Supporting Students with ADHD in the Classroom

Capstone Project

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Abstract

Students with ADHD often face academic challenges (Rawe, 2014). Researchers have examined ways in which various levels of assistive technology (AT) devices to help mediate some of these challenges. A selection of AT options range from high-tech, mid-tech, to low-tech, and each level were examined for their effectiveness, ease of use, and affordability. Additionally, researchers used AT with an at-risk student with ADHD in order to examine the effectiveness when improving the student's academic success. Researchers discuss and examine applications of AT in the classroom in order to provide educators with information on how to assist students who have ADHD and/or are struggling academically.

ADHD in the Classroom

As science and discovery progresses, teachers utilize more technology-based assistive technology, [AT] supports in order to help students with and without learning disabilities. AT is recognized as a support for students with IEPs in schools by the Individuals with Disabilities Education Act and 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" (IDEA, 2014). Students with disabilities often face difficulties in academic settings with the demands that are expected of them (Blackhurst, 2006) and in order to mediate these difficulties, a plethora of AT options can be offered to them in any educational environment. A large body of research has concluded that the addition of AT supports can influence a student's academic performance, as well as affecting the student's disposition toward school entirely (Alsalamah, 2017; Patti & Garland, 2016; Pyle & Fabiano, 2017). AT provides students with disabilities a more even playing field.

According to the National Survey of Children's Health, nearly 6.1 million children have ADHD. Given the more notable benefits of AT on those with this disability, perhaps one of the more prevalent reasons why AT plays an important role in the education of children is because about 5% of school-aged children are being diagnosed with ADHD (The Diagnostic and Statistical Manual of Mental Disorders (DSM)); however, there have been other studies in the United States that have estimated higher rates than this in community samples (Centers for Disease Control and Prevention, 2018). These staggering numbers bring attention to the fact that AT is needed in classrooms. AT can help mediate some of the challenges students with ADHD often face including, difficulties with managing emotions, following directions, managing time,

staying focused, becoming and staying organized, memory, initiating tasks, and following directions (Rawe, 2018).

When selecting what AT options are best in the classroom, teachers have a variety of options to select from that sort of fall on a continuum consisting of high-tech, mid-tech, and low-tech. High-tech AT includes devices that are complex and although the most expensive option, most have electronic or digital components which likely require training to be efficiently used (Georgia Tech). Mid-tech AT is in the middle of the continuum and includes devices that have some complex features, are generally battery-operated, may require some training for the user, and are less expensive (Georgia Tech). Low-tech AT devices do not have complex or mechanical features, do not require much training, and are the least expensive (Georgia Tech). The remainder of the paper will outline some options that are popular amongst these three levels of AT.

High-Tech AT

Although there are several high-tech AT for students with ADHD, the following options are worth highlighting given the research backing and user acceptability.

Computer Assisted-Instruction

Computer-assisted instruction incorporates any number of different computer software options that are designed to provide instructional support for students. With computer-assisted instruction, students are able to receive immediate and frequent performance feedback, continuous and repetitive opportunities of various academic stimuli, as well as instant reinforcement. In addition, this software records student performance data that can be retrieved by educators (Xu, Reid, Steckelberg, 2002).

Not many studies have been conducted on the use of computer-assisted instruction in regard to students with ADHD because computer-assisted instruction is not widely available, nor is it used very often in the classroom setting. Despite this fact, it can still be concluded that computer-assisted instruction can help students with ADHD when implemented correctly. The scaffolds and student-level instruction these software are programmed to deliver (e.g. feedback on student performance, academic stimuli, and instant reinforcement), serve to mediate obstacles that students with ADHD struggle with in their academic settings (Barkley, 1998).

Computer-Assisted Cognitive Training (CACT)

Often students with ADHD experience deficits with cognitive organization skills as well as social skills (Rawe, 2018). Researchers have found that despite medical and behavioral treatments, some specific deficits such as difficulties with managing emotions, low frustration tolerance, information processing, and high distractibility still prove to be obstacles in academic careers of students with ADHD (Tansey & Bruner, 1983). A promising technology to mediate these issues is computer-assisted cognitive training (CACT).

