Enhancing Learning with the Use of Assistive Technology for Children on the Autism Spectrum

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Abstract

This goal of this study is to understand the effective learning of the iPad and the use of the system to assist elementary-age students with learning. The research literature promotes different types of assistive technology used for learning and suggests a few applications to use for the iPad.

Four students with autism learned to use an iPad tablet to learn phonics. An empirical approach was used via teacher action research by collecting observation data on students. The purpose of this research was to evaluate the effectiveness of using the iPad in teaching language arts.

The data indicated that all participants began learning more independently after the iPad was introduced. Their performance in communicating and in recognition and identification of letters became apparent. These results are presented in the context of how effective the iPad can aid students who are on the Autism Spectrum.

Chapter 1 Introduction

About a year and a half ago, I was researching an alternative augmentative communication device for one of my students. My student was a non-verbal student, male, 10 years old, on the classic autism spectrum disorder. He started attending Oak Hill School in the beginning of September of 2010. In his IEP it is listed that he uses an AAC to communicate. At the time, his district provided him with an AAC device that he was using called the Springboard Lite. This device was a fairly portable device that helped him communicate. The cost of the Springboard Lite was $2,595 and had the same use as a picture exchange and communication program. Through different informal assessments and observation of the use of his device, my student was not using his device as a functional use of communication. Instead of purchasing more programs to use for his device, which cost a fortune, my instructional aide and I decided that we should look into the use of the iPad as a communication device.

The iPad was introduced to consumers in January 2010. The iPad is a touch screen device for consuming media in all its forms: video, music, the Web, electronic books and magazines, and video games.

For years, different modes of technology have been used to improve the quality of life of people who have various developmental disabilities. However, the varied use of

technology for children with autism continues to receive limited attention, despite the fact that technology tends to be a high interest area for many of these children.

This literature review investigates current research on various modes of technology, including technology designed as a augmentative communication system, for children with autism and how assistive technology can be utilized to improve their language skills.

A wide variety of augmentative and alternative communication devices are used to meet diverse needs of individuals with autism spectrum disorders. Individuals with Autism Spectrum disorder have difficulty using natural speech to meet their daily communication needs. In order to meet the needs of children on the Autism Spectrum disorder, what types of portable computing options can be used?

Purpose Statement

The purpose of this study is to develop teaching strategies in using the iPad with children on the Autism Spectrum. Additionally, information on technology tools is insufficient as a resource for parents and education.

Research Question

In what ways can the use of the touch screen electronic device, iPad assist in language arts instruction for non-verbal autistic children aged 7-10? For the purposes of this study, the term language arts refers to teaching phonics and letter recognition.

Theoretical Rationale

As a result of the Civil Rights movement, students of color were allowed to attend integrated public school. Parents of children with disabilities or special needs used this legislation to advocate for their children so that they could attend local public schools in the general population. The legislation also established that these students were entitled to a Free Appropriate Public education. This was established through federal legislation, *Public Law 94-142* "Principles of IDEA." Learning Disabilities of America. October 22, 2011). This law had a dramatic, positive impact on millions of children with disabilities in every state and each local community across the country. The purpose of the public law 94-142 was to assure that all children with disabilities have available to them a free appropriate public education which emphasizes special education and related services designed to meet their unique needs. The law was to assure that the rights of children with disabilities and their parents were protected. This law assisted states and localities to provide for the education of all children with disabilities and to assess and assure the effectiveness of efforts to educate all children with disabilities.

Assumptions

Assistive technology is becoming part of the fabric of the school day and the classroom. There are so many different devices to choose from. Educators understand that new technology can serve its purpose for teaching children with autism. There is little documentation on effect.

Background and Need

Kanner's Syndrome -Classic Autistic Disorder

Kanner (Autism United.org, 2012) described and studied this well-known and common disorder. Originally the syndrome was referred to as "Kanner." Later it became known as Autism Spectrum Disorder (ASD). These students have limited emotional connection with others, and they are often seen as "living in their own world." (Bender, 1959, p. 82) They often want everything to be the same all of the time, and this includes routine, sometimes down to the exact minute, choice of clothing, food, and television shows or movies. They can be deeply affected by noises, bright lights and smells. They are generally considered to be low functioning, but how well their mind works is largely unknown because of extremely poor social and communication skills.

