor. She described one trip to the dentist and said, “Every time he goes to the dentist, he tells the whole dentist story.” “I’ll see the hygienist and she’ll clean my teeth. The dentist is going to check my teeth and that’s okay.” Mom also noted the Apps have made family life easier because the children have reduced anxiety because of using the social stories. She said they prefer videos about real life things they do versus just viewing possible opportunities.

Mom also remarked concerning David’s facilitation with communication she says, “…he is using it more like coming out with things on his device or verbally and it was a lot of adult facilitation, initially, but I guess within this last IEP period, that’s
drastically improved and he’s doing more on his own. They’ve actually been using him. I’m like, “Oh you have?” as a role model, I guess in a lot of the social skills groups.”

Again, this represented the power of the device combined with appropriate Apps, which have increased David’s capacity to communicate. Mom noted the transfer has not been as obvious in the home.

The researcher queried Mom if she feels all of the technology has positively impacted the relationship between she and her husband. While she did not feel there is a difference in that relationship, she did highlight “it helped out now because I feel a bit more confident to leave the kids with a sitter that David’s better to communicate and he’s not aggressing very frequently now.” She explained to her children, “You know, we need to get out and just have time out for us, ourselves, to do and have some fun and relax and have a nice dinner without the kids once in a while.” As she responded to the interviewer, “So we try and go out at least once or twice a month now. Sometimes it’s like two weeks apart, but at least I feel like that helps our relationship, by him being able to communicate better and get those frustrations down.”

Mom summarizes the situation as to where the family was and to where they have come. She says, “Yeah, it was rough, like I said. It was rough the first couple of years. It was frustrating for him and us and finally, we’ve gotten to a good place for the most part. Obviously, we still have our days where we get frustrated but… and he (David) still gets frustrated but few and far between.”

Mom recognizes there is growth still waiting to happen. She was asked what she hopes for her children in terms of their communications skills and where do you think they will be in the future? She responded, “With David I’m hoping that it will facilitate him to be able to
communicate better, so he’s less frustrated and be able to get those thoughts fluently across, no just one-word utterances or a couple of word utterances, but in actual full sentences whether it’d be through the device or through his own voice. That’s my biggest hope for him. With Connor, I’m hoping that he will eventually be able to learn generalized skills better because of the use of the video modeling, learning the skills on there. Then I’m hoping eventually he’ll be able to learn skills without the use of the video modeling down the road.”

The use of the tablet to assist with communication in the family, at school or in the community has shown improvement. Mom recognized the family will need to continue their efforts to help both boys although one son requires more assistance than the other one. Their eldest son (Jonathan) has begun to be of assistance with the family dynamics such as when they go out into the community. But, most importantly, the children have been finding ways to make their wants and needs known both at home and in school. In some situations, they were able to execute their needs more effectively when in the educational setting, primarily due to the significant structure of the classroom. This same level of structure did not exist in the home and, perhaps, required a different set of structures to capitalize on similar results. However, in both situations, according to Mom, the children made great gains making their needs known thereby reducing their frustration and aggressions. Family life continued to have its challenges but Mom and Dad made it known they are willing to meet those challenges. As Mom stated during her interview, “It has to be up to the parents to decide how far they want their child to go in life.” She believes, “…the more support, the more communication you have between school and administrators and outside therapists and other parents, it’s only going to help your child better communicate through assistive technology.”
The parents recognized that their lives revolve around the needs of their children. They have sought out ways to improve communication skills through assistive and augmentative technology. Mom explained that she is always seeking new ideas and very open to exchanging thoughts with other parents. She did not feel it is restricted only to parents of autistic children. Rather, she has listened to all parents and makes exchanges about Apps, devices and anything else that can improve communications skills. She offered a final thought on how autistic students should be offered every advantage to gain the needed skills to communicate with the family, in the classroom and out in the community.

“My final thought would be just that encouraging families and parents whose children have difficulty communicating, whether they have autism or another diagnosis, just to keep trying. It’s hard to say to people when they’re living it in the moment, but just trying different things ‘til you find the right things for your child. It could take a while. It wasn’t like it happened overnight for us. We’ve slowly learned different things over the years. I’m always amazed when I learn something new. Like when the teachers say, “Oh, your child did this today with the use of the iPad®, or they were able to communicate better because they used the iPad®.” That’s been a huge help to me.”

The relationship between the autistic child and technology

The third and final theme addressed understanding the importance of the relationship between the autistic child and the technology, specifically the device. The prior two themes stressed the importance the device has had in allowing autistic children to gain needed skills to find their inner voice and effectively negotiate their environment. The parents stressed how and why they needed to advocate for their children to ensure they were receiving all possible opportunities. While the schools, both public and private have offered support, Mom, in
particular, has needed to have an active role in ensuring her children are given as many opportunities as possible to succeed. She has relied on her private speech therapist and as well as at least one talented public school teacher who specializes in technology to garner the greatest depth of knowledge for the sake of her children. Mom has demonstrated how she has needed to advocate for her children both in school and out. Because of her advocacy work, one would conclude her children’s growth is, in large part, the result of her efforts.

The device the two autistic children now use did not exist when they began employing augmentative devices for the purpose of communicating. Since the advent of the tablet, the device has been integrated into their daily living so much so, they each have two devices; one for educational purposes and one for entertainment.

Mom stated, “The technology has made it so much easier because they can communicate a lot better than having to pull and put pictures on Velcro.” Mom noted it has decreased her children’s frustration level allowing for more communication. She expressed that David, her oldest child diagnosed with autism, was using the tablet within his first year in school having graduated from the PECS system, to a miniature tablet and then the full size tablet.

Mom notes that when the tablet was first given to her son, a collaboration evolved between the classroom teacher, school speech therapist and herself. This created a triangular relationship that revolved around her son using the device. First Mom needed to learn programming which required regular communication with the school. Then, she needed to be able to carry it through in the home. She noted that today she does very little of the actual programming. Rather, most of it is able to come from the school. This allows the school to focus fully on the educational portion of her oldest son while the family is able to offer more time toward their interpersonal relationships.
The technology has benefitted him beyond utilizing it for the purpose of communication. Mom explains that she began putting social stories on the tablet for both her children’s use so they could learn how to navigate a variety of social situations. The school augments her stories with ones uploaded from Youtube®. She explained this has carried over to his core academics, especially in reading. She talked about how reading is very engaging for him. She said, “that’s how we got him starting to read is reading the stories, either myself or the teacher, and then him reading it but now, he’s learned all these sight words. Then, also in addition to the sight words, hearing the stories has been engaging and gotten him to read.” She adds, “…we noticed within the last couple of months, over the summer actually, I was sounding out things so he started modeling that. Now he will attempt to decode it himself if it’s a word he doesn’t know. Sometimes he’ll look at me like, “Am I saying that right?” and I’ll correct him if he’s not saying it correctly.” The original intention of social stories was to assist the children with negotiating their social environment. The aspect of modeling has led to further benefit that has carried over to school and home.

The tablet has also offered each of the boys an opportunity to enjoy music. They have their own set of songs they prefer, but Mom explains that they will share with each other when there is a common interest with any particular song. The purpose of using the tablet as a means of entertainment was not the initial intent but it satisfies a need in the children’s lives.