CACT is programed to assist students with ADHD by creating an individualized treatment program that focuses on the specific deficits that each child has. CACT also can save automatic recordings of information presented that can be retrieved and analyzed at a later time (XU, Reid, Steckelberg 2002). With CACT, deficits such as difficulties with managing emotions, low frustration tolerance, information processing, and high distractibility in students with ADHD are targeted in order to help students succeed in areas that they have trouble with. Additionally, CACT can be further tailored to the individual including the time and frequency each training takes place.

Biofeedback Training

Although Biofeedback training was once limited to practitioners of medicine, there are now reports of Biofeedback training being used as AT in the classroom—specifically with students who have ADHD (Condor, 2000). Biofeedback works in two different ways in the assistance of students who have ADHD. One of these ways is through electromyographic (EMG) feedback in order to reduce muscle tension levels. The other is through the use of electroencephalographic (EEG) feedback in order to train the student to increase desired brain-wave activity (Tansey & Bruner, 1983).

Students who have ADHD may have high muscle tension levels and in order to reduce these levels, an electromyographic (EMG) can provide feedback of the muscle tension the student is producing. This feedback is displayed visually with a meter that shows a needle indicating the level of muscle tension. A higher muscle tension is indicated by the needle pointing right, and a lower muscle tension is indicated by the needle pointing to the left (Tansey & Bruner, 1983). With this feedback, the student is instructed to calm down in order to make the meter point in the desired direction. With this tool, students are taught to reduce their own muscle tension, which assists in the reduction of hyperactivity (Tansey & Bruner, 1983).

It has been suggested that students with ADHD produce excessively slow wave theta (i.e., a rhythm produced in the brain that can be detected via electrodes attached to the scalp) and as a result, they are deficient in beta production (Lubar, 1991). Electroencephalographic (EEG), [measures of brain electrical activity] feedback is utilized to help the student condition their brain-wave activity. The computer detects and classifies the various levels of the electrical brain activity and this information is displayed through the use of lights and sounds (in the form of beeps) that show the student how much of the activity they are

producing. These students are then provided with feedback about their individual brain activities and are trained to increase the brain activity that is desired, and decrease the activity that is undesired. The student is trained by being told to relax, and then given intermittent positive reinforcement when they are able to calm themselves. They are then instructed to practice this relaxation at home (Tansey & Bruner, 1983).

Kindergarten Assistive Robotics (KAR)

Kindergarten Assistive Robotics (KAR) is an AT that provides tools such as educational games, defining daily tasks, and providing feedback about student performance in order to promote the social, cognitive, and educational development in children, as well as improve everyday habits (Fridin & Yaakobi, 2011). KAR teaches students various skills and meta-cognitive abilities through educational games that reinforce the skill being taught (e.g. how to construct a puzzle) (Fridin & Yaakobi, 2011). The robot is approximately 23 inches tall, is human-like in appearance with two arms, two legs, and a head, and speaks in a female voice. Equipped on the robot are two cameras, several sensors, and embodied speech/voice that expresses emotion (Fridin &Yaakobi, 2011).

KAR is utilized to help students with ADHD in the academic settings in a multitude of ways. KAR can assist students with ADHD by training cognitive skills (such as constructive learning or selective attention) via educational games, defining daily tasks, providing feedback to students on their performance, and monitoring this performance in order to see their progress over time (Fridin & Yaakobi, 2011). The teacher programs the robot in order to work with the students one-on-one. The robot can be programed to play educational games, define tasks, and monitor information about a student's performance. Although this can prove to be a useful and fun tool for students, it should also be noted that there are some negative aspects

of KAR. Some students form emotional attachments with the robot, while others do not accept the robot and fail to form an attachment (Fridin & Yaakobi, 2011).

Attention Training Systems (ATS)

Attention Training System (ATS) is a battery-operated electronic device that has a counter and a red light. The device is placed on the student's desk and displays the total amount of points the student earned for on-task behavior. Points are awarded to children at pre-determined intervals (e.g., 1 min). This device is placed on the student's desk and also displays the cumulative points that the student earned for their on-task behavior. When the student earns a pre-determined amount of points, they can be later exchanged for items that have been pre-determined (Xu, Reid, Steckelberg, 2002). ATS has proven to be a valuable tool when motivating students to stay on task because rewards the student receives are student specific and often very motivating. Additionally, the feedback provided from the ATS promotes self-awareness of the time the student spends on-task.