Pervasive Developmental Disorder (P.D.D)

Also called "A-typical Autism." Children with this disorder have many of the same characteristics of Autism, but not all the criteria associated with autism.

Asperger's Disorder

Children with this disorder do not have the usual language barriers associated with autism and are generally very intelligent. However, they do tend to struggle with social interactions, and can fixate on a particular object or subject they take an interest in.

Retts Disorder

First described by Rett, in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV American Psychiatric Association, 2000) this disorder is a rare and little-

known type of autism, and seems to only happen in girls. These patients often have problems with muscle atrophy, and tend to do repetitive hand motions. They are almost always mentally retarded to some degree, and are very low functioning. This particular type of autism has been diagnosed since the 1960s, and in the late 1990s, researchers pinpointed a gene that might cause this condition. The symptoms of Retts begin to occur between ages 1 and 4.

Childhood Disintegrative Disorder

This is also rare and something that strikes children who appear to have normal development from birth. Usually between two and four years of age, regressive symptoms begin to develop. These children often do not potty train; they will lose the will and the ability to interact with other children, and will lose an interest in play. They will also have problem with the motor skills that were something they at one time had mastered. They will stop talking, or their communication skills will regress to some degree.

Effectiveness of Video Modeling to Teach iPod Use to Students with Moderate Intellectual Disabilities

The purpose of the study was to examine the effects of video modeling delivered via computer on accurate and independent use of an iPod by three participants with moderate intellectual disabilities.

Chapter 2 Review of the Literature

Historical Context

During the last decade, Augmentative Alternative Communication System began to merge together with the field of assistive technology. Assistive technology is using aided tools to improve the lifestyles and skills of individuals. This term includes eyeglasses, hearing aids, close-caption television, wheelchairs, adapted computers, Braille elevator buttons, and AAC. Legislation has been adapted and enacted to ensure that individuals have access to AAC technology and related services for implementing the technology (e.g. Individuals with Disabilities Education Act and the Technology Related Assistance for Individuals with Disabilities Act) (Glennon, 1993).

The use of alternative methods of communication can be traced back to ancient times when individuals who were deaf or could not speak developed a manual language. Manual languages were also used by Native Americans to communicate with members of other tribes (Glennon, 1993). The beginning of AAC is considered to be the 1950s. Many of the first AAC devices were developed by professionals with disabilities who struggled to communicate with others.

As the years progressed, more children survived premature births and the population of people with cerebral palsy, motor impairments or paralysis increased. Adults began to survive strokes, disease and trauma. Many professionals attempted to use AAC on individuals with aphasia and cerebral palsy and documented it in journals. As the years progressed into 1960 and 1970, the public and the government became more

aware of individuals with disabilities. During the late 1960's, students with disabilities began receiving educational services

Towards the end of the 1970s, AAC was viewed as a legitimate method of communication. This was prompted by PL 94-142 that mandated appropriate education for all children and the Rehabilitation act of 1973, which prohibited discrimination against individuals with disabilities within any program receiving federal money.

Definition of Autism

Autism is a complex developmental disability that typically appears during the first three years of life and is the result of a neurological disorder that affects the normal functioning of the brain, impacting development in social interaction and communication skills. Both children and adults with autism typically show difficulties in verbal and non-verbal communication, social interactions, and leisure or play activities. Autism affects people of every race, ethnic group, and socioeconomic background. Boys are four times more likely to have autism than are girls. According to a study by the Centers for Disease Control and Prevention (CDC), autism spectrum disorders were found to affect as many as 1 out of every 150 8-year-old children.

Autism is one of five disorders that fall under the umbrella of Pervasive Developmental Disorders (PDD), a category of neurological disorders characterized by "severe and pervasive impairment in several areas of development."

Review of the Previous Literature

There are three main characteristics of autism: social interaction impairment, speech, language, and communication impairment, and stereotyped and repetitive behavior. In simple terms, autism effects language, perception, the senses and social skills. Parents often report the lack or loss of normal language development when seeking help that ultimately ends with a diagnosis of autism. Language and communication are often the most observable, but other issues that individuals with autism deal with on a daily basis are described in the following sections.