The tablet has served a ‘sitter’ role as well. Mom shares, “On weekends, I let it be (the schedule) flexible. I do let him have the iPad® in the morning. Mostly, for my own sanity so I can get a couple of extra hours sleep. One of us, either me or my husband, can get a little extra sleep.” Mom also utilizes the iPad® during the week between homework and dinner. She says they may use their iPad® to “play games on there or listening to music on there.”
The data shows there is a relationship between schooling and the device. The history of David’s use of the tablet is detailed through his schooling. While he originally began with large, clumsy devices, he soon turned to the tablet. The school asked to use the parent’s materials because they saw the value in them but not enough to purchase them. Using the device to help advance David’s communication was important enough to the parents that they lent their materials to the school. Now David is receiving the technology twenty-four hours a day between school and home. The device is the foundation of the home-school relationship. The device has also served as David’s internal voice. When he needs to communicate, he turns to the device, although not as much now as when he was younger. When David began to initiate communication with the adults, he was encouraged to push away from his device in lieu of verbal speech. This was implemented consistently between school, his private therapist and his parents. The tradeoff is that a lot of emphasis must be placed on his articulation of sounds. Mom said he is able to communicate effectively but “there is occasionally times we don’t understand what he wants and we have to tell him to show us on his device. Sometimes he can and sometimes he can’t, depending on if that choice is there or not.” Connor was already more adept at his communication skills so his relationship with the tablet is less dependent. However, he, like his brother, utilizes the tablet for separate purposes.

Because the device is an integral part of both boys’ communication, between home and school, a special collaboration exists between the family and the teacher. Mom explained how the teacher has been using Educreations to make movies for Connor. In a collaboration around teaching the alphabet, the teacher asked Mom to come up with the key words for each letter. Mom shared, “I uploaded pictures from Google Images onto there so her and him are going to narrate that and he’s going to do the same thing, like he did that and doing more questions like
that where he provides the answer.” Mom finds this a very successful endeavor and a
shared experience between home and school.

Mom affirmed that prior to David having the tablet he was completely nonverbal until he
was about five or six. She said, “He started saying some words that were more clear. Really
using the Proloquo2Go™. I think he started using it probably when he was… he must’ve been
about four or five when he started using that particular software.” The result of using the
software, David began to string words together to make thoughts. Mom also stresses that the
tablet allows David as well as Connor to listen to an item over and over again for the purpose of
reinforcement. It is comparative to having a traveling classroom.

Incorporating the tablet into the family has had positive outcomes. When Mom was
asked what she believes is most improved in their family since integrating the tablet for the
purpose of communicating, Mom responds, “Just communication ability, frustration level has
gone down with the use of the iPad®.” She goes on, “Yeah, just being able to effectively
communicate, whether it be a one-word utterance or a couple of words utterance, verbally or
through the iPad®.”

Giving thought to how the tablet has helped the sibling relationship, Mom also shared
that she’s “hoping with David, to take, like I said, take a step back and have him use the tablet a
little bit more to engage him more than a one- or two-word conversation with his brothers.” She
allots a great deal of time facilitating communication with them but now that both children are
adept with the tablet, she hopes to step back in the process.

There is a strong relationship between the use of the tablet and the outcome of the
communication. The Apps on each child’s tablet are specifically chosen for their level of
communication skills and their personalities. The school has been a fundamental part of the
process as has been the family’s outside Speech Pathologist. Mom acknowledged that it has taken many people over the years to help reinforce and solidify the children’s communication skills. When asked if she believed the tablet really increased the family dynamics at this point, she responded in the affirmative. She stated that each day is different but the children have learned a skill set that has improved family relationships. For David, he has lowered his frustration, reduced his aggressions and improved his speech. For Connor, Mom stated she has a repertoire of ideas to utilize with him acknowledging he is a different child and might need different programs to be successful. For both boys, the tablet has had made a positive impact in their lives both at home and at school. They have an identity that is expressed through the tablet and now with stronger verbal skills with their words. The three prong approach of teacher-student-parent focused around the tablet has offered new life into the family. The collaborative approach allowed the adults to work to make the children successful. Mom’s advocacy has permitted her children to acquire the needed tablet to advance their communication skills. In turn, the parents have reaped the benefit of their advocacy working side by side with the teachers and outside therapists to provide the boys with the needed competencies. Mom says, “…the more support, the more communication you have between school and administrators and outside therapists and other parents, it’s only going to help your child better communicate through assistive technology. …Connor’s teacher, she’s constantly sharing ideas with other teachers that have the similar population of students but are at different levels, like high school, middle school, and the next level up from her. They’ll say, “oh, we never thought of that.” So sharing ideas, it gets people brainstorming and coming up with better ways to help these kids through the use of technology.”
Introduction to the Problem of Practice

This chapter reviews the problem of practice through a case study highlighting the research questions that were chosen specifically to capture the nuances of family dynamics with children diagnosed with autism. Understanding the history of technology and how it has come to play a big part in everyone’s daily living was the initial bridge into the world of autism. Next, the theoretical framework flushes out the research that has already taken place as it pertains to both developmental language and family dynamics. The seminal research reviews, again, how the study complements the research that already exists and how the findings fill at least some of the gap in the literature. Implications for practice offers some insight into why the research has relevance now and in the future. Lastly, implications for further research addresses how the researcher has changed as a result of completing this study and how she plans to implement the information learned from the Talbot family.

Families of children with autism have struggled for the last thirty years to provide a viable means of communication for their children who have no verbal, or minimal verbal, abilities. With little to rely on, families have made adjustments using primitive low tech approaches to mediate the language environment they live in. While technology was always built for the masses and those without neurological and developmental difficulties, autistic children suffered due to the lack of capacity for addressing their particular needs. Since 1983, when Steve Jobs introduced the computer generation, he explained that following 1960, when the first personal computer was constructed, it had positively impacted how we worked.
Fifty years after the introduction of the personal computer, Apple® introduced a much anticipated device, the tablet. This multidimensional tool was designed for maximum function in a portable size. The goal was to offer the business world a way to increase work productivity and functionality. Ultimately, the product was quickly adapted into the educational setting, allowing not just typical students but atypical students to benefit from the multidimensional aspects of the tablet.

Technology has always been an important part of communication for students with autism. Most of what had been invented up until 2010 was often unwieldy to manipulate and too expensive to acquire. Aside from issues of ownership and usage, families found time was not on their side and utilizing these cumbersome tools did not foster greater communication among family members. However, children with autism appeared to gravitate to the tablet without assistance from the educators. This provided new hope for assisting autistic children with communication skills in an already crowded field of devices. But the tablet was different. The complexity of the options combined with the ease of use provided the first ray of hope in many years.

This study set out to explore how tablet technology impacted families with autistic children. Learning the various ways tablet technology improved family dynamics, increased discourse among immediate family members, and carried into the community would hopefully provide a framework for understanding the overall impact of this technological wonder. The study sought to learn the types of opportunities for communication involving the tablet and whether they could be replicated by other families. Next, the study looked at the individual family members who had the most significant role as caregivers to understand if the tablet’s use
allowed the autistic child to have increased dialogue and participation in both their family circle and in other locales such as school or the community.