<Table 1>

Mid-Tech AT

Talking Word Processor

A talking word processor provides auditory feedback (i.e., the device reads back the letters or words typed) to the student for individual letters, words, sentences, or paragraphs or can also be used as a talking spell checker (Seegers, 2001). If a student has trouble paying attention or focusing on specific aspects of their writing, they can use this device to hear the typed responses as many times as they need so that they comprehend the text. A talking word processor also helps students hear their own writing in a way that they would not have if they

just read what it is that they wrote. This feedback can greatly benefit them in the revision process of their work (Seegers, 2001).

Automated Prompting

A vibrating wrist watch, such as Revibe, can be used to increase on-task behavior in students with ADHD. This AT incorporates automated prompting via vibrating alarm wristwatch to cue a student to complete a task. The watch can be programed to remind the student of a routine or can be set to vibrate at a specific time to remind a student to engage in various classroom activities, (e.g., start their work, to stay on task). A study conducted on automated prompting and how it can assist students who have ADHD has determined that automated prompting can help the student with ADHD complete the task required of them (Blicha & Belfiore, 2013). In this case, the vibrating watch would assist the student with ADHD to complete a specific task at a specific time.

Time Timer

The time timer allows students to see the amount of time remaining they have left to complete a task or until the current activity ends. The time remaining is shown as a red disc that shrinks as time remaining decreases and when time is over, the color red disappears leaving only see the surface of the clock (Maynard, 2007). Students who have ADHD may struggle with time management (Rawe, 2014) and the visual representation of the time the student has left allows the student to better manage their time. The visual representation gives students a greater understanding of the time they have used and the time they have remaining, thus assisting the student in the area of time management.

Smart Pen

Students with ADHD may also have difficulties staying focused, staying organized, and following directions (Rawe, 2014). This makes note taking, reading, and following directions for an assignment a challenging for these students. The use of a smart pen can help students succeed in these tasks. Smart pens have a wide range of functions, including recording what the user says, hears, or writes. The smart pen also allows audio and written files to be accessed at a later date (Patti & Garland, 2015).

While using a smart pen, the student can go back and revisit anything that was heard, said, or written. The retrieval of this information eliminates the stress that a student might have while taking notes, reducing the risk of instruction resulting in little or no retention. Additionally, the student is less likely to struggle with lack of information recorded and/or the stress and anxiety of note taking in general.

White Noise Emitter

Noise is typically seen as being detrimental to cognitive performance, but it actually has the opposite effect on the cognitive performance of students with ADHD. Studies have found that a moderate amount of noise actually exerts a positive effect on students who have ADHD in regard to cognitive performance (Söderlund, Sukström, & Smart, 2007). A piece of AT that can be utilized to provide a moderate amount of noise is a white noise emitter, which is a speaker that produces white noise (e.g., constant background noise that sounds like “sh”), or static.

It is important to note that the noise level needs to be moderate in order to positively impact cognitive performance. This white noise emitter can produce this appropriate level of noise (i.e., not too loud or too soft). This is important because if the white noise level is

too high, it may prove to be distracting and impede academic performance in both the student with ADHD and their surrounding classmates whereas if it is too low, it will not have the desired impact.

<Table 2>

Low-Tech AT

Hand-Fidget

Hand fidgets are used for students with and without ADHD. Hand fidgets can come in the form of fidget cubes, fidget spinners, squishies, and a large variety of other forms. These low tech AT options allow students to be able to improve their concentration when provided with something to manipulate in their hand. Fidgets can help some students with ADHD focus better as they allow students to work in ways that help them concentrate, such as keeping their hands busy (Wright, n.d.).