Sensory Integration/Perception Issues

Indicators of autism include oversensitivity or under reactivity to touch, movement, sights, or sounds—often times people with autism experience oversensitivity and under reactivity simultaneously. These issues with sensory integration difficulties can manifest themselves in the appearance of physical clumsiness or carelessness, poor body awareness, a tendency to be easily distracted, impulsive physical or verbal behavior, an activity level that is unusually high or low, being unable to unwind or calm down, difficulty learning new movements, and difficulty in making transitions from one situation to another (*Felipe et al, 1999*).

Social Skills

Individuals with autism have an impaired ability in social and personal relationships because of the issues they have with reading non-verbal cues, as well as knowing what another person is thinking or feeling through both expressive and body language.

Language Delays in Children with Autism

Across different individuals with autism, there is a wide range in the expression of the social, language and communicative deficits. Some of this variability may be related to cognitive level and age at which the child is examined. There may also be differences in the degree to which language is impaired across children with autism. Prominent psychologists hypothesize that these communication deficits may be caused by difficulty with understanding joint attention—drawing someone's attention via gazing or pointing. *(Mundy, 2007).* Studies from the department of psychology at the National Chung Cheng University showed that: (1) young children with autism display deficits in both initiating and responding to joint attention but the latter may remit with development; (2) higher IQ and lower mental age (MA) may be related to different joint attention deficits manifested by children with autism; (3) deficits of joint attention were observed from infants to adolescents in autism; joint attention skills were concurrently associated with language and predicted long term gains in expressive language.

Many children with autism are non-verbal past the time that a typically developing child would develop speech. During a child's first year of life is when typically language begins to develop. Auditory development grows, babbling and nonsense talk appears, and vocal responsiveness and receptive language skills are being built. With the onset of coordinated joint attention, intentional communication starts; the child begins to point or grab an adult's hand to show them something. These communication building blocks typically appear at the age of none to ten months, long

before the first spontaneous words are uttered (McCauley & Fey, 2006). Many children

with autism do not follow this typical development schedule; some may not utter their

first words until they are four or five years old, while others remain non-verbal their

entire lives. Studies have shown that unless some useful language is developed by the

age six the likelihood of acquiring language is very small (Charman & Stone, 2006).

Many children with autism display a reduced or even non-existent motivation for social

communication. They often require external reinforcers to engage in social

communication (McCauley & Fey, 2006). Language skills are directly related to

motivation and some people with autism have little intrinsic motivation (Snead, 2010).

Since children with autism exhibit significant deficits in language development,

they also exhibit delay in imitation including object, gesture and verbal imitation skills.

Imitation skills play a foundational role in the development of spoken language. In one

study, (Ingersoll & Schreibman 2006) used a multiple-baseline design across five young

children on the autistic spectrum to examine the efficacy of Reciprocal Imitation Training

(RIT) for teaching object imitation. All five children improved their ability to imitate

actions with objects. In addition, they also improved; their verbal imitation skills despite

the fact the intervention did not directly target verbal imitation. In a second study using a

multiple-baseline design (Ingersoll, Lewis and Kroman 2007) taught five different young

children with ASD to imitate gestures during play. Again, all children increased their

ability to imitate gestures as well as their verbal imitation. Taken together, these studies

suggest that teaching non-verbal imitation skills via RIT may be an effective method for

increasing language skills in autistic children.

Define Assistive Technology

Assistive technologies are defined in the federal law that provides the foundation for all

special education service- the Individuals with Disabilities Education Improvement Act

(IDEA 2004). This law's definition of assistive technology consists of two parts:

assistive technology devices and assistive technology services. IDEA 2004 defines an

assistive technology device as "any item, piece of equipment, or product system, whether

acquired commercially off the shelf, modified, or customized, that is used to increase,

maintain, or improve function capabilities of a child with disability" (IDEA 2004, Sec.

1401(1)(a)). The 1997 reauthorization of IDEA was the first law to require that assistive

technology be considered for every student receiving special education services. This

can include high or low-tech devices, products or software to help individuals with

disabilities in many different facets of their lives. Many times, we see assistive

technology being used with individuals who have a physical or cognitive disability to

help them with daily living skills or communication. Assistive technology can be a

wonderful tool in working with many different kinds of disabilities or impairments. It is

my goal to explore the benefits of assistive technology for those with autism, along with

parents, teachers and practitioners that work with individuals on the autism spectrum.

