Using iPads to improve academic gains for students with disabilities

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Abstract— **Students with disabilities have a difficult time making academic progress in the classroom. Depending on the type of disability, students need various modifications and support to assist with academic tasks. This literature review examines the effectiveness of the use of iPads to help improve achievement for students with disabilities. Both benefits and difficulties of using iPads in the classroom are explored with an emphasis on how iPads can be used to improve instruction for students receiving special education services. The findings of this literature review confirm that iPads are an effective piece of technology in the classroom, and suggestions for implementing iPads into daily classroom instruction are provided. In addition, areas of further investigation and research are identified.**

Keywords—iPad; Assistive Technology; Instructional technology; students with disabilities

I. INTRODUCTION

In today's society, electronic devices are unavoidable. Schools are no exception in this changing trend and immersion into the digital age. Students come to schools each day with smartphones, tablets, and other electronic devices. In fact, today's students are referred to as iGeneration students due to the escalating use of technology both inside and outside of school (Bouck, Flanagan, Miller, & Bassette, 2012). While some schools try to fight the use of phones and other devices in the classroom, some school districts across the nation are embracing the technology age and incorporating students' personal devices into the classroom. Since students come to school equipped with technology, it only makes sense to employ this new age of technology in the classroom rather than fight against it. Teachers need to find ways to promote the use of technology in the classroom, especially in an age where technology is so accessible to students, it seems to make sense to teach students how to use it responsibility.

As a special educator, I work with students who struggle with academic tasks on a daily basis. Students with disabilities may need support in the realms of communication, academic tasks, and daily living skills. Recently, I became part of an iPad pilot program at the district I work where the students in my 12:1:1 Algebra class are all provided with iPads. They use iPads at school and can also take them home with them. In order to prepare for this new endeavor in teaching, I began looking into the available research on the use of technology in the classroom**.** The purpose of this paper is to provide a literature review of some of the previous research on the use of iPads in the classroom for students with disabilities, and also to share my own reflections working with students in my classroom.

II. LITERATURE REVIEW

A. Understanding Disability

In order to understand the significance of the use of iPads in the classroom, it is important to understand types of disabilities and how disability affects students with disabilities. Most of the research related to students using iPads in the classroom has focused on intellectual disability, autism and emotionally and behavioral disorders. These are the same disabilities that make up the population of students that I work in my classroom so I will begin with a brief summary of each of these disabilities and the need for iPads to help reach educational goals.

Students with emotional and behavioral disorders typically have lower amounts of credits received in high school, lower GPAs, and are more likely to fail a class. This is mostly due to lack of engagement in school related tasks. Students with emotional and behavioral disorders are less likely to complete assigned classwork assignments. Research has shown that students with emotional and behavioral disorders benefit from tasks that provide immediate feedback. If students can see they are completing work correctly, they are more likely to continue the task (Hayden, Hawkins, Denune, Kimener, & McCoy, 2012). A research study conducted by Hayden, Hawkins, Denune, Kimener, McCoy (2012) found that students with emotional and behavioral disorders are more likely to respond to academic tasks using an iPad. Reasons for this may be more active student engagement because students received immediate feedback. The iPad also provided examples so students would not make the same mistake again. Students were more likely to complete work when they knew they were doing it correctly.

Students with autism typically require some type of intervention to help with social skill adjustment. One of the types of interventions used with students with autism is story-

based interventions, such as social stories to teach a specific skill. Students with autism also rely heavily on visual cues to help teach skills and remind students of previously learned skills. Self-modeling and video modeling have also been proven to be effective strategies to help teach students with autism new skills. A research study on using iPads to create videos used as social stories for students with autism showed that iPads could be an effective tool for not only academic tasks, but social tasks as well (Helps & Herzberg, 2013).

Research has also shown that adolescents with autism can benefit from iPads to help with expressive communication. A study comparing a picture-based communication system and the use of iPads found that students and teachers both preferred the use of iPads. The teachers found iPads were easier to use and actually increased the speed of the student's communication. Students also showed gains in the area of language and communication when using iPads. Teachers felt the iPads were more engaging and easier to use compared to picture boards (Cumming & Rodriguez, 2013).