Hand fidgets incorporate sensory integration which is the structured, repetitive exposure to a sensory stimulation (Morin, n.d.). Many studies have been conducted in order to determine the correlation between sensory integration and on-task behaviors (Thompson & Raisor, 2013; Clark, Mailloux, Parham, & Bissell, 1989). In certain cases, students showed improvements in on-task behavior while using a hand fidget during activities where they were required to sit still (Voytecki, 2005). Additional findings have indicated that both the classroom teachers as well as the students in the classroom prefer the use of hand fidgets in comparison to the alternative, “keep your hands quiet” approach (Voytecki, 2005). Hand fidgets are very popular among students (Hinck, 2017). These fidgets are widely available, and can be bought for a low cost at just about any retail store. It is important to note that sometimes, hand fidgets can

prove to be used as a distraction, rather than as a tool to increase on-task behavior. This can aggravate individuals, including teachers (The Understood Team, n.d.). Therefore, in order to increase on-task behavior, hand fidgets must be used as a tool to help focus instead of as a toy.

Self-Monitoring Strategies

Self-monitoring strategies are a piece of AT that are used to assist students with and without ADHD. This AT is a tool students can use that includes a clear idea of expected behavior and targeted behavior they are working to fix. With teacher guidance, students record their own behavior and compare that behavior to the standards that were previously set. For example, a student might have a goal to not interrupt more than three times. The student is able to keep track of how many times they interrupted, and then compare that to see if they met their goal (Intervention Central, n.d.).

Self-monitoring strategies can be implemented in a variety of different ways. These include a rating scale where a student can score themselves on their behavior, a check list where a teacher and check off what behaviors they displayed during a set period of time, or a frequency count where the student keeps a running record through tallies of the number of times that they displayed the target behavior. Results from studies have indicated that most of students with ADHD showed improvement both in their on-task behavior as well as on the academic outcomes when participating in self-monitoring strategies (Alsalamah, 2017).

Bouncy Bands

Bouncy bands are utilized to help students with ADHD and consist of a thick layer of a bouncy plastic that is strapped across a student's chair legs and is positioned parallel to the floor. While the student is sitting in their chair, they can move the band with their feet and

legs, which results in more focused concentration. The presence of the bands encourage active sitting by allowing the student to move and exercise their legs.

Studies have been conducted that suggest unstructured movement (a motion made by an individual when given a manipulative, either conscious or unconscious) is an effective intervention for students who have ADHD (Tine & Butler, 2012; Burgoyne & Ketcham, 2015). Bouncy bands allowed students to have unstructured movements and burn off excess energy, thus they exhibited fewer off-task behaviors and spent more time on-task (Dempsey, 2017). These bands can be beneficial for a student who needs to move in order to be able to concentrate by providing them an opportunity to do so in a productive and non-disruptive way.

Weighted Lap Pad

Students who have ADHD can have problems with moderating their level of arousal, which prevents them from paying attention or completing on-task behavior (VandenBerg, 2003). In order to combat this, a weighted lap pad is utilized for students with ADHD complete more on-task behaviors. The weighted pad (or can be a blanket or vest) goes in the lap of a student, similar to a blanket and can have a calming effect for the student. The use of these weighted pads can calm the students, reversing negative impacts on their academic performance. Therefore, the time spent on-task in the academic setting is increased (VandenBerg, 2003).

<Table 3>

Case Study

A case study was conducted with a 1st grade student, Kate, who has been diagnosed with ADHD. The purpose of this case study was to implement interventions in order to assist a

student who has ADHD. The student was chosen to participate because she was scoring low in several areas of instruction—most significantly in reading, writing, and mathematics and has a history of off-task behavior. As the school year began, Kate's family collaborated with the school staff in order to support Kate's academic achievement. At the time this case study was conducted, Kate was going through the initial assessment process in order to receive an IEP. Additionally, Kate also started taking medication to help neutralize the effects of ADHD.