Whether the incidence of autism is rising, or there is better criteria and education for

diagnosis, looking at the benefits of using assistive technology in children with autism is

very relevant for all of those affected by the diagnosis. Very limited consideration has

been given to this concept, but the use of assistive technology is promising to provide

unique tools in the development of language, communication and other skills (Mondak,

2000).

      Assistive technology can encourage and support independent functioning skills,

self-help skills, overall understanding of the environment, social skills, expressive

communication and language skills, and sensory processing. When children have

developmental challenges, technology can provide them with opportunities to more fully

participate in group activities, increase communication, and be more independent in their

daily lives (Mondak, 2000).

      Research has found that children with autism process visual information more

effectively than auditory information (Schlosser, Blischak, Belfiore, Bartley & Barnett,

1998). Assistive technology devices can be used with children with autism to support

their strongest processing modality, which can include visual cues and visual schedules.

One of the most common visual strategies is the use of pictorial schedules to assist

children with autism in understanding activity sequences in order to make transitioning

from one activity to another easier and less stressful (Quill, 2000). Visual symbols are

also used for choice making, to support language comprehension when augmented input

is needed (Vaughn & Horner, 1995). For example, if a picture exchange communication

system is used (PECS), visual supports are provided in the form of drawings or real

pictures. Language is used on the part of the parent or educator and the child can make

choices using symbols while strengthening their comprehensive and expressive language.

Although most of the research regarding assistive technology and autism is positive and supports the use by parents and educators, there is very little research available. It would be advantageous for additional research to be completed on the subject of assistive technology in order to support the current work, make the practice better known and to provide more resources to parents and teachers of children with autism.

Who Cannot Communicate?

Being able to communicate your thoughts, feelings, and ideas is absolutely critical to being successful in school and the workplace. Being able to understand other people's communication attempts is equally essential. For people who cannot speak or hear speech, technology offers a range of solutions.

Communication problems are one of the defining characteristics of individuals with autism (Wing, 1996). Although they do not have physical disabilities and some may be able to recite television commercials or sings songs by rote, many students with autism have dyspraxia, which is an interruption in the ability to program the position of speech musculature (Stuart, 2002). They do not have the motor planning skills necessary to express themselves meaningfully.

Strategies to Exchange Communication

Deficits and problems of communication are a core component of the diagnosis and treatment of children with autism (American Psychiatric Association, 1994; Waterhouse, Morris, Allen, Dunn, Fein, Feinstein, Rapin & Wing., 1996). Since a third of all children with autism fail to develop speech, non verbal communications systems such as hand

signs, pictures or word cards serves as alternatives (Quill, 1997; Bondy & Frost, 1994;

Schuler & Goetz, 1993: LaVigna, 1987).

Many non-verbal children with autism show reduced vocal imitation rates, a

restricted babbling repertoire, and deficient skills in imitating sounds (Stone, Lemanek,

Fishel, Fernandez, Altemeir, 1990). At the same time, these children frequently have

better or even normal skills in visual discriminations. This is reflected in good

performance in completing puzzles or remembering locations (Siegal, Minshew &

Goldstein, 1996). In these children, visual-spatial skills dominate verbal skills to the

extent of an average difference of 20 IQ points (Allen, Lincoln & Kaufman, 1991; Rutter,

1985). This means that children with autism process visual information easier than

auditory information. Any time we use assistive technology devices with these children,

we're giving them information through their strongest processing area. Therefore, using

various types of technology, from low tech to high tech, should be incorporated into

every aspect of daily living in order to improve the functional capabilities of children

with autism.

Visual Representation Systems

For years, educators have been aware of the advantages of introducing children to

enriched learning environments that reinforce a child's primary learning style whether

they are an auditory, kinesthetic or visual learner. An auditory learner interprets the

underlying meaning of speech through tone, pitch and voice speed. A kinesthetic learner

absorbs information by physically interacting with their environment through movement,

drawing or taking notes. The majority of children with Autism are visual learners who often think in pictures and more readily comprehend a lesson if provided with visual cues. Verbal instructions alone are not usually a sufficient form of communication for these children. It is easier for a child with Autism to understand the teacher's intended communications by visual facial cues, hand gestures and body language. However, one of the challenges faced by Autistic children is the common problematic behavior of making eye contact and socializing which directly interferes with the ability to optimize a visual learning style face-to-face with people.