Students with Intellectual Disabilities (ID) have an IQ at least one standard deviation below the mean. This definition has been in existence since the Implementation of IDEA in the 1970's under the former label of Mental Retardation (MR) (Douglas, Wojclk, & Thompson, 2012). However, with the changing notion of disability and the move towards inclusion whenever possible, the constitutive definitions of ID has changed from an emphasis on a condition someone has marked by deficits that the general population may not have, to a looking at ID as the need to help support a student become more included in school and society as a whole. In order for this to inclusion to occur, the student's educational team would determine what areas of functioning the student may need assistance with in order to fully participate in school and to help transition into post-secondary life (Douglas, Wojclk, & Thompson, 2012).

In order to determine what a student needs to be fully included, the focus is on looking at disability through a social-ecological perspective, which focuses on how an individual interacts with the environment, and how to modify the environment to meet the student's needs (Douglas, Wojclk, & Thompson, 2012). Therefore, it becomes essential to provide aids and supports to make students are included in the classroom. In order to make this happen effectively, it is necessary to determine a student's strengths related to the environment they are working on and develop supports based on an assessment of their strengths and needs. It is also important to use these various supports with students with and without disabilities. This promotes inclusion where changes are made to the environment to meet everyone's needs, including students who may not be classified as having a disability.

The final important piece of including students with all disabilities in the classroom, is promoting self-determination (Douglas, Wojclk, & Thompson, 2012). Research has been conducted on person-centered planning, self-determination and the use of iPads. The research is centered on student's choice when it comes to finding different apps that can be used on the iPads. While some educators may argue that students are not capable to pick out their own apps, research demonstrates students can choose their own apps and this helps promote self-determination, which is the ability for a student to make decisions regarding their own life (Helps & Herzberg, 2013). "Leisure activities assist in establishing a meaningful quality of life if individuals are in control of their choices and are allowed to express their personal autonomy" (Helps & Herzberg, 2013, p. 232). By allowing students to choose their own apps and even find students who have similar interests in music or games, students are developing friendships and determining what types of activities they may like to do outside of school (Helps & Herzberg, 2013).

B. The Need for iPads: Assistive Technology and Instructional Technology

Assistive technology (AT) is defined 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 the functional capabilities of a child with a disability" (Bouck, Flanagan, Miller, & Bassette, 2012, p. 47). AT is used to help create opportunities and promote independence for students with disabilities. It also helps empower students with disabilities to take the lead in their education and can help to develop self-determination when students can pick their own apps. Students use AT not just to make it easier for them in the classroom, but also to help make daily and academic tasks possible that may not have been possible before (Bouck, Flanagan, Miller, & Bassette, 2012). For example, students with poor handwriting and under developed fine motor skills may have access to equipment that makes handwriting easier and more legible. The key is finding the appropriate piece of assistive technology for each individual student and this is determined by looking at students' needs and abilities and the current materials that are in the environment. It is also important to assess the purpose and need for the assistive technology and the student's needs and educational goals as defined by their IEP (Bouck, Flanagan, Miller, & Bassette, 2012).

Though AT is a crucial piece of a student's individual education plan, the inherent problem with assistive technology is the difficulty of taking it out of the classroom and continuing to use it in the home or even after graduation from high school. Technology should be used in the classroom that can be used out of the classroom as well. Therefore, there has been an increased interest in looking at how regular devices students already have access to, such as tablets and phones, can be used as AT to meet their IEP goals and help decrease challenges with AT (Bouck, Flanagan, Miller, & Bassette, 2012). The use of iPads can help make the use of AT easier and more efficient, and more students may even have the chance to have access to technology that may not have had access before.

AT is equipment that is designed and used specifically for students with disabilities based on their need to access the same curriculum as everyone else. Instructional

technologies, on the other hand, are educational materials that help teach concepts to all students. This includes any technology that is used in the classroom to teach content and improve academic skills. For example, a computer program that provides math problems to practice (Douglas, Wojclk, & Thompson, 2012). Some technologies can be used both for assistive technology and instructional technology. If the student is using writing software that helps teach the student how to write, and is using it because they could not write without it then it would serve the purpose as both assistive technology and instructional technology. Mobile technology, such as iPads, is examples of technology that can be used as both assistive technology and instructional technology (Cumming & Rodriguez, 2013). Mobile technology includes devices that can easily move from school to home (Cumming & Rodriguez, 2013).