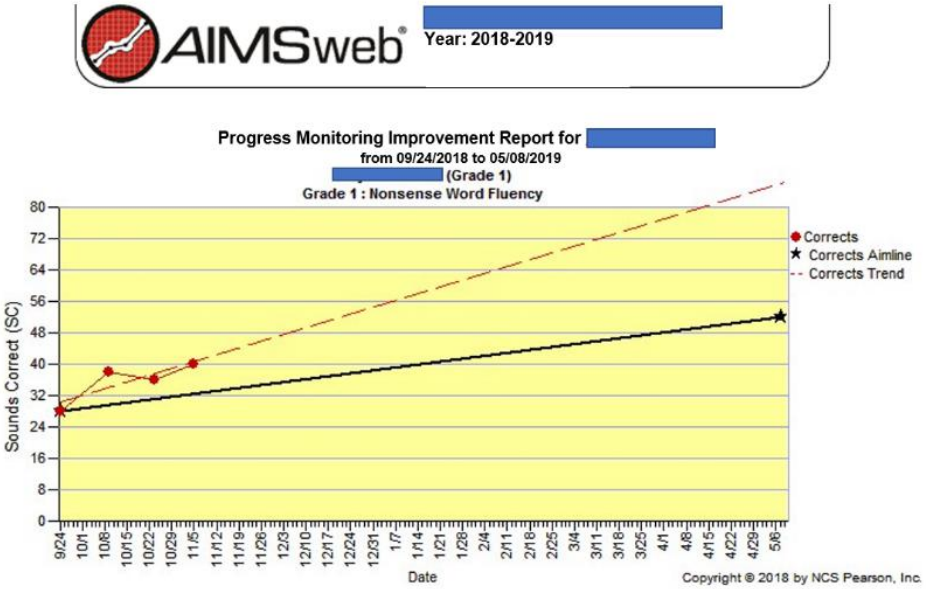
In order to help Kate in her academic setting, some actions were immediately put into place in order to increase her time on-task and foster higher academic achievement. Kate initially had difficulty with the task of copying down what was on the board to a piece of paper in front of her at her desk. In order to decrease the difficulty of the task of copying down information from the board to her paper, the first researcher changed her seat. When the issue first arose, Kate was in a seat where her back was facing the whiteboard. Because of her position, she had to turn her body to look at the board, and then turn her body back around in order to write the information on her paper. In order to eliminate the need to turn as frequently and the potential of forgetting what she was supposed to be written before she had successfully copied it down, the first researcher changed her seat. Her new seat was positioned so that Kate was facing the whiteboard at all times. The first researcher kept this in mind when changing seats, and always made sure Kate never had a seat where her back faced the whiteboard.

A subject in which Kate could benefit from interventions was reading. Kate was identified as qualifying to receive reading interventions with the school's reading specialist. The reason for Kate's qualification of these services is because when she entered first grade, she was reading at a level 3 DRA. Her DRA level was slightly below the expected goal of students entering first grade, which is a level 4 DRA. In order to increase her reading performance, Kate

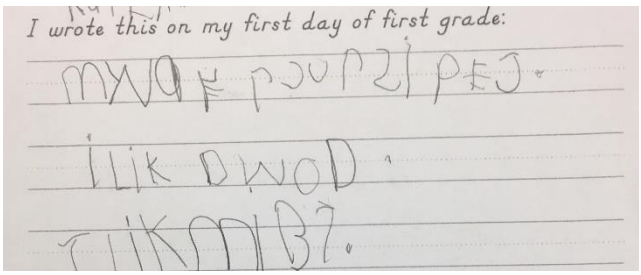
was given direct instruction interventions through the Leveled Literacy Intervention, or LLI program.

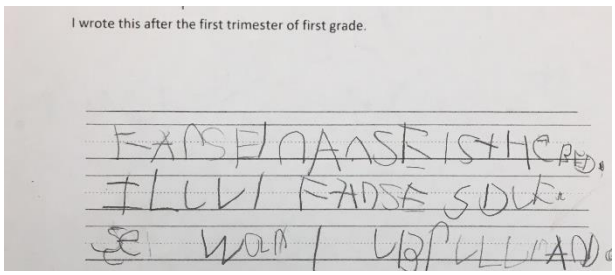
Kate was pulled into the reading resource room once a day for 20 minutes where the reading specialist worked with her and a few other students to improve their reading. The first researcher collaborated with the reading specialist in order to come up with interventions that could be implemented in order to further assist Kate in the subject of reading. Through this discussion, it was concluded that the first researcher would work with Kate in order to increase her phonemic awareness. The first researcher pulled Kate during silent reading time and worked with her to develop her phonemic awareness through the book *Phonemic Awareness: The Skills that They Need to Help Them Succeed!* by Michael Haggerty. The first researcher worked with Kate on various skills of phonemic awareness such as onset fluency, rhyme recognition, and blending phonemes, to name a few.

