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What Educators Should Know About iPads and Students with Autism

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Abstract: *Anecdotal evidence shared by teachers appears to support the iPad as a useful tool for working with children with autism. However, there are thousands of possible applications, known as "apps", available in the Apple iTunes store for download and trying to decide what would be most useful for students can be daunting. This article will review the limited research currently available on usage of iPads with students with autism and share information about apps currently used, as well as information on peripherals and basic iPad accessibility features teachers may find useful in the classroom.*

Key Words: autism, iPads, apps, technology

Anecdotal evidence shared by teachers appears to support the iPad as a useful tool for working with children with autism. However, there are thousands of possible applications, known as "apps", available in the Apple iTunes store for download, with more added every day, and trying to decide what would be most useful for students can be daunting. There is such a variety of apps available, even an app to find apps for students with autism can be downloaded. As one parent said, "There are so many apps, and not all of them are great" (Joshi, 2011, p. 11). Additionally, while most apps are fairly low-cost, some can cost hundreds of dollars (for example, the popular *ProLoquo2Go* communication app costs $249.99 to download). The technology is still less than a decade old, with the original iPad released only in April 2010 and updated versions released in subsequent years (currently in its 8th generation, released in March 2018). Since its release, a smaller version has also been developed, called the iPad Mini (now in its 4th generation). There is also now the iPad Pro, which has accessories designed for it specifically, such as the Smart Keyboard and the Apple Pencil; however, at a cost ranging for $799.99 to $1,229.99 based on storage size and cellular connectivity, the Pro version is beyond the financial reach of most schools.

As with many new tools in education, research on usage is far behind implementation of the product. Teachers need to know now what apps would be most useful and the most cost-effective in their classrooms with students. This article will briefly discuss why iPad technology may be particularly useful for students with autism, review a handful of apps in a variety of categories, share some accessibility features and peripherals that can be helpful for students with autism, and finally, suggest directions for future study critical in this rapidly changing area of

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classroom technology.

Autism and Visual Learning

Autism is a neurodevelopmental disorder characterized by significant impairments in communication and social interactions, as well as the presence of repetitive and stereotyped behaviors (such as spinning, hand-flapping, or other compulsive behaviors). Prevalence of autism has been on the rise over the last two decades, with current rates estimated as high as one in every 59 births (Centers for Disease Control and Prevention, 2018).

There has been much research done in the last ten years regarding the possible etiologies and the actual prevalence rates of autism. Despite the progress being made in determining the etiology of autism, there is no clear consensus on the best method for treating children with autism or on therapies for managing the symptoms associated with autism and related disorders. Currently the most accepted and widespread treatments for autism are behavioral in nature. The methods of implementing behavioral change may differ slightly, but they are still highly focused on teaching more socially acceptable behaviors to the child with autism. Additionally, medications may be used to help control aggressive or self-injurious behavior. However, new treatments for autism are continually being developed and those published in peer-reviewed journals have the possibility of being replicated and studied on larger scales, thus becoming more mainstream. One such method is the use of video self-modeling for students with autism (Belli, Gardner, Hudock, & Kashima-Ellingson, 2016; Boudreau & Harvey, 2013; Buggey, Hoomes, Sherberger, & Williams, 2011; Gelbar, Anderson, McCarthy, & Buggey, 2012; Schaeffer, Hamilton, & Johnson, 2016).

Previous research has shown that students with autism will sometimes respond more favorably to visual images (such as video and pictures) rather than human beings (Quill, 1997). This led to the development of video modeling, notably by Dowrick (1999), in which children watch video of desired behaviors or skills being completed successfully. Video self-modeling (VSM) techniques (in which the child watches an edited video of themselves successfully completing a desired task or skill) have been used for students with other behavior problems (Axelrod, Bellini, & Markoff, 2014; Lonnecker, Brady, McPherson, & Hawkins, 1994) and for language development (Buggey, 1995, Gilmour, 2015). Because autism affects both behavior and language, it seemed like a natural progression to use self-modeling for children with autism. It is still unclear why this method yields favorable results with children with autism, but additional studies may show this to be yet another positive treatment in the arsenal against autism. Perhaps a clue may be found in the first-person account of Temple Grandin. Dr. Grandin is well known professionally in her chosen field of animal sciences. In the social sciences, she is known for her unique accounts of growing up and living as a person with autism. In her autobiography, *Thinking in Pictures* (1995), she explains her view of the world:

> I think in pictures. Words are like a second language to me. I translate both spoken and written words into full-color movies, complete with sound, which run like a VCR tape in my head. When somebody speaks to me, his words are instantly translated into pictures. (p.1)

Grandin's explanation of her perspective on the world may provide insight into the power of visual supports for students with autism. Because of its clear emphasis on visuals, iPod/iPad technology seems to be an ideal medium for working with students with autism.