IPads are devices that can be used as both AT and instructional technology because students with disabilities can download apps that provide visual, auditory and tactile learning opportunities, but could also be used as learning tools for any student (Bouck, Flanagan, Miller, & Bassette, 2012). iPad apps can help support students with ID in school, employment and the community. Once educators find apps to meet individual students' needs, the student is taught how to use the app, learns how to use it independently, and find apps on their own (Douglas, Wojclk, & Thompson, 2012). This helps students improve academic skills, develop a use of technology to help compensate for areas of difficulty, and foster self-determination.

Apps can assist students in a variety of ways. For children who have trouble with fine motor skills, touch screen devices are actually easier to use than a mouse and a computer. The size and portability of the iPad is also easier for students with motor difficulties, because it is easier to transport (Shah, 2011). They can also help students who have other disabilities in conjunction with motor impairment. "For a child who may be a little slower learner, struggling with reading, has an arm that doesn't work, the (tablet-style) computer has all these modalities, sound and touch (Shah, 2011, p. 16). Additionally, for students who need to work on life skills, such as budgeting and communication skills, apps are available that can help students order food at restaurants, organize grocery lists and buy groceries. Apps are also available to help with time management and organizational skills (Shah, 2011).

C. Rationale for Using iPads: Motivation and Ease of Use

When I was deciding whether or not to use a class set of iPads for my students, I was looking at motivation and what I could do to get students more interested in math. In addition, I had some students who had fairly significant disabilities and had the use of various AT devices on their IEPS. These technologies were mostly for reading and writing skills and included Fusions (portable keyboards) and access to laptops with various software programs. However, there was little technology used for math skills, and my students were not interested in completing math problems. I was looking at a way to motivate my students and since they enjoyed using the computer, I concluded iPads might be devices that could help increase academic achievement in my classroom and motivation to learn.

Research has shown that using iPads in the classroom does increase motivation. Part of this is due to the fact that iPads shift the control to the students. By providing students with iPads they can use for school and home, they can pick their own apps. When children have the choice, they are more engaged in academics (Shah, 2011). For example, a teacher of a 6th grader with an emotional disturbance reported that a particular student would not complete math problems using paper and pencil, but was happy to spend time completing math problems on an iPad (Shah, 2011). One teacher reported, "When you work with the special needs population, you really need to find ways to reach out to the kids. Anything that will reach a kid and make them excited about learning." (Shah, 2011, p. 16).

Another motivating aspect of using iPads is that they offer instant gratification. Students who may have attentional difficulties can complete a problem on an iPad can receive feedback immediately. In addition, students with sensory integration struggles may respond better to touch screens, rather than using a computer and a mouse. Students also have the option to customize their iPads including picking different pictures for backgrounds, choosing different apps to use and organizing the iPad the way that makes sense to them (Shah, 2011). iPads also help students bridge the gap between school and home. Students can be introduced to educational apps at school, and continue to use them at home. Students have the capability of finding their own apps that may be of academic need and interest to them. Students can begin to search apps that meet their own individually needs (Cumming & Rodriguez, 2013).

A big benefit of iPads is that they allow students to have technology that can be used as AT or instructional technology that does not make the student stand out. Some AT devices can be bulky, and are obviously used to assist with some type of disability. iPads are used by disabled and non-disabled students and are less likely to make students receiving special education services stand out or look different (Shah, 2011). "AT and other education professionals are noting that students are embracing the use of mobile devices because they easily blend into the mass of other students with the signature white earbuds hanging around their necks or stuck in their ears" (Newton & Dell, 2011, p. 48). Additionally, teachers who have worked with iPads in the classroom have reported that they enjoyed using iPads because students participated in classroom activities with little assistance from teachers, and in the process were developing independent work skills (Cumming & Rodriguez, 2013).

D. Benefits of iPads and Apps

A research study about the amount of educational apps available on iPads found that 2 out of every 5 apps could be used to support students' needs in school and the community. This includes health, safety and advocacy as well. While there are other devices that use apps, the iPad has the greatest abundance of apps that can be used for educational purposes

(Douglas, Wojclk, & Thompson, 2012). Some additional skills apps can teach are: self-monitor behavior, take medicine, monitor progress of personal goals, and know when to do different tasks (Douglas, Wojclk, & Thompson, 2012). In fact, apps used for special education have become so popular that Apple has created a page on their app website just for finding apps that could be used for students receiving special education services (Shah, 2011). Rothschild (2011) called iPads a "digital prescription pad" because each iPad could be customized to meet the students' needs, and is also engaging and interactive (Cumming & Rodriguez, 2013).