While Kate received interventions from both the reading specialist and the first researcher, she was still reading at a level 3 DRA by the end of the first trimester. Although her DRA level did not increase, there were still improvements that were noticed in Kate's reading performance. In order to monitor her progress, Kate's sounds correct from grade 1 nonsense word fluency were recorded. The rate of improvement should be 0.75 Sounds Correct per week. Kate is progressing in an upward, as she is increasing her sounds correct at an average rate of 1.72 Sounds Correct per week—higher than that of what the rate of improvement should be. Due to the fact that Kate is increasing at a higher rate than what is being aimed for, she is projected to end the school year at a higher number of sounds correct than expected.



Another subject in which Kate could benefit from interventions is writing. Kate had handwriting which needed improvement. At the beginning of the school year, Kate had several reversals, words spelled incorrectly, as well as handwriting that was difficult to read. In order to improve Kate's handwriting, interventions were put into place. The occupational therapist provided Kate with a pencil grip to help improve her handwriting. The first researcher and Kate's teacher provided Kate with extra time assisting her while she was working on handwriting due to reversals. Additionally, a sheet with all of the letters of the alphabet was taped onto Kate's spot at her table. This was provided to her so that she could refer to it in order to write her letters correctly and avoid reversals. Provided below are two samples of writing completed by Kate. The first is in August, and the second was in November.





The first researcher also worked with Kate in order to increase her academic achievement in mathematics. The school in which Kate attends utilizes Eureka math for their math curriculum. In Eureka math, a problem set and an exit ticket are implemented during each math lesson, which are typically focused on addition and subtraction. While working with Kate in the clinical setting, it became evident that Kate could benefit from interventions in math. Kate was struggling to successfully complete both the problem sets and the exit tickets.

Problem sets are typically 1-2 pages and consist of problems that allow students to practice the concepts taught in the lesson. The students complete the problem set to the best of their ability on their own. The teacher then walks around in order to assist students if they have questions or need to adjust their answers. The exit tickets are typically only a few questions and encompass the concepts taught in the lesson. Students complete the exit tickets on their own as formative assessment. The teacher can utilize the data from the exit tickets in order to assess student learning and differentiate future instruction.

Kate had difficulty completing both the problem sets and the exit tickets correctly. By the end of the first trimester, Kate had successfully completed 8 exit tickets out of 33 total. In order to promote successful completion of these worksheets, both modifications and accommodations were provided to Kate. At first, accommodations were provided to her. One of these accommodations included increasing the amount of time that Kate was allowed to complete the worksheets. Typically, the time allotted for completion of the problem set was 10 minutes. In order to accommodate Kate and promote successful completion of the problem set, the first researcher allowed Kate to have more time to complete the sheet she was working on.

An additional accommodation provided to Kate was decreasing the amount of work required on both the problem sets and exit tickets. The first researcher instructed Kate to only

complete about half of each of the work sheets. This was done in order to increase accuracy, completion, and self-esteem in Kate through the elimination of some problems. The incorporation of the requirement of less problems was implemented in order to decrease the level of stress on Kate, allowing her performance to increase. Despite the implementation of these accommodations, Kate was still struggling to complete the worksheets successfully. It became evident that accommodations were not enough, and that modifications were needed.

The first researcher started working with Kate one-on-one during both the problem sets and exit tickets in order to provide modifications. One of these modifications was that the first researcher would model how to solve the problem, work through the problem with Kate, and then have Kate try to do the problem on her own. This is known as "I-Do, We-Do, You-Do". For example, the first researcher would demonstrate how to solve an addition problem by drawing out the problem and explaining the steps to Kate. Then, the first researcher and Kate would solve the next problem together. The first researcher would ask questions to Kate that would prompt her to a successful way of solving the problem, such as "What should we do next". Lastly, the first researcher would ask Kate to solve a problem by herself using the same procedure done previously. Even with the "I-Do, We-Do, You-Do" strategy, Kate still struggles to complete the exit tickets successfully.

An additional modification that the first researcher provided to Kate was drawing a picture for Kate so that she could in order to solve the problem. For example, if the question was 9+3, the first researcher would draw 9 circles and then 3. The first researcher would then tell Kate to look at the picture in order to help her solve the problem. For the majority of problems, Kate was able to successfully utilize the picture provided to her by counting the circles drawn and ultimately provide the correct answer.

With the incorporation of Common Core Math, several strategies are taught to students to be able to solve problems. Eureka math teaches several strategies to obtain the same answer. For example, one of the strategies is making 10. In order to solve the problem 9+3 with the making 10 strategy, a student would take 1 from 3 and add it to 9 in order to make 10. Then, they would add the remaining 2, resulting in 10+2. This would get them the final answer of 12. With the incorporation of different strategies such as this one proving to be difficult for Kate, another modification was provided to her. Instead of having Kate solve a problem using the specific strategy learned in the lesson, Kate was told to solve the problem with any strategy that she would like. Instead of requiring Kate to use the make 10 strategy, the first researcher would simply tell her to add 9+3 in any way that works for her. While this accommodation did make things a bit less complicated for her, Kate still struggled with successful completion of worksheets without assistance from the first researcher.

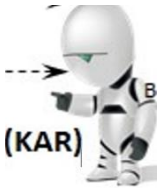
Despite the fact that Kate was not performing in math as high as her teacher and the first researcher would have liked, Kate still had improvement over the period of the first trimester. When Kate took the pre-test for the first math unit, she scored 0/66, or 66%. Kate scored a 28/66 on the post-test, or 42.42%. While this is not as high as Kate's teacher and the first researcher would have liked to see, it is still important to note that Kate made a significant improvement as was able to increase her score on the same test by 42.42%.

Keeping everything this case study encompassed in mind, recommendations can be made in order to help continue the improvement of Kate's academic achievement. In Kate's upcoming IEP, it is recommended that a math goal is provided, as this is a subject she still continues to struggle with. One-on-one interventions, accommodations, and certain modifications could be given to Kate in order to help her in the area of mathematics. Seeing as Kate is improving in her

reading fluency, yet is still below grade level for her reading level, it is recommended that she still meet with the reading specialist in order to continue reading interventions. Lastly, it is recommended that Kate's writing is monitored and she is provided one-on-one feedback when possible in order to help decrease her use of reversals and improve her handwriting overall. With all of these supports in place, Kate's academic achievement can continue to improve in a learning environment that caters to her individual needs.

While Kate faces some challenges in her academic setting, there are several tools that can be provided to her in order to combat the challenges she faces. This case study provided the first research a few tools that can be implemented in order to help improve academic achievement in students who have ADHD and/or face challenges in the subjects of reading, writing, and mathematics. Through the implementation of reading interventions, accommodations in reading and mathematics, and physical arrangements in the class, this case study provided the first researcher with a variety of resources that can be utilized for helping a student who has ADHD and/or has academic challenges.

Table 1

Tech	What it does	Cost	Availability	Pros	Cons
Computer-Assisted Instruction (CAI) 	Provides students with receive immediate and frequent performance feedback, continuous opportunities where academic stimuli is provided to them, as well as instant reinforcement.	Varies	Not readily available, as it is not commonly used in the majority of classrooms	Provides specific scaffolds to students with ADHD in areas where they typically struggle academically	Limited research on CAI, not widely available nor used commonly in the classroom settings
Computer-Assisted Cognitive Training (CACT) 	Provides individually tailored instruction focused on the deficits students with ADHD have in order to level the playing field with their classmates	Varies	Not readily available, as it is not commonly used in the majority of classrooms	Instruction as well as frequency of intervention is individually catered to the specific needs of each student	Limited research on CACT, not widely available nor used commonly in the classroom settings
Biofeedback Training 	Uses electromyographic (EMG) feedback in order to reduce muscle tension levels and electroencephalographic (EEG) feedback in order to operantly condition brain-wave activity	Varies	Not typically readily available, however, it is growing in popularity, receiving media attention increasingly	Provides accurate, specific, and individualized feedback in order to target specific behaviors in students	Not readily available, requires expert in order to implement this with students
Kindergarten Assistive Robotics (KAR) 	Robot provides a toy and game approach in order to train students' cognitive skills, define daily tasks, provide feedback on student performance, and monitor student performance over time	Price to be determined	Not typically readily available, as it is not commonly used in the majority of classrooms	Engages students in a fun and unique way, provides one-on-one experience to students, monitors progress in order to give feedback	Not readily available, not always accepted by the students or on the other hand, sometimes students form an emotional bond to the robot
Attention Training System (ATS)	Awards points at pre-determined intervals for when the student is performing on-task	$325	Can be easily purchased online, utilized in schools for	Rewards can be individualized to student interests in	Students may become extrinsically motivated

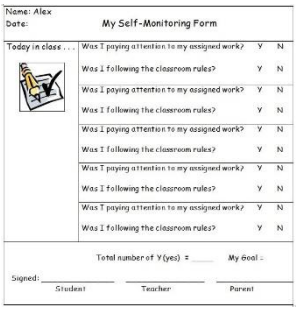
Tech	What it does	Cost	Availability	Pros	Cons
	behaviors, also displays cumulative points the student has earned for on-task behavior. These points can be later exchanged for pre-determined items		students with ADHD	order to motivate them more, can provide a positive learning experience for the student	instead of intrinsically motivated and may not be as motivated when the ATS is not around

Table 2

Tech	What it does	Cost	Availability	Pros	Cons
Talking Word Processor 	Provides auditory feedback for various letters, words, sentences, or paragraphs in addition to a talking spell checker	$35-100	Can be purchased relatively easily online	Helps assist students in the auditory process of hearing specific words, letters, paragraphs in addition to being able to be used as a talking spell-checker	Student might not be able to differentiate between homophones with this piece of technology. For example, they might type "That man over their" and not realize that their sentence is grammatically incorrect
Automated Prompting 	Delivers a message to the student to prompt them to do a part of their routine, stay on task, etc.	$15-70	Can be purchased easily as a watch that has a vibration setting	Can be easily purchased, encourages student to follow routine with minimal prompting	Student may rely too heavily on it and forget to do an activity if they do not have the item prompting them
Time Timer 	Helps students keep track of time by having a designated amount of time clock down. The time remaining is shown with a shrinking red disc.	$40	Can be easily purchased online	Helps student keep track of time, displays time in a visual representation	If student does not frequently remember to look up at the timer, the student can easily lose track of time

Tech	What it does	Cost	Availability	Pros	Cons
Smart Pen 	Records audio and written samples of what the user of the pen hears, says, and writes	$100-200	Can be purchased relatively easily online	Assist students in notetaking, which is something they may struggle in	Students may rely too heavily on it and struggle with taking notes without it
White Noise Emitter 	Speaker emits white noise in order to help the student with ADHD focus	$50	Can be purchased relatively easily online	Assists students' cognitive performance	May be distracting to other students, noise level has to be "just right"—not too high and not too low

Table 3

Tech	What it does	Cost	Availability	Pros	Cons
Hand Fidget 	Allows students to be able to improve their concentration by allowing them to manipulate something in their hand	$1-10	Readily available and can be purchased at a multitude of stores	Readily available and utilized in the classroom, able to be purchased at a very low cost	Can be distracting to other students or even distract the student using it
Daily Report Card 	Consists of a list of the individual student's target behaviors and includes specific criteria that is required to meet each behavioral goal, from this a reward system can be implemented if they reach the target behavior specifications	Free online	Commonly implemented in schools, daily report cards themselves can be easily made or accessed online	Individually catered for specific target behavior based on each student, highly motivating as reward system can be catered to students' likes/interests	Students might lose interest if rewards don't change and/or are uninteresting
Self-Monitoring Strategies 	Tools such as a rating scale, checklist, frequency count, etc. that allows students to monitor their own behavior and compare it to pre-determined goals	Free online	Easily and readily available, resources can be found and printed from the internet	Readily available, implements self-reflection and awareness in the student of the behaviors expected of