One way to improve these children's lives is to introduce learning tools called Augmentative Communication. This assistive technology provides visual information in a creative format to improve a child's ability to complete activities of daily living both in the home and at school. Depending on the situation, various visual systems can be introduced to turn up the volume on learning.

The intent of this research is to provide parents and educators with a rich resource of assistive technology ideas to assist them in working with a child with autism. Assistive technology tools are described in depth as a resource to parents and teachers.

Types of Assistive Technology: Low, Mid, High

"Low" Technology: Visual support strategies which do not involve any type of electronic or battery operated device—typically low cost, and easy to use equipment. Example: dry erase boards, clipboards, 3-ring binders, manila file folders, and photo albums, laminated PCS/photographs, highlight tape, etc.

"Mid" Technology: Battery operated devices or "simple" electronic devices requiring limited advancements in technology. Example: tape recorder, Language Master, overhead projector, timers, calculators, and simple voice output devices. "High" Technology: Complex technological support strategies - typically "high" cost equipment. Example: video cameras, computers and adaptive hardware, complex voice output devices.

Statistics

Autism Spectrum Disorders are a group of developmental disabilities that can cause significant social, communication and behavioral challenges. According to the center of disease control, there is an estimate that an average of 1 in 110 children in the U.S have an ASD. It is estimated that between 1 in 80 and 1 in 240 with an average of 1 in 110 children in the United States have autism spectrum disorder.

ASDs are reported to occur in all racial, ethnic, and socioeconomic groups, yet are on average 4 to 5 times more likely to occur in boys than in girls. However, we need more information on some less studied populations and regions around the world. Studies in Asia, Europe, and North America have identified individuals with an ASD with an approximate prevalence of 0.6% to over 1%. A recent study in South Korea reported a prevalence of 2.6%.

Approximately 13% of children have a developmental disability, ranging from mild disabilities such as speech and language impairments to serious developmental disabilities, such as intellectual disabilities, cerebral palsy, and autism.

Studies have shown that among identical twins, if one child has an ASD, then the other will be affected about 60-96% of the time. In non-identical twins, if one child has an ASD, then the other is affected about 0-24% of the time. Parents who have a child with an ASD have a 2%−8% chance of having a second child who is also affected.

It is estimated that about 10% of children with an ASD have an identifiable genetic, neurological or metabolic disorder, such as fragile X or Down syndrome. As we learn more about genetics, the number of children with an ASD and an identifiable genetic condition will likely increase. A report published by CDC in 2009, shows that 30-51% of the children who had an ASD also had an Intellectual Disability (intelligence quotient <=70).

Studies show that fragile X affects 5% of people with an ASD and 10% to 15% of those with fragile X show autistic traits. One to four percent of people with ASD also have tuberous sclerosis. About 40% of children with an ASD do not talk at all. Another 25%−30% of children with autism have some words at 12 to 18 months of age and then lose them. Others may speak, but not until later in childhood. Studies indicate that up to 60% of these children will be unable to communicate their wants, needs, and thoughts verbally. According to birthrate statistics reported by the CDC, that means that up to 17,000 children are born each year who will be diagnosed with autism and remain functionally non-verbal.

Administrative Records

According to the executive summary school of accountability report card in 2011, there

are 34 students with disabilities at Oak Hill School. 75 % of the students are White, 3.6% are African American, 10.7% are Asian, 3.7 are American Indian, and 7.1% are Hispanic. The school is Kindergarten through secondary school. There is not enough data available for students in proficient and or above on California Standards test.

Special Collections

As a professional, I have built a collection of books on the topic of autism. My most useful book that has carried many resources is the book called "Assistive technology in the classroom" by Amy G Dell. This book highlighted the experiences of students with disabilities and the use of assistive technology. It showed me the many different ways students learn through technology.

Autism Spectrum Disorder By Amanda Boutout provided a comprehensive coverage of characteristics and strategies for students on the autism spectrum, including real-world examples, and a strong focus on research-based practice.