Another benefit of using iPads and apps is that the cost of an iPad and corresponding apps are less expensive than other devices used for AT and instructional technologies. Families and educators can also look through apps on their own and find apps that can be useful to students and it is very easy for parents and families to purchase these apps if needed. Due to the low cost of the apps, there is also more flexibility in choosing tools to assist students. This makes iPads a better economical choice to use as instructional tools and AT in the classroom when possible (Douglas, Wojclk, & Thompson, 2012).

One of the major benefits of using iPads in the classroom is the ease of use for teachers. Many teachers struggle with adapting to assistive technology devices they may be unfamiliar with. However, most educators have some type of smartphone or table that operates the same way as an iPad. Since many teachers already know how to use iPads, it makes training professionals to use the equipment as AT or instructional technology much easier (Newton & Dell, 2011).

E. Problems with iPads and Apps

While there are a lot of apps available to assist students receiving special education services, it can be difficult to find apps that best meet students' needs. More research needs to be done to develop a comprehensive list of apps and how each app can be used to assist students (Douglas, Wojclk, & Thompson, 2012). It can be a time consuming task to try and find apps without any direction as to what apps are useful for different needs. Also, there are a lot of apps that are available to help meet educational goals, but there are not a lot of apps developed to help promote self-determination. While the use of choice in iPad usage may help promote self-determination, goal setting and monitoring apps could help develop the skill of self-determination. This includes the development of apps that could help with goal setting (Douglas, Wojclk, & Thompson, 2012).

Another problem that may come up when using iPads is that some children are unable to handle the responsibility of using an iPad appropriately. iPads have the ability to connect to the Internet so students need to understand how to properly use social media that can be accessed on an iPad. Additionally, students need to distinguish academic time and free time. Since students can download games on their iPads, they need to understand when is an appropriate time to use their own apps related to their own personal enjoyment. Some students may need consistent reminders to work on schoolwork before having free time on the iPads. Another concern is that some students with more significant behavior concerns may not be able to take care of an iPad, which can be broken if dropped or thrown (Curry, 2012).

While there are ways to overcome all these obstacles, a bigger concern is that students with autism may use iPads excessively for the purpose of self-stimulation. If this is the case, the educational value of the iPad may be secondary and students may spend too much time playing games and doing other activities on the iPad unrelated to assistive or instructional technology. Many professionals have expressed that iPads offer to0 much self-stimulation and that they may be used as baby-sitters rather than for educational value. There is growing concern that iPads have been implemented into classrooms without much thought as to how they will be used, and therefore the educational value is sometimes forgotten (Newton & Dell, 2011).

However, there seems to be contradicting opinions on whether iPads promotion of self-stimulation is good or bad. One research study selected using iPads because of the multi-sensory output. The study found that the iPad provided a better medium than using traditional textbooks, and that ereader capabilities on the iPad helped increase comprehension skills (Price, 2011). Teachers also cited that "students found the iPads motivating and that the use of the iPad reduced off-task behavior" (Price, 2011, p. 32). There was also never a need to revoke iPad privileges for students because they all used them responsibly. While no students in the study showed decreases in academic achievement, the amount of increases varied greatly from 0 – 50% improvement (Price, 2011). Therefore, there needs to be more research done on the advantages of using iPads for students with autism related to self-stimulation.

III. ANALYSIS

My experience using iPads confirmed much of what the research told me about using iPads for students with disabilities. While some of my students do have access to various types of Assistive Technology, I was looking at the iPads as an instructional tool. I had the daunting task of teaching Common Core Algebra standards to high school students who had no previous experience with algebra or even pre-algebra. I was looking for a way to motivate my students and keep them engaged in the classroom. Many of my students had already displayed an interest in using computers so I concluded iPads might help keep them motivated. I applied to have iPads for each of my students and was accepted into the district's new iPad program. Similar to what some of the research suggested, the training on how to use an iPad was not difficult for me because I already had my own personal iPad and knew how to operate it. However, I did have some difficulty finding appropriate apps to help promote algebra skills. With the help of other teachers in the building and district provided Professional Development, I was able to find apps that could help with algebra skills, and other executive functioning skills as well.