This study sought to answer these two questions:

(1) *In what way(s) does assistive technology, specifically the tablet, help non-verbal and low-verbal autistic children negotiate their environments?*

(2) *How do their caregivers describe the cognitive and social production in relation to their environment based on the utilization of the tablet?*

In the case of the first question, the tablet served as a communication device that created a bridge for conversation between David and his family, school, and community. He was able to create a dialogue with his parents to make his needs known. The same happened with Connor but because he had better communication skills to begin with and received assistance earlier than David, his skills advanced more rapidly. During one interview session, Mom said when the children were smaller and had limited speaking skills, they pulled her over to the object they wanted. With the tablet and the software applications, the children could have a voice without literally speaking. She articulated the tablet had a positive impact on their family dynamics.

Mom has now acquired two tablets for each child. She believes the tablet has been the device combined with many other structures that has improved family dynamics.

Mom and dad both saw value in using the tablet as a means of communication. Throughout the interviews, Mom spoke favorably about how the tablets expanded her children’s worlds. The infinite number of applications available for them to use created many opportunities for them to communicate. Both parents sat with the boys regularly to play educational games and or complete tasks using the tablet. The tablet has been the voice for their children when they could not formulate their words or thoughts. Mom pushed to integrate the tablet into their
She was positive the device would make an impact on the boys’ worlds. She was correct in her assessment. She also noted that “It takes a village” to raise the children, something she admits she never believed prior to raising her two boys with autism.

**Theoretical Framework**

Two theoretical frameworks served as the foundation of this research. The Developmental Theory and the Family Systems Theory both offered an in-depth understanding of how a child develops language and how the child grows socially and cognitively in order to negotiate the family structure and the community outside their home.

**Developmental Theory**

The Developmental Theory was supported through the works of Piaget, Bruner and Vygotsky. Piaget is best known for his “stages of development” which suggested the typically developing child progressed through the initial stage of assimilation and continued until he/she reached their full development to accommodation. Prior learning experiences permitted the child to make application of their knowledge toward new and novel situations involving language and actions based on the child’s environment. Piaget looked at a child’s cognitive and biological maturation. He postulated that a child who developed typically would have the capacity to negotiate human interactions that allowed for appropriate social integration. He also believed that passing through his “stages of development” in order of presentation was a requisite for uninhibited emotional and cognitive growth.

Piaget’s pre-operation stage was reflective of a child’s developmental years, ages 2-7. Those crucial years are during the time a child learned critical social and language cues that would carry them for the remainder of their lives. The memory storage of this information was needed to ensure they were able to negotiate novel social situations.
Piaget’s theory offered a framework of expectation for how children develop based on a constant and orderly set of experiences. He believed the cues children learn would be embedded in their language area to be called upon when needed. However, children with autism fail to retain an experience on the first attempt and sometimes for many opportunities after the initial exposure. In contrast to Piaget’s theory, children with autism frequently require multiple exposures in order to understand the organization of a social cue, know when to call upon the social cue, and store new information about the social cue when an adjustment needs to be made. Even with multiple exposures and trials to learn how to navigate these events, they might not be able to retain the experience for the future (Miller, 2011).

Bruner investigated the education component of the child. He recognized learning is an active process where the child creates meaning out of their environment based on the situation they are experiencing in the moment (Miller, 2011). All children require the same foundation but the ability of the child with autism to recall from memory those experiences is compromised, resulting in failed family dynamics. According to Bruner’s theory, the child with autism never reaches the readiness stage, inhibiting their ability to communicate either within the family or out in the community.

Vygotsky studied how the child functioned in relation to the environment they lived in. He coined the phrase “Child-in-Activity-in-Cultural-Context” meaning the child was observed while in their environment in relation to how they interacted and not separately as the child versus the environment (Miller, 2011). Vygotsky believed cognition was a dynamic process and not static, relying solely on stored information. He linked developmental changes to changes in cognition. Unfortunately, the child with autism generally is not able to establish a relationship with his environment, inhibiting his growth. The child’s inability to rely on stored experiences
and activate that knowledge during active engagement is negligible if at all. They lack the cognitive development to link the present with the future and cannot rely on stored experiences like their typical peers. This obstructs typical family dynamics and personal relationships resulting in stressful interactions within the family circle.

The Talbot family’s experiences with two boys with autism served as an excellent example in understanding the dynamics of these developmental theorists. With her first child, David, Mom described how he developed language and then at the age of eighteen months began to lose his ability to speak or utter sounds. His example demonstrates why learning how to function in the family circle as well as in the community has been so difficult. She said, “David, I noticed him trying to say some words until he was probably eighteen months, and then I noticed he wasn’t. The words started going away.” Neither David nor Connor developed language consistent with the developmental expectations of the developmental theory. Mom addressed the number of exposures each of her children needed to have success with a given cue. Even then, so much of the language development was fostered through a number of caregivers beside the parents. These specialists consisted of the speech therapist and school educators who gave the needed support to help the family. With all of this support Mom characterizes her children’s growth as remarkable but fraught with frustration.

The developmental growth of a child with autism is not characteristic of Piaget, Bruner or Vygotsky. A child with autism develops unevenly, sometimes quite unexpectedly. In some cases, they just as easily regress. Mom described a series of times when she created social stories or programmed either one of her son’s iPads® in order for them to negotiate their environment like their typical peers. She also recognized if not for the constant interaction of the adults around both her children, neither might succeed. Neither child could communicate well
enough independently to have their needs met. As she said, “A lot of it [social interaction] is adult facilitated.” The use of the tablet has facilitated greater communication in a more Piagetian fashion, as the technology can help organize the communication. This, in turn, has led to increased positive dynamics, not just in the immediate family but in other environments such as school and the community.

Understanding the developmental theories helped me as a researcher to frame the questions asked of Mom for each interview session. Learning how the tablet was utilized and how it served as a substitute to create the chain of discourse with another human being, solidified the positive outcomes generated by its use. Language development in both boys has developed at different paces but both have demonstrated progress. The tablet has provided an adaptation that gives the boys access to a world of language by programming the tablet with various Apps that let both of them communicate with the individuals around them. The tablet can be said to serve like their mirror neuron system, creating a storage system that the boys can rely upon.

**Family Systems Theory**

The Family Systems Theory looked at how the family unit functioned as a whole and as a single unit. Murray Bowen, author of the Murray Bowen Theory, developed a construct that fit under the umbrella of the Family Systems Theory. He observed people’s behavior in the family unit with an emphasis on the mother-child relationship and the triads in the family that consisted of the father, mother, and child. He created eight concepts that focused on the child as the center and how the family relates to society (Bowen, Butler, Bowen, & Kerr, 2013).

Bowen’s work originated during World War II when soldiers returned from the war with what is known today as Post-Traumatic-Stress-Syndrome (PTSD). The basis of the theory examined relationships among people in specific groups such as the family unit (Rabstenjnek,
Bowen stated that atypical family situations stressed family relationships. He observed the stress in a family unit through his post-World War II work with families.