Engaging Autism By Stanley Greenspan opened my eyes to the perspective of children with Autism Spectrum Disorder. It helped me learn more about how children on the autism spectrum related and communicated, with a floor time and DIR teaching method. Bryna Seigel wrote the book "*Helping Children with Autism Learn*". When a child with autism lacks the ability or drive to imitate things in the world around him, he fails to engage in critical self-initiated experiments that should allow him to construct a world of meanings for the objects and activities he sees. This book taught me that imitation was a complex ability, and it was also a complex disability. Difficulties with imitation were

thought of as a convergence of at least two main areas of innate disability that may affect children with autism.

Playing Learning and Laughing with children on the Autism Spectrum By Julia Moor

Dominican library

RISE

Parent Education network

Marin County of Education

Interview with an Expert

As part of my research for this topic, I interviewed an expert, Dan Phillips (personal communication, April 18, 2010), an AAC / AT specialist and speech pathologist, who started the Technology Resource Center in the local county education offices. The Technology Resource Center in Marin is one of the most respected and renowned programs in the world. It is the envy of every school district in California. It is the only program of its kind created and supported by the community for the benefit of all children receiving special education services in the local area. The services they provide are assistive technology and augmentative alternative curriculum assessments, equipment loans, adaptations, open labs, training, and lending library. Children referred by their teachers receive comprehensive assessments on how they learn and the best ways to help them succeed. Before equipment is recommended for purchase for a student, the TRC provides a loaner to make sure it's the right intervention. Each year tens of thousands of dollars are saved through buying the right equipment for the right kid only after it has

been thoroughly tested. Adapted curriculum enables kids of all abilities to access

standard lesson plans. Software, specialized books on CD and other interventions

provide children with the educational content they need. The TRC has become an

essential resource for teachers and families. Open labs allow hands-on exploration of

materials, equipment and software to educators, students and families. Training for

teachers, resource specialists, speech and language therapists, and other special educators

are the key to staying current in best practices and learning new software and equipment.

The software, low-tech devices, adapted curriculum, and resource information are

available for educators and families to check out at the Technology Resource Center.

The focus topic of my interview was to ask Dan Phillips his opinion on the use of the

iPad for children on the Autism Spectrum specifically in learning phonics in the English

language arts. I asked open-ended questions.

      Years ago, Dan Phillips was interested in working with challenging

communication cases. He wanted to work with kids that no one really wanted to work

with. He found that students who were nonverbal but had cognitive capabilities were an

interest to him. So, he started working with these students more often. He has used all

kinds of technology working specifically with non- verbal kids. What brought the iPad to

the table to working specifically with these kids were that it was more affordable

compared to the rapidly taking of many other devices and systems. An iPad that includes

touch screen abilities, video and web is $500.00 compared to a dynovox, which can be

close to $7500. An iPad is an easy technology to understand and it was a platform that

everyone can all relate to which many kids and families already have experience in using as a tool. The iPad as a tool can accomplish many things; it can be a book, a communication device, a writing tool, a therapeutic tool, and a mirror. Kids are extremely motivated to use it with very little training –and right away they can hold it in their hands and be able to interact with it. Dan talked about the many programs that he used for the ipad. He mentioned that all students use programs that range from communication applications, AAC, reading applications to develop literacy skills, to creating books. There were also writing programs that allowed students to use their hands, a stylus, a keyboard and voice to produce and develop written language skills, speech and language applications. The iPad still has a few access issues that sometimes make it difficult for students with fine or gross motor challenges to access the tablet completely. Other methods of access such as using a switch, or eye gaze, may come in time for the ipad, which is something he sees in the near future for children on the spectrum. He sees a lot of "plug and play" application such as the ones that you can pull up and let your kids go on it. What Dan is looking for are more apps that allow teachers to modify curriculum for their kids especially relevant in math. For learning phonics, reading and writing, there are so many apps that sometimes there are too many choices.

Generally, autism affects neurological functioning, which means the systems in the brain aren't firing all together. A common teaching strategy that would be helpful for these students, are programs that provide multi-sensory input. The ipad clearly shows visuals, provide auditory feedback, and provide tactile and kinesthetic feedback. Dan

concluded that the iPad does many of these things in the apps that he is finding and he

thinks the iPad will resonate with many autistic kids.