USING IPOD/IPAD TECHNOLOGY WITH STUDENTS WITH AUTISM

Utilizing previous video modeling techniques with newer iPod technology, several articles were published in a special issue in the *Journal of Positive Behavior Interventions* (Cihak, Fahrenkrog, Ayres, & Smith, 2010; Kleeberger & Mirenda, 2010) in which the video the student was to view was loaded onto an iPod Touch that the student could carry with them. Another article that same year examined the use of an iPod Touch as a communication device for a child with autism (Kagohara et al., 2010). The apps that were used on the iPods can now be used on iPads. For example, Jowett, Moore, & Anderson (2012) used video modeling on an iPad to teach basic number skills to a young boy with autism, demonstrating that the method will transfer to the newer technology. Similarly, Burton, Anderson, Prater, and Dyches (2013) utilized VSM techniques on an iPad to teach math problem solving skills to students with autism, and Marcus (2014) used VSM on an iPad to teach children social skills necessary for inclusion in general education classrooms.

Finally, a brief case study on the use of iPads used as e-readers to improve literacy skills in students with autism at one school was shared by Price (2011), in which she indicated that iPads appeared to be superior to traditional communication devices but that "more research is needed into new and emerging technology to help professionals and parents understand what would be worth the investment for most students with autism" (p. 34). Flores et al. (2012) examined usage of iPad technology as a communication device compared to "low-tech" picture symbols, and found mixed results. Additional studies have been conducted recently focusing on using the iPad as a communication tool with promising results (Alzrayer, Banda, & Koul, 2017; Muharib, Correa, & Wood, 2018; Sng, Carter, & Stephenson, 2017). In conducting a review of computer-assisted instruction for students with autism, Knight, McKissick, and Saunders (2013) recounted one author describing iPads as "miraculous" for students with autism and stated, "At best, these claims support the need for repeated empirical study of technological interventions to determine if the data support the proclamations of 'miraculous' interventions," (p.2629). Clearly, more research needs to be done examining iPad usage with students with autism.

CURRENT APPS FOR STUDENTS WITH AUTISM

Teachers often rely on word of mouth recommendations from other teachers or suggestions from parents when choosing apps to use with students in the classroom. For the purposes of this article, we have classified apps into categories based on broad areas of need often addressed with students with autism: communication apps, speech and language development apps, visual schedules and social skills apps, and content area (reading, writing, math, science, and social studies) apps. Needless to say, this is not an exhaustive review of all the apps available that may be appropriate for use with students with autism; indeed, by the time this paper comes to press, more groundbreaking apps could be developed. As stated in Davis' 2012 article, " … anyone able to invest about $10,000 can have an app ready for the marketplace within six months (n.p.)." Our goal in this article is to provide teachers and others making technology purchase decisions a starting point to make informed choices in a timely fashion when beginning to use iPad technology with students with autism.

COMMUNICATION APPS

One of the defining characteristics of autism is the presence of deficits in the area of communication. Communication deficits in children with autism can include complete lack of spoken language, use of limited spoken language, the presence of *echolalia* (which is the

immediate or delayed repetition of words or statements the child has previously heard), or the ability to use spoken language, but not in a functional fashion to communicate wants or needs. Communication is a method of transmitting information about wants and needs, and because individuals with autism often have problems with using spoken language, they have a hard time communicating (Scheuermann & Webber, 2002).

One of the most commonly used iPad apps is a communication app called *Proloquo2Go* ($249.00). *Proloquo2Go* is a digital version of a picture communication system, popularized by Bondy and Frost (1994). For the past two decades, many students with autism have carried around bulky notebooks filled with cards of picture symbols they would use to indicate what they wanted or needed. The pictures could also be used to design their schedules or create picture task lists for them. This app condenses all of those cards into the iPad, making it less obtrusive and more socially- and age-appropriate, especially for older students (Sennott & Bowker, 2009). A number of recent studies have demonstrated the strength of this app in increasing the communicative intent of children with autism in classroom activities, as well as decreasing disruptive behaviors (Lorah et al, 2013; Lorah, 2016; Lorah, Tincani, & Parnell, 2018; Sigafoos et al., 2018).

At the opposite end of the cost spectrum is *Sono Flex Lite,* an app that teachers can initially access for free, although for more customized experiences, paid versions are available. This app includes commonly used phrases, requests, and items that students would use throughout the day. The ability to try the app for free and then choose a variety of paid subscriptions as needed rather than the initial high start-up cost of *Proloquo2Go* is likely the main benefit for this app, especially for small schools or programs, or districts just starting their iPad technology program.