Bowen’s theory can be applied to families with autistic children even though the focus is not on PTSD. Bowen highlighted the stress placed on family dynamics when a family unit did not function in typical fashion. Reflecting on the triad of father, mother and child, he recognized each unit members’ responsibilities could not be met when interruptions took place in the individual roles. The Talbots’ family has two children diagnosed with autism. The typical dynamics in a family are absent. Whether they negotiate food content at the table, choose a vacation location, or venture to the store for food, the family must focus on each step of the undertaking to ensure it will run smoothly. Even then, the unexpected interruptions force the family to change their course of action on a minute’s notice. Mom described planning for a vacation, “…this summer was the first summer we decided to take a week-long vacation. …we had originally planned to do a road trip and we were going to Hershey Park.” After careful reflection, the family opted for a vacation close to home with less activity because they recognized that their oldest (child) would not cope with the wait time required.” The parents constantly reflect on their choices before moving forward. Every decision they make is generated with the children in mind and what will make their environment the best. The family dynamics are an integral part of how the Talbots function. Decisions were predicated on their children’s needs and never on their own. But, as Mom said in one of her interviews, there is stress in the decision making.

The combination of these two theories served as the basis for this research when studying the relationship between family members in a single unit both pre- and post- the introduction of the tablet. Gaining a greater understanding of how a child with autism might comprehend their
environment, using these two theories as a research basis, provided affirmation of the current research and offered new insight as to how family dynamics are affirmed or altered based on the child’s development.

The selection of these two theories was fitting in the context of a family with two children with autism. The Developmental Theory provided the foundation to understand how children with autism might negotiate their world as well as why, despite repeated exposures, the information cannot be stored in their memories. Children with autism require multiple opportunities to practice an outcome and, even then, may not store the information in their memory. The research with the Talbots showed that having two children with autism, often presented two kinds of opportunities for them to learn the same experience. Mom spoke numerous times about how she often made social stories in order to help the boys learn how to respond to various situations. One child gravitated to the stories while the other child used them but not with regularity. One child took pleasure in the videos and the other child could learn through a story board.

The two theories grounded the research, because focusing on the children led to greater understanding as to how the children developed cognitively. Their inability to store information for long-term recall when they encounter similar experiences multiple times helped to validate the types of stresses placed on any family. The Talbots appeared to be similar to other families in that respect, but Mom’s relentless desire to provide optimal conditions for the boys to learn language was extraordinary. She honed in on what the boys needed and made sure these needs were fulfilled.

The theoretical frameworks addressed typical neuro developmental adults and children. Based on these two theories, the Talbots represent an opportunity for hope. Their boys have not
progressed through the steps given by Piaget or the developmental schemata explained by Bruner. Their family does reflect the findings of the Murray Bowen Theory where the family triad is comprised of mother, father and child. The nucleus of a family is intact and Mom ensures that it remains intact despite the stresses placed upon the structure.

This research is affirmation of the theoretical frameworks and adds to the knowledge by confirming atypical children have developmental stages that might ebb and flow. They might not progress at all and even fail to pass through the stages of development. Yet, there is an opportunity to learn as demonstrated by David and Connor. They lag in their development but Mom is working to help them through the various stages without realizing how her efforts are creating an environment ripe for learning social cues. The boys were at the center of this family and how they related to each other was based on the need to create positive learning experiences. The mother’s understanding that the development of language growth was crucial to both boys’ advancement and reinforces the premise that understanding the social cues in the family and the community reduces stress. Mom explained multiple times that when the boys understood what was being asked of them they cooperated, resulting in positive outcomes. When the boys were able to engage the adults around them to make their needs known, stress was reduced and relationships were strengthened. Conversely, when the boys were unable to negotiate their environment whether they were at home or at school, their anxiety escalated, resulting in frustration and negative behaviors.

Mom’s understanding that language development was the key to her children’s advancement; she took advantage to offer her children as much assistance as possible. When one service was removed for occupational therapy, she added additional speech sessions in that opening to reinforce their skills. She recognized the importance of gaining as much language
growth as possible during her children’s critical developmental years. Even though both boy’s language development lags behind their typical peers, the gains each child has made demonstrates the importance of continuing efforts to improve their skills.

**Seminal Research**

The seminal research for this study was divided among four themes. The first theme, Theory of Mind (ToM) explored communication skills in the child with autism spectrum disorder (ASD). How language is developed in the brain was explained using the Theory of Mind. Peter Mitchell, a British researcher introduced his primary work in 1997. The basis of his work looked at the mirror neuron system (MNS) examining how children manipulated language and then stored it for future use. He approached his work much like Darwin using an evolutionary structure to explain the brain’s adaptation to the environment. He studied apes to gain a better understanding of social behavior and then applied his knowledge to children. Utilizing the ape’s behavior, he created a framework that mirrored behavior in human beings. Mitchell employed a false belief system for the purpose of understanding the relationship between behavior and utilizing mirror imaging for recalling experiences. Mitchell’s work suggested that children make meaning of their environment at any time. All decisions were anchored in some sort of belief system (Mitchell, 1997).

Mitchell’s research began in England but the implementation of his work took place in North America. The framework of language development was comprised of five systems that included Theory of Mind, Mindblindness, False Belief Systems, Mirror Neuron System and technology. The research was focused on the relationship between the Theory of Mind and language acquisition (Perra, Williams, Whiten, Fraser, Benzie, & Perret, 2008; Begeer, Malle,

Research underscored that a disturbance in communication in the child with autism impeded their ability to relate to other human beings (Prizant & Wetherby, 1993; Sparrevohn & Howie, 1995). However, it did not mean these individuals could not communicate with other human beings. In contrast, research bore out the fact they could relate to humans but they must be trained to do so. The degree of interruption determined the level of need for training.

The mirror neuron system was the basis of the research because it played a large part in the child’s ability to communicate, manage emotions, and control social interactions. The importance of focusing on the speech emanates from the research that suggest up to 50% of students never develop functional speech or it may be compromised and possibly reduced to simple labeling (Tager-Flusberg, 1996; Tager-Flusberg, 2000; Wan et al., 2010).

Focus on the mirror neuron system was the foundation of the research because it was the portion of the brain that allowed a person to register experiences and store them for future use. When individuals encountered a new experience, they store the new experience in that portion of the brain. Then, as new experiences were introduced, they were compared to the ones in storage and adjustments made in relation to making meaning of the new experience (Mitchell, 1997).

The relationship between perception and action was due to the mirror neuron system that reflected and stored the results of an event. Hence, when the child experienced a repeated event, the child called upon the storage for the outcome. When a new experience took place, the child needed to store it and then evaluate it in context with the previous experiences. Children with autism could not perform this function because they were unable to tap their mirror neuron
system. They failed to recognize the experience no matter how many encounters the child might have had (Mitchell, 1997).

The Theory of Mind impacts how children from birth on are able to communicate with others using both verbal and non-verbal language. Deficits in communication influence the outcome, often having a negative impact (Petersen, 2005; Baron-Cohen, Leslie, & Frith, 1985; Charman, Baron-Cohen, Swettenham, Baird, Cox & Drew, 2000; Astington & Jenkins, 1999).