Ethical Standards

This paper adheres to ethical standards in the treatment of human subjects in research as

articulated by the American Psychological Association (2010). Additionally, the research

proposal was reviewed by the Dominican University of California Institutional Review

Board for the Protection of Human Subjects, approved and assign number 9083

Chapter 3 Method

Introduction

The study follows a teacher action research model. As the teacher assigned to students

with ASD, I examined four students who used the iPad for language arts instruction,

specifically phonics and letter recognition. I examined the questions: How did the

students use their ipad? How was the brain wired in learning with visuals? How to

ensure the learning of a student? What was the best app for the student?

Sample and Site

My research includes one interview with open-ended questions to Dan Phillips who is the

Speech Pathologist and Technology Resource Specialist at a local county office of

education. Dan Phillips is a great source of information. He was purposely selected for

an interview. My research also includes observation of students with ASD. The

demographic of the four students that I am focusing on is between the ages of 9 and 11,

grade 4th and 5th, all of which are male. The four students all have unique characteristics

of classic autism. 1 out of 4 students uses the ipad as a tool for communicating. The four

students all have speech and language impairments and are currently being serviced by a

speech pathologist.

Ethical Standards

This paper adheres to ethical standards in the treatment of human subjects in research as

articulated by the American Psychological Association (2010). All of the participants

and their parents were informed of the nature and scope of the study. The parents signed

a form to agree to volunteer their child to participate. All were assured that

confidentiality would be maintained, and that they had the option to withdraw from the

study at any time without any negative consequences.

Access and Permissions

These students are assigned to my class. I serve as the teacher of record.

Data Gathering Strategies

Data collection strategies includes teacher observation of student interaction with the

iPad, every time student recognize or identifies a letter, it is included in the assessment.

Every time a student does not recognize the letter was assessed in teacher observation.

Data Analysis Approach

Data were examined to calculate positive and negative instances of student performance

using the iPad.

Chapter 4 Findings

Descriptions of site, Individuals, Data

The school that was the subject of my research serves students across the San Francisco

Bay area with autism and other developmental differences. The school is located in

Northern California. The student statistics for the 2011-2012 school year are as follows:

3.6% African American, 3.6% American Indian, 10.7 Asian, 7.1% Hispanic, 75% White,

100% students with disabilities. The number of students for the whole school is 36. My

observation focuses on the classroom that serves students ages 9-11 years old with

language intensive needs. A strong emphasis on learning in language development

enriched with augmentative and alternative communication supports. Academic

instruction focuses on pre-academic skills and foundational living skills. A strong

sensory-motor element is infused throughout the school day, and multi-sensory learning

opportunities happen in both individualized and group settings. The school day is in

session from 9am-3pm. Three out of four parents are very involved with their child's

needs in school. They supervise home activities related to school. 65% of the students at

the school used the iPad as a tool for learning. In the classroom I observed, 100% of the

students uses the iPad. Over the following year, data was taken on four students in my

classroom. The data that was taken included results on four sets of comprehension

questions to identifying and matching letters. Each student was to learn 2-5 letters per

month and asked to identify the letter at the end of the month to see what they have

learned. This study included three different apps that provided instant reward

gratification with audio and text. All of the participating students had a diagnosis of autism.

My research also includes an interview with a speech pathologist and technology resource specialist from Marin County of Education. He has a strong background in working with children on the autism spectrum using different types of assistive technology. He runs a center that teaches a wide range of professionals that use the iPad in classrooms. The final component of my research includes previous articles and book reviews conducted on this topic. All of the previous research provided in this paper describes evidence of how effective the ipad is as a learning tool to teach children on the autism spectrum phonics and alphabet. I have found that although currently there is no research, assessments or studies conducted that prove the ipad to be an effective tool to teach children on the autism spectrum phonics and alphabets, some evidence and observations have implicated that the ipad is an effective teaching tool. The conclusion is that technology will rapidly advance and provide solutions to improve on language, academic skills, social skills and executive functioning in children with autism.