Speech and Language Development Apps

While the above apps will allow students with autism to communicate with others, they are not designed to stimulate or promote the use of spoken language. There are apps on the market that are designed for that function. Again, prices range from free to almost $1,000.

Several apps by the developer *Mobile Education Store* help students with autism with various components of speech/language. Their website shows apps such as *Conversation Builder, Sentence Builder,* and *Question Builder*, ranging in cost from $5.99 to $19.99. All of these apps use visual and/or video prompting to help students develop correct sentence structure or language usage.

Another developer focused on speech/language apps is *Smarty Ears.* With a variety of apps, teachers can target specific speech/language deficits working in conjunction with the speech/language pathologist. One app that can be used by multiple students is *Language Empires* ($24.99). It is played as a game, yet targets skills deficits typical in students with autism such as answering questions, increasing vocabulary, sequencing, and using figurative language. A similar game but for younger children or children at lower developmental levels is *Language Adventures Pro* (also $24.99). It uses an old format of board games, familiar to speech/language pathologists, but updates it to the new iPad technology, and again, it can be used by multiple students. It has multiple levels of difficulty and targets language skills that can be problematic for students with autism, such as antonyms, synonyms, inferences, and words with multiple meanings. While neither of these apps are free, a benefit to both of them is the multiuser aspect of them. As multiple students can use the apps, that lowers the cost per student; additionally, as social skills deficits are one of the key characteristics of autism (and will be addressed in the next section) having multiple students use these apps as "multiplayer games" at the same times will address both speech/language goals and social skills goals at the same time.

VISUAL SCHEDULES AND SOCIAL SKILLS APPS

There are a number of apps that can be used to design visual schedules students with autism use to structure their daily schedules. Much like a high-tech "to do" list, these daily schedules allow students to plan step-by-step what activities they need to complete throughout the day. One good example is the *First Then Visual Schedule [FTVS HD]* app (available for $14.99). Users have the option of using stock images that are loaded in the app, or taking their own photos and/or video to use within the schedule to individualize the schedule for each child.

There are also apps that can be used to design what are known as "Social Stories." The idea behind Social Stories™ was initially developed by Carol Gray (1995) to address deficits in social skills. In the initial development of Social Stories™ teachers would write the story and either hand-draw illustrations to go along with the story or utilize clip art from the *Mayer-Johnson Boardmaker* program. A recent studies show the strength of developing play stories using the Keynote app for the iPad, allowing for photos and more sophisticated graphics to be used in the stories (Brodhead, Courtney, & Thaxton, 2018; Murdock, Ganz, & Crittendon, 2013). Keynote is one of the business apps for Apple products, a counterpart to Microsoft PowerPoint, and currently a limited version of Keynote for iPad is now available for free. This high-tech application may show great promise as a way of modernizing an older technique through the use of the iPad.

A specific set of apps that have been designed utilizing the same strategies is the *Social Story Creator & Library* (free download). This app allows the user to build stories with pictures, recordings, and texts using either images from the app's library or images the user uploads. There are several additional strengths to this app; PDfs can be printed of stories so paper copies may be printed and shared with additional caregivers of the child, and stories may be made in any language, which is extremely useful for families from diverse cultural and linguistic backgrounds.

CONTENT AREA (READING, WRITING, MATH, SCIENCE, AND SOCIAL STUDIES) APPS

There are such a wide variety of apps available for the content areas that separate articles could be written to review apps in each content area. The primary benefit teachers should examine when considering apps to use with children with autism in content areas is the use of visuals. Apps that are overly-reliant on written content may not be the most effective for students with autism. However, apps that take content and place it in visual form may be highly beneficial for students. For example, a basic science content app that could be useful for higher functioning students might be *The Human Body* ($3.99) or *Space* ($2.99) by Tinybop. Both apps contain brightly colored, clear visuals that would be ideal for students with autism. Using headphones, students can see and hear components of the human body in action: the heart beating, lungs breathing, and a stomach gurgling. Both apps are interactive and allow multi-user features and activities. They also can be used in over 30 languages, again making these excellent choices for students from diverse cultural and/or linguistic backgrounds. This company has continued to develop visually pleasing and interactive apps in multiple content areas for students from preschool level to grade 6, so there are many that could be useful for students with autism.