As stated earlier, how technology influenced the mirror neuron system was relevant to the discussion. The research focused on the connection between technology and the mirror neuron system. The Theory of Mind could be altered based on the implications of technology because the layers of the brain are altered through its use (Francis, Mellor, & Frith, 2009).

Social pragmatics was a key factor in recognizing the characteristics of autism. Children with autism have a negligible understanding of what to do in social situations because their ability to retrieve past experiences from storage in their mirror neuron system, fails them in the moment of need. Baron-Cohen (1997) highlighted the autistic child’s inability to recognize social relationships in their environment. He restated that it is really a case of the Theory of Mind gone off kilter and can best be explained as “mindblindness”. He stated the mirror neuron system wreaked havoc with the role of social pragmatics resulting in specific language impairment (Begeer et al. 2010; Marton, Abramoff, & Rosenzweig, 2005; Asington & Jenkins, 1999; Peterson, Garnett, Kelly & Attwood, 2009; Gillott, Furniss & Walter, 2004).

The mirror neuron system has played an important role in a child’s development. The typical child learns how to negotiate their environment through trial and error. The ASD child, by contrast, has a flawed mirror neuron system. Storage of information may not happen. If the child should find an avenue to store information, retrieving it may be inconsistent.
The Talbot family affirms the notion that social pragmatics is not a natural occurrence in their family structure. Mom retained an outside speech therapist and occupational therapist to ensure everything possible was being done to equip her children with the needed skills to negotiate their environment. Even then, she recognized the path to solidifying these skills has not and will not be easy. She feels it is her responsibility to provide as much support as she is able to in order to give her children the necessary grounding. Time and time again, the mother referenced why she remained at home to raise the children, the sacrifices that needed to be made to offer this support, and her goal to never give up on them. Without any formal education, Mom realized that providing her children with the most beneficial amount of speech services would provide them the greatest opportunities moving forward. It is important to note that on more than one occasion, Mom needed to make decisions that did not coincide with the wishes of her public school. She frequently functioned in an advocacy role to ensure the schools understood the path she expected them to take as she moved forward. Her choices were not popular with the school and, ultimately, her first child needed to leave the public school to secure a more intensive educational experience.

The second piece of the research indicated children with autism are capable of acquiring communication skills. Even though children with autism may not develop language skills like their typical peers, this may not be evident to the adults until they reach as late as two or three years of age. The form the communication takes can be varied, ranging from no communication skills at all to some children who have the skills intact but cannot have a discourse with anyone. Even more difficult to explain is the child who develops language and then regresses after the language has been firmly established (Jones & Campbell, 2010). This is exactly the situation the Talbots found themselves in with their first child. As Mom explained, somewhere around
eighteen months they began to see David regress, first losing some words and then losing all sounds until there were just utterances.

The child’s regression of language can be a developmental setback, or it can be a result of the child reaching a plateau. In the first situation, the child acquires language and then loses it. In the second situation, the child plateaus and stops developing language for no apparent reason. In addition to the deficit in the child’s language development, other communicative skills might be at risk for advancement.

Children with autism struggle with some facet of communication and language development. Unfortunately, the level of impairment is not predictable and assuming how to remediate the deficit is equally difficult. The Talbots provided the researcher an opportunity to observe and learn how multiple children in a single family have gained and lost language skills. She demonstrated that giving the children continual assistance in the area of speech benefitted them both now and in the future.

The third area of research is the relationship of technology to the child with autism. Most technology designed has been for the neuro-typical individual. The intent of the technology was to find ways to streamline a function or perform a task either faster or more efficiently.

Technology has been a part of our lives since 1947, offering a plethora of activities with an early emphasis on business world applications. In contrast, Congress took action only three decades ago to ensure that individuals with disabilities could have similar opportunities to their typical peers.

The history of technology for students with any type of special need has ranged from low tech to high tech depending on the population and the task that needed to be achieved. But the
use of technology to assist the mirror neuron system for children with autism will offer greater access to communication.

The Talbots personify how technology can serve as an arm of communication, allowing both David and Connor to negotiate their environment. For David, being the oldest meant he was the first in the family to access technology for the purpose of communicating. Mom spoke about his history of utilizing technology first with low-technology, a two-dimensional picture system, and advancing to high technology, ending with the tablet. Connor was fortunate that by the time he was diagnosed, the tablet had already been released and was easily accessible.

Mom’s continual advocacy for her children has provided an environment rich in Apps and language resulting in higher language production. When the tablet was first released, she refused to wait for the school to purchase it, and took it upon herself to buy one for David. Now, both children have not one, but two tablets for their use. The first tablet is strictly for educational purposes while the second tablet lets the boys enjoy games and other types of appropriate entertainment. Mom is continuously seeking new ways to utilize the tablet and spends time researching new Apps that will enhance their communication. She stated that the children are her life and she would do anything for them. That has included educating herself in order to ensure her boys have the needed equipment loaded with the correct Apps for improving their communication with the world. What they might be missing in their mirror neuron system is assisted by the use of the tablet.

The original purpose of the tablet did not include the eventual utilization for the special education world. None of the tablet makers could have envisioned their products would allow an often excluded segment of the population to become active participants. Almost seventy years
after the computer was invented, and thirty years after the passage of special education laws, children with autism can fully participate in their world through its use.

**Implications for Practice and Recommendations**

This study explored the experience of a single family with two children diagnosed with autism and how the family dynamics changed with the introduction of the tablet. Several themes evolved through the numerous interviews with the parents; the majority of the interchanges occurring just with the mother, informed the following implications for families making the determination to introduce the tablet into their family structure.

**Family dynamics change with the tablet**

The introduction of the tablet into a family for the purpose of improving communication can be productive for families. For the Talbots, the development of the tablet came after the development of the iPod®, a smaller version of the electronic device. Both David and Connor learned to use the iPod® while in their preschool years. They graduated to the iPad® once it arrived on the market. Mom embraced the technology before her children’s school elected to incorporate it in their educational program. Her desire to find ways to help her children communicate and have the best advantage possible in life was a driving force in her finding ways to access the tablet. Through numerous conversations, it was obvious that Mom saw the value of the tablet. She sought out various ways to use the tablet for the purpose of communication and then added educational Apps. Mom also found the advantages of using the Tablet for the purpose of entertainment. While this is a secondary use for the tablet, it is a convenient one as Mom described during one interview. She expressed it as a possibility to get a bit more sleep on a Saturday.
Mom’s insatiable desire to assist her children has proven to be a positive decision. She has sacrificed many things in her life to ensure her children have what they need to succeed. Further, the historical context shows that both boys are able to communicate without the tablet but it is available in the event they need it. Just a few years earlier, Mom explained that the tablet required programming with a special application to help the boys speak. Now, they are able to have conversations in the family circle and not rely solely on the tablet. This family serves as an excellent example of how to incorporate the tablet for the purpose of increasing communication skills among family members. The regular use of the tablet for the purpose of communication in the Talbot household has improved family dynamics.

**Educators should incorporate tablet technology into the school day**

With each passing year, the number of applications available for the tablet increases. Many of these applications are designed specifically for educational purposes. The vast array of applications offers the educators an endless pool of ways to introduce content to students.

In this study, the number of teachers who were knowledgeable in technology was inconsistent. This caused some difficulties for the parents of David and Connor. The type of education their children received was dependent on the knowledge base of the teacher. Mom needed to communicate regularly with the teachers to be sure they were working with her sons using applications that benefitted their learning. Mom noted there was a particular teacher in her district that she considered the most knowledgeable in the area of technology. She was confident in this teacher’s ability to instruct her children using technology. When her oldest child moved to Extended Year Services (ESY), she found the level of knowledge among the teachers was significantly less than she expected. She noted David regressed each summer because the momentum in learning was dissipated by the lack of understanding of his summer school
teachers. Even his BCBA told David he needed to adapt to the changes in the program. David was unable to comprehend the meaning of this request and mom recognized her son did not have the capacity to make the requested change.

The experiences that Mom described, both the positive and negative, suggested that a collaboration must exist between home and school for any program to be successful. Mom gave experiences that showed the greatest success happened when she and the school worked together to create change for her sons. The collaboration was further enhanced when the outside speech therapist was incorporated into the conversation. In contrast, the summer programs assigned to her sons were not successful. In addition to the change in faculty and curriculum, the teacher’s lack of knowledge around technology was an impediment to her sons’ progress. This indicates that teachers must be afforded professional development in order to service students appropriately. Money cannot be the deciding factor if teachers are given professional development. The teachers need to know how to use the technology in order to teach with it. Otherwise, student progress is stymied. Mom has shown the research to find Apps is not difficult. Mom has also shown that learning to program the tablet and use the App is doable. If Mom, the non-educator is able to search out the applications, load them on the tablet and utilize them with her sons, then the school should be able to follow suit.

**Advocacy plays an important role**

Time and time again, mom gave examples of how she, independent of the school, elected to visit Boston Children’s Hospital to learn about the tablet, researched Apps on her own, sought assistance from an outside speech therapist and was willing to say “no” to the school’s recommendations for both of her sons. In the case of her first son, David, she needed to communicate with the school regularly to inform them what she knew David needed. Her
interviews repeatedly offered examples of her advocacy work on behalf of her children. In one instance, Mom stated that after the school refused to buy the iPad®, she went out and purchased it herself. The school was willing to use it, just not willing to buy it. Perhaps, the novelty of the device caused skepticism among the educators, especially the administration responsible for approving the purchases.

Six years later, the tablet has infiltrated nearly every school in America. Because of its pervasiveness, schools have trained teachers in the many uses of the tablet. Special Education has been one beneficiary of the tablet. The unexpected benefits for students with disabilities has made the tablet a gift for students. The quantity of Apps has benefitted the students because of the variety and cost to offer programs. Today, most schools provide the professional development for the teachers and advocate for tablet technology.

The role of advocate should emerge from the school, not the parent. With the abundance of tablet technology in the schools today, educators should be well versed in these tools. They should have a partnership with parents by which the students are the beneficiaries of the relationship. Collaboration is key for the students if they are expected to show gains across all settings. Further, the parent should be allowed to be the parent. They should not be forced to advocate for their child in order to receive the needed technology. Mom never pleaded with her school but she needed to place pressure on them in order to receive assistance. Even when the school would only partner in a limited fashion as when they were willing to work with David and his iPad® but not willing to purchase it, the parent should not need to struggle to receive assistance. After all, if a parent of a typical student made requests for items in the classroom, would they not be honored? Unfortunately, when a school district is not forthcoming when a parent makes a request, the relationship can escalate to the adversarial level quite rapidly. Parents
of special education students do experience difficult relationships because schools will see their situation for their child differently. When this occurs, parents become advocates for their children. We can assume they know their children best. If their expectations are reasonable, then the educators need to listen to what parents believe will help their children.

The role of advocate is to guarantee children are given the needed assistance in order to achieve in the classroom. A good collaboration is the best way to avoid tension, establish a good working relationship, and honor the child’s needs.

**Understand primary caretaker’s role in the process**

Mom served multiple roles for her children, ensuring they received the necessary technology and teaching to maximize their learning. While both parents participated fully in the children’s education, Mom remained at home during the early critical years because she felt her role was to be the facilitator of their educational opportunities. She recognized that one of the parents needed to remain fully involved in their children’s needs. Her husband’s position warranted his continuation at work. Logically, Mom stepped in as the primary caretaker focused on her children’s needs. Throughout the interviews Mom spoke little about what she sacrificed by staying in the house with the children. During one interview session she commented that she had only recently returned to work now that her children were more settled and functioning at a higher independent level. When they visited relatives’ houses for various family functions, there was a great deal of preparation to ensure it was a positive experience for their family as well as the relatives. Still, Mom is always “on-call” when company is around the boys.

The type of facilitation, research, advocacy, teaching, and love that Mom gives to her children on a daily basis required her full attention. She asked for little in return. For many years, both she and her husband stayed at home. Only now are they beginning to go out for
dinner together while they leave the boys home with a sitter. The lack of time for herself was evident, but she noted that all the time devoted to her boys was worth the outcome. She stated multiple times that she felt she needed to offer her children as many opportunities as possible so they could have the best possible outcomes later.

**Implications for Research**

*Schools should look at their methodology for working with families*

The response Mom received from her school district in terms of purchasing and utilizing technology for her child may be common in the area of special education. Schools must be flexible with parents and learn to collaborate with them. While it is understandable that not all relationships are perfect collaborations, the more improved the collaboration between the schools and the parents, the more improved the student outcome. Keeping parents informed about what is happening in the classroom and working with them to ensure a productive outcome is critical to having a successful relationship that will benefit the child.

*Repeat the study with other families*

The Talbots represent one family with two children diagnosed with autism. It is important to replicate this study with other families who have multiple children or one child with autism. Perhaps, some families have not been as successful as the Talbots when implementing tablet technology. A family with one child may have had another type of experience. Or another family might have had different experiences that can add to the literature and offer more opportunities in the field. Looking at families with older or younger children now that the tablet technology has been on the market for seven years may offer another perspective than that of the Talbots.

*Examine communication skills through specific applications*
Each day new applications appear on the market. The inundation of Apps makes it difficult to know which ones are best. Honing in on a number of Apps in a specific order to see if the outcome improves communication skills that, in turn, improve family dynamics might offer hope to parents who look for a definitive answer on a curriculum, a type of App, or specific technology.

**Understand the position of the parent(s)**

The Talbots were an extraordinary family. They understood their children’s needs and were relentless when the school suggested an alternative arrangement or methodology. Mom never allowed the schools to have the final decision. She worked in concert with the schools but retained all rights. It is very important for the schools to understand how the parents feel. The parents are not the education experts but they might need to become one when their child is diagnosed. The schools need to understand how the parents feel and then build a structure around that, recognizing their part of the process.

**Professional development for schools**

Throughout this process it was apparent that some educators were not prepared for the level of response the parents were hoping for. Now that seven years have passed, it is more common for school districts to provide teachers with appropriate professional development in order to service students. Even so, the autistic child requires very specific, high level professional development. School districts need to ensure funds are available so their staff are able to receive the necessary training.

**Consistency with ESY programs**

The Talbots had numerous experiences with summer programming that would indicate their children were underserved each time. As mentioned earlier, their oldest child participated
in an ESY program at a time when schools were beginning to include the tablet in the classroom. While the tablet serves as the mechanism by which the children may communicate, the teachers must be trained in the population they are expected to teach. In David’s situation, he required very specialized instruction for educators who were experts in the field of autism. The school was not able to utilize teachers with that expertise, choosing to use teachers who were certified in special education, but in a different area. The reason for making that decision is not known, but it can be assumed the specialists David required were not available for his summer program. The purpose of ESY services it to prevent regression. In order for ESY to be successful, children must be given the same highly skilled teachers in their summer weeks that they are offered during the regular school year.

**Advocacy is important for all parties involved with a student**

David was very fortunate that his mother was able to have full participation in his educational program. This was only possible because she did not to work. This allowed her to be the advocate her children needed to ensure their success. She advocated for technology, software, curriculum, teachers, and types of classrooms. She was the children’s greatest advocate. Parents need to be advocates for their children, but so do the schools. Some families actually hire professional advocates to be sure schools are following the children’s educational plan correctly. When a third party is brought into the process, a sense of mistrust might arise. If schools examine the role of each person on the TEAM and then work collaboratively to establish what is best for the child, the reduction in stress and increased attention on the child should lead to successful outcomes.

**Research schools who do not support tablet technology**
Despite the success demonstrated with the Talbot family, not all schools may share the same philosophy as the schools David and Connor attended. There are schools, both public and private, who advocate the use of tablet technology impedes the autistic child’s desire to develop speech. When this occurs communication is reduced and frustration increases. Still, some educators believe that the child should learn to communicate without the tablet. They suggest it may serve as a crutch and encourage the child to rely too heavily on it as a form of speech production and less on their own capacity. The philosophy that drives this educational decision may lend a broader understanding as to why some children are offered the tablet while others are not. There is an important element deciding what distinguishes the need for a student versus what does not. More information is needed to know why a school decides an autistic child should be encouraged to speak versus offered the tablet with Apps that might help them negotiate their environment.

**Self-care is relevant**

Throughout the interviews Mom emphasized her need to be an integral part of the developmental process for her children. The quantity of time she committed to researching technology, educational materials, and school programs is demonstration of her investment. Additionally, she sought out the best outside help she could find that was near to her home, offering her children multiple opportunities for language development. The time, money and sacrifice to ensure this occurred on a daily basis was enormous. Yet Mom did not address how she found ways to rejuvenate. It appeared that her commitment involved not just the times her children were awake but even after they went to sleep. She spent time researching and reading ways to increase her children’s capacity and improve their communication skills. Ultimately, her devotion to seeking out speech and language, occupational therapy, physical therapy,
technology, curriculum and even vacation spots for the family demonstrates her desire to maximize her children’s opportunities. Still, gaining a greater understanding about the type of respite care she might require to maintain her high level of involvement remains an area that requires further investigation.

Sharing the wealth

Recognizing that students with autism can benefit from tablet technology is important. Once a school, school district or community understand the potential of tablet technology utilized for increasing communication skills, a plan needs to be developed that would allow access to it. The price of the tablet has moderated over the years, especially with market competition placing pressure on the manufacturers. It is no longer one corporation producing the tablet and controlling the customer. The competition has provided for a wider range of options so families can access the technology on their own. But, if families are not in a position to do so, schools need to step in and assist families. Today, the number of grants provided through state governments or private foundations has grown. Schools need to have a plan in which they can help families find the needed technology by either directing them to an opportunity or the school personnel might even need to help facilitate the connection and paperwork that accompanies the request. When this is not an option, schools need to have a technology plan that builds in the devices so families do not need to wait for a tablet.

The Talbots were fortunate because Mom was able to take the time to seek out assistance by asking questions and investigating options. This is not the case for all families. Schools must be prepared to help families access the technology.

Action Plan
This study will be beneficial for school systems investigating ways to develop effective programming for students with autism. I plan to share my findings with districts in the Massachusetts area. As a Superintendent with a special education background, I have access to an array of educational settings in the state. Now that I have reached retirement, I have the ability to consult with both schools and parents to ensure students are receiving the strongest program possible for students with autism. My focus will be on two specific items; building relationships with the parents and creating ESY programs that reflect the autistic child’s needs.

**How I have changed as a scholar**

I think it is important to state that I grew up with severe learning issues at a time they were not recognized. I did not learn how to read until I was eighteen years of age. This has had a life-long impact on my decision to become an educator and my desire to ensure all students have the best opportunities possible. I, personally, recognize the importance of caring and well-trained educators. I feel compelled to ensure that all students, especially ones who cannot advocate for themselves nor have families that are able to advocate for them, be offered an appropriate education that complements their learning needs.

This process, a long one, has helped me to be more introspective and think analytically about the education field. It has helped me to understand how much I miss being in the classroom with the day to day activity that occurs when working directly with students. I look forward to retirement so I can have the time to return the classroom, even if it is on a voluntary basis. This will allow me to continue to grow as an educator and scholar.
References


Appendix A

IRB Action

Figure A1
Notification of IRB Action

[Image of NOTIFICATION OF IRB ACTION document]
Appendix B

Participant Recruitment Materials

Figure B1
Recruitment of Participants Copy for Email and U.S. Mail

June 1, 2015

Dear Parents or Guardians,

My name is Barbara Cataldo and I am a doctoral candidate at Northeastern University in the College of Professional Studies program. I am studying how tablet technology impacts family dynamics when there is a child with autism. Specifically, I am interested in exploring how parents decided to use the tablet, at what point parents included the device in their child’s daily living, how it has changed family dynamics, and why this particular device is meeting with success unlike many other devices on the market today.

The reason why this study is important is because of the struggle students with autism encounter when developing language skills. Technology tools designed to help students communicate are often complicated and expensive. Families might invest in these tools but if they are not easy to program and use, the devices are not used. In contrast, the tablet has created a new environment for children with autism. They have greater portability, are easier to program and more cost effective.

There will be six one-hour sessions that take place in the home with you, the parents or guardians. If more hours are needed, they will be mutually agreed upon but the number of hours will not be less than six. As the parents or guardians, you may quit at any time if either one or both are uncomfortable. A series of interview questions will be asked of you with dialogue branching off from any of the questions asked. Confidentiality is important and your identity will never be made public. As well, all results from this work will be reported in a confidential manner. All records will be kept in a password-protected computer file and paper copies will be kept in a locked cabinet. As soon as the initial results are in, I would be happy to report them to you.

This research greatly depends on your help and participation, and I will be grateful if you are able to help me out. If you would like to hear more about the project and how we would work with your child, please contact me directly. Thank you for your consideration of this project.

Sincerely,

Barbara J. Cataldo
781-789-2621
cataldo.bj@husky.neu.edu
Barbara Cataldo

Introductory Script for Phone Calls to Schools

Hello. This is Barb Cataldo. I hope all is well with you today. I know we have spoken over the last few years that I am working on my dissertation. I am contacting you directly because I am aware that you have programs for students with autism. My topic is Tablet Technology and Its Impact on Families With Autistic Children. I am contacting you because I am ready to work on my research component and am looking for a family to help me. Let me tell you about the criteria for the project. I am seeking a family with a young child with autism. The child should be in the early stages of working with a tablet in order to communicate with the family. I am hoping to have two parents or guardians involved if possible. Also, the child may or may not have siblings. If they have siblings, birth order does not matter. It will require I come to their house to meet with the family for six one-hour visits. Families will have the option to stop the research anytime. Finally, all information will allow them to remain anonymous. I also have a letter that will be shared with families that address the details about the research. I will send that to you following our conversation. I only need one family to complete the project that I hope to begin by July 1st. I hope you are able to suggest a family to me so I may complete this important work. You have my contact information. Once you have located a family I will send them an introductory letter. I hope you will be able to connect within one week. Thank you.
Appendix C

Informed Consent Documents

Figure C1
Informed Consent Page 1

Informed Consent Document

Northeastern University: College of Professional Studies

Name of Investigator: Principal Investigator-Dr. Karen Reiss Medwed
Student Researcher-Barbara J. Cataldo

Title of Project: Tablet Technology and Its Impact on Families with Autistic Children

Informed Consent to Participate in a Research Study

We are inviting you to take part in a research study. This form will tell you about the study. You may ask any questions that you may have. When you are ready to make a decision, you may tell me if you want to participate of not. You do not have to participate if you do not want to. If you decide to participate, you will be asked to sign this statement and you will be given a copy for your records.

Why am I being asked to take part in this research study?

You are being asked to participate in this study because you have a non-verbal or low-verbal child with autism who is beginning to or has shortly begun using a tablet as a communication device in the household and at school.

Why is this research study being done?

The purpose of this research is to learn how the use of the tablet impacts families and influences the child’s social and cognitive abilities.

What will I be asked to do?

If you decide to take part in this study, the student researcher will visit your home and observe your family for approximately six hours.

- I will come to your home or visit you for no more than six visits lasting approximately one hour each.
- During these visits I would like to have some time observing your family using the tablet to communicate.
- I would like to interview you, the parent(s) or guardian(s), of the child with autism to gain a deeper understanding how your family dynamics change when the tablet is.

Where will this take place and how much of my time will it take?

You will be asked to allow the researcher six hours in your home to observe your family and interview you, parent(s) or guardian(s), of the child. The interviews will last approximately one hour and the participant(s) will be given a copy of the questions. This will take place in the child’s home unless the family decides to move outside of the home during that one-hour period.

Will there be any risk or discomfort to me?

During the course of the interview process you will be asked to discuss your child. There might be moments when the topic will be emotional. You could be asked to elaborate on specific events in your child’s life that will elicit emotional outcomes. While your child will not be interviewed, some of the questions you might be asked could expose intimate details about your family.

Will I benefit by being in this research?

There will be no direct benefit to you or your family for taking part in this study. However, the information learned from this study may help other families as well as community entities that work with students with autism.

APPROVED

SIGNED

THROUGH

11

Northeastern University - Human Subject Research Protection
Rev. 02/10/15
Who will see the information about us?

Your part in this study will be confidential. Only I, the researcher, will see the information about you. No reports or publications will use information that can identify you in any way or any individual as being part of this project.

All participants will receive pseudo names to protect their identity. No one will be able to match the pseudo names with you.

Any and all data collected during the course of this research will be maintained in a locked file in the researcher’s office for twenty-four months. All audiotapes will be destroyed along with any paper documents.

In rare instances, authorized people may request to see research information about the participants in this study. This is done only to ensure the research is collected properly. We would only permit people who are authorized by organizations such as the Northeastern University Institutional Review Board to see this information.

What will happen if I suffer any harm from this research?

No special arrangements will be made for compensation or for payment for treatment solely because of your participation in this research.

Can I stop my participation in this study?

Your participation in this research is completely voluntary. You do not have to participate if you do not want to and you can refuse to answer any questions. Even if you begin the study, you may end the relationship at any time. If you do not participate or if you decide to quit, you will suffer no consequences as a result of your decision.

Who can I contact if I have a question or problem?

If you have any questions about this study, please speak with me and I will put you in contact with the Northeastern University office overseeing this study.

Who can I contact about my rights as a participant?

If you have any questions about your rights in this research, you may contact

Nan Regina, Director
Northeastern University
Human Subject Research Protection
360 Huntington Avenue, Mailstop: 490 Renaissance Park
Boston, MA 02115-5000
Phone: 617-373-4588
Fax: 617-373-4595

Will I be paid for my participation?

You will be given a $25 gift card to Whole Foods Market at the conclusion of the research.

Will it cost me anything to participate?

There will be no costs to you to participate in the research.

Is there anything I need to know?

All legal guardians or parents must sign consents.

APPROVED

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Rev. 4/21/2015
I agree to take part in this research.

Signature of person agreeing to take part

Date

Printed name of person above

Signature of person who explained the study
To the participant above and obtained consent

Date

Printed name of person above

APPROVED

NU Ref. 18SP 77-15

VALID THROUGH 5/23/15

Northeastern University - Human Subject Research Protection
Rev. 4/2/2015
Appendix D

Sample Interview Script

The following prompts are representative of questions that will be asked in the interviews. The interview process is designed to be semi-structured by design. Situations surrounding the visit may prompt other areas of questions. It is expected that follow up questions will be utilized during the interview sessions.

**Interview questions**

How old is your child?

What is the gender of your child?

Please give me a history of your child's schooling

Can you discuss the means by which your child has communicated since birth?

What methods or materials have you employed to work with your child to communicate with them?

What tools, either low tech or high tech have you incorporated into your family to help communicate with your child?

Are there any tools or technology devices you have tried that you did not find met your needs?

How long have you been working with a tablet?

What kind of apps are you using on your tablet to facilitate communication?

What kind of activities do you find most useful when utilizing the tablet?

How do you feel your family has changed since implementing the tablet into your family?

What uses do you employ the tablet? Can you describe some of the specific activities that you believe are most successful?

Can you address if and how utilizing a tablet has allowed your child to communicate with their sibling(s)?

What is the number one thing you feel has improved in your family since using the tablet to communicate?
Is there anything you would like to see incorporated into the tablet that does not already exist so you could facilitate improved communication?

Can you say if you feel having a tablet in your child’s hands has increased the family dynamics?

How do you feel having the tablet has improved your relationship as a couple?

Can you give an example of a before and after situation where the tablet has truly changed the family dynamics?

Can you share some examples that demonstrate how the tablet has allowed the family to function more typically?

Can you talk about routines and how the tablet has helped the family?

How much time and training do you require to utilize the tablet? Do you feel you are able to make adjustments to maintain positive family dynamics?

What else would you like to tell me about how the tablet use for your child has improved or maintained positive family dynamics?