Overall Findings, Themes

I began this research topic around the time the first Ipad was launched in 2010. At the time, there were only 30-40 good apps to choose from for children with autism spectrum. When I researched for articles, I only came across articles that blogged about apps, but there was not enough research that was specific to studies about children with autism spectrum using the iPad. I found that each individual with autism has different learning

strategies and to conduct a valid research study to learn about how effective the ipad can work with children on the spectrum can be challenging. In our small sampling, every child with autism improved when using the iPad. With the children I observed, I found that Visual discrimination had improved. Students followed along from left to right. Certain apps on the iPad have instant rewards to motivate the students to continue working. The students become motivated when they hear sounds of praise as part of the embedded reward system in the different programs. Students improved their fine motor skills by writing on the iPad; tracing along the screen and with repetition began learning the letters in the alphabet. The tablet is easy to navigate by sliding the finger across the tablet. As for teachers, "We are able to do things that we couldn't do with a single-use device. We can work with one student, who is learning letters and shapes, then turn around and use it with another student who is learning yes or no questions. The applications allow for so many different levels and have so many purposes. It's really critical for schools. Applications like Look2Learn and Stories2Learn aid with student communication skills with recorded photos and audio. Stories2Learn promotes the creation of personalized stories that helps educators and parents teach social messages and exhibit personal cues. For those with linguistic or cognitive delays, the higher-priced, picture-based Proloquo2Go is one of the most recommended applications for exceptional learners. However, the more reasonably priced Grace application – picture based – is designed specifically for autistic (but helpful for all non-verbal) learners. However, one must keep in mind that no two individuals with autism are the same. The

percent of increase in information acquisition when using the iPad was 0-50% in my study. While no student showed a decrease in information acquisition using, the iPad and some students showed huge increases (up to 50%), some students did not show significant increases.

With recent advancements in technology, there should be a clinic or institute that provides a facility to investigate and research pilot studies of children on the autism spectrum using the ipad as a tool for fine motor skills, communication, learning language arts, mathematics, and executive functioning skills. There should also be a rubric for every app that is developed for children with autism. After reviewing my research, the main findings and observation is clearly that the iPad is such a new technology tool that there is just not enough research gathered to increase learning and understanding to improve the education for children on the Autism Spectrum. Each student learns differently and it depends on what strategies the teacher uses and what effective ways taught by using the iPad. Technology is constantly changing, when I started my research the iPad just came out, now we are on the iPad 3. Parents and educators can now find an app created specifically for autism called Autism Apps.

Chapter 5 Discussion /Analysis

Summary of Major Findings

My observation, interview and research have helped me see that the iPad is an effective

teaching tool for children with autism spectrum. The main finding is that the iPad is an

easy tool to navigate. It is cost efficient, and can be used as a tool for everything

including web, communicating, math, reading, writing and learning. For students with

autism spectrum the iPad can be very engaging, motivational and portable. It can help

encourage students on the spectrum learn and overcome challenges. An iPad's place in a

special needs class is apparent from the hundreds of positive testimonials regarding its

beneficial applications. The inspiration it currently provides as an assistive technology

tool proves immeasurable for the development of necessary skills to move forward.

Social implications of the technology, motivation and behavioral management provide

enough evidence to continue extensive research. Educators can alter the entire

framework of special education by aligning curriculum with the iPad. Students with an

array of strengths and skills from a widely diverse background can all benefit. The iPad

for special education classes brings simple accessibility and flexibility to the inclusive

community to improve the quality of life.

Comparison of Findings to Previous Research

Research is limited on the use of iPads for students with special needs, specifically ASD.

There is broad based research on using iPads with children with special needs. With

ASD, the use of the iPad is creating a phenomenon.

Limitations/Gaps in the Study

There are a few limitations and gaps in the study. I used only a small sample to use in my research. The small study was an in classroom observation. There was limited ability to evaluate student success using standardized measures.

Implications for Future Research

This study promotes many implications for future research. It would be more information if research was done in a pilot study during a clinical setting, hospital, and schools setting on the use of the iPad as an instructional tool. There is a need to develop a rubric for each apps created. It would be a significant factor in future research to interview more teachers and the strategies they use to teach students with Autism Spectrum. There needs to be a list of apps that works and does not work for students learning. More research is needed into new and emerging technologies to help professionals and parents understand what would be worth the investment for their students.

Overall Significance of the Study

The overall significance of the study is to enhance learning with the use of assistive technology for children on the Autism Spectrum. The main topic was to promote the different types of assistive technology used for learning. This study focuses on the specifics of the iPad used as a tool for enhancing learning for children with autism spectrum. Based on observations, an interview, and previous research gives us some evidence that the iPad is worth the investment for most students with autism.

About the Author

My name is Tin Fan. I graduated with a Bachelor of Science degree from University of

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