My goal was bigger than just using apps to supplement math instruction. It was my hope to make the iPads the center of my classroom instruction. This included a paperless classroom, and when possible even a flipped classroom. I was looking to embrace what technology had to offer and teach algebra in a way that I had never taught before. The students all had notebooks set up on their iPads so no paper copies of notes were provided anymore. I found this extremely helpful, especially with students who had difficulties with fine motor skills and handwriting. Students were able to enlarge their screen to have more room for writing. The need for spending time making enlargements was no longer necessary. Some of the research I found supported this claim. "Using the iPad provides practice and refinement of skills for students with poor fine motor skills and it is highly motivating, so students are more likely to stick with the activity" (Aronin & Floyd, 2013, p. 38).

In addition to using iPads for note taking, all of my assignments were completed on the iPad and then submitted to me through the iPads. I continued to give tests and quizzes on paper, and occasional class activities, but I began to try and create a paperless classroom to the greatest extent possible. For my students who lacked organizational skills, this helped them keep track of everything, because it all of their materials were in one place, and the students never lost iPads. I also used apps as formative assessment tools and was able to do quick checks of understanding using the iPads. This included using an app to post a question about the lesson, and then using the app to take a poll of the student's answers. I could set up to tell me each student's answers or just tally the response for each answer choice anonymously. Many of the students liked this form of assessment because they could often find out instantaneously whether or not they provided a correct response.

I tried to use the idea of an iPad as a personal "prescription pad" for each student, but I will still need more time to develop this. I had students download various math apps that provided drill and practice. I gave each student different lessons and practices on the iPad they should be working on based on their academic needs. However, it became difficult for me to monitor each student and I will have to continue to determine how to organize that piece of instruction more effectively. However, I did notice that the students were more apt to complete algebra problems on the iPad and since their results were sent to my iPad, I was able to quickly see who was making progress and who needed more practice. Similar to much of the research I found, I do not think any of my students math skills were weakened from the use of iPads, but individual progress was very diverse. Some students continued to struggle, but others mastered various skills that I was not sure they would be able to do.

I did have some difficulties with the implementation of using iPads. My biggest problem was working to get the students to understand the iPads were for instructional tasks first and leisure activities second. Many of my students found games they enjoyed playing and sometimes it became difficult to get them off their own apps to focus on academic tasks. The students had the ability to download their own apps, and were able to take the iPads home with them at the end of the day. While it was my hope, they would do math at home, this was usually not the case. It became difficult to get students to work on math practice at home, and I am still unsure of how to increase the amount of independent time that students used iPads for academic tasks.

IV. Discussion

A. Implications

Based on my own findings and the literature review, it seems that introducing iPads into the classroom does no harm. While some students may not make academic gains, I did not find any studies, including my own experiences, where students' skills decreased. Therefore, it seems iPads should be used more regularly in classroom across the country. More research should be done on what apps are most effective at improving academic skills in specific subjects. This includes a comprehensive list of effective educational apps.

Many students are more actively engaged while using iPads due to the immediate satisfaction of knowing whether or not they answered the question correctly. Students can also receive tutorials explaining how to correctly answer the problem if it was not answered correctly. This helps take some of the pressure off the teachers because they have more time to work one on one with students. Teachers can work in small groups and have the rest of the class work using their iPads, and feel satisfied that the students are still receiving instruction even when their attention is focused somewhere else. I would have liked to incorporate the idea of a flipped classroom, but did not feel I was prepared to do this, and wasn't sure if my students would be able to work in that type of environment. There should be more research done on how special educators can flip their classrooms and use technology to the fullest potential to help students achieve academic goals.

B. Limitations

I have not had enough time to explore self-determination with students and how the iPads can assist with students developing their own goals. While my students had the ability to download their own apps, and many of them spent a lot of time playing different games, I'm not sure how this correlated with self-determination. I was also not able to find a sufficient goal setting app to help with this. More research needs to be done in this area and I hope to explore the area of self-determination and person-centered planning as I begin my second year of teaching in a classroom where all students have access to iPads.

I also think more research needs to be done on how to make iPads the center of instruction rather than just a method of supplying additional content. I think there are a lot of ways that technology can be better utilized in the classroom, but the research is lacking on the ways this can be implemented. Along with this way, the research noted that an area of further need is looking at apps and developing a comprehensive list of apps that can help with various skills. This is something I

would agree needs to be done in order to make the transition to using iPads in the classroom smoother. I spent a lot of time looking for my apps on my own, and more time could be spent planning, if I had more guidance of what apps helped with different skills.

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