A more basic content area that can be addressed is reading, and teachers can use the app *Play Sight Words* by the company eFlash Apps for that. This free app allows students to play games to practice both recognition of sight words and spelling of basic words. There are options to change the difficulty level, to manage the words, and to manage grade level. Teachers can also work on basic math skills through a number of apps that practice math facts. There are apps that are simply high-tech flash cards (such as *Math Drills*) or more engaging game-like apps (such as

the series by *Motion Math*). Again, most of these apps allow teachers to preview a limited number of levels before having to purchase additional levels. Teachers should fully test the app before deciding to invest any additional time and money in the program.

Finally, an app teachers may want to consider to help students with autism who are learning to write independently is *I Can Write 2* (free). Students are shown cartoon images and then given prompts with drop-down menus to choose from in order to construct a correct sentence. Not only does this strengthen writing skills, but it also works on use of prepositions for relational skills (such as in response to "Where?" questions) that can be difficult for some students with autism (Koegel & Koegel, 1995).

iPad Accessibility Features and Additional Peripherals

There are a number of accessibility features that teachers may find useful when utilizing iPads with students with autism. One feature that can be very useful is what Apple has titled "Guided Access." Guided Access allows the teacher to lock the iPad into only accessing specific apps so that the student cannot tap and enter other apps, no matter what buttons he pushes or where on the screen he taps. This is particularly useful when you have multiple students sharing an iPad, resulting in a large number of apps on an iPad, or if you want a student to focus on a particular app at a given time. Teachers will also want to know how to use the screen lock button on the side of the iPad so that the screen stays locked in either the horizontal or vertical frame; otherwise, as the student turns the iPad, the frame of reference will keep switching which can be distracting to the student.

There are also some peripherals that will be critical for teachers to have for classroom iPads. The most important would probably be protective cases. One brand of case that has been particularly useful in the classroom of one of the authors is the *M-Edge SuperShell* case. This hard foam case is both durable and thick, with a contoured shaped that makes the iPad more easily held by younger children who may have problems with fine motor skills, such as many children with autism. It is available for purchase at many "big box" stores and online retailers, and the price varies by outlet. A final peripheral teachers may want to consider is a charging station. These may be purchased directly from Apple or other audiovisual supply companies, and the need for them will be dependent upon how constant the usage of the iPads will be. Charging stations allow for teachers to have one central location where all classroom iPads are stored and charged. Larger cabinets can be rolled around the classroom and may be able to locked. When purchasing a charging station, teachers should consider if they will be using protective cases, as some charging stations do not allow extra space for a case. For ease and consistency of use, teachers should be able to simply plug the iPads into the station at the end of the day, slide them into the station, and close the cabinet. Having to remove cases would make it less likely the iPads would get charged regularly or the cases may get left off the iPads, possibly resulting in damage.

One helpful hint we have learned from our tech support professionals is to unplug all the iPads from the cart before students have access to the cart. Students are likely to just yank the iPads from the cart and may damage the charging cords if they pull too quickly while the tablets are still plugged in. At the end of the day, teachers should then go through and plug all the tablets back in, ensuring that they will get fully charged overnight.

The Future of iPad Usage with Students with Autism

Since its introduction in 2010, educators have been optimistic about the possible uses of the iPad in the classroom (Leoni, 2010; McCrea, 2010). At the same time, educators have

recognized the difficulties in staying up-to-date with technology that changes so rapidly and the problems teachers would have finding appropriate uses for the technology with little to no direction provided to them (Banister, 2010). As with any emerging practice, research is needed to help provide clear direction to educators working with children with autism so that time and resources are not wasted on ineffective practices.

Possible directions for future research could be studies to examine which apps best address characteristic areas of weakness for children with autism, or studies to determine whether iPad technology yields better results or gains than currently used low-tech interventions. For example, researchers demonstrated that use of an iPad for instructional use rather than traditional paper/pencil materials lessened the disruptive escape-maintained behavior of two young boys with autism (Neely, Rispoli, Carmargo, Dabis, & Boles, 2013). Another study compared a low-tech treatment (paper/pencil) versus using the iPad while self-monitoring during task completion and found that students with autism needed less assistance and preferred the use of the iPad for self-monitoring (Bouck, Savage, Meyer, Taber-Doughty, & Hunley, 2014). Most recently Gilroy, McCleery, & Leader (2017) reviewed research on high-tech methods of teaching social and communicative behavior to determine the extent of the research and found that studies to date appear to focus primarily on requesting behaviors, and made several recommendations on extending the research before determining the strength of these high-tech interventions over low-tech ones. Studies such as these are expanding the research on iPads and students with autism. The growth of iPad technology is not likely to slow down; researchers have a duty to practitioners and to their students to ensure that we determine what works and pass on that information to them quicker than ever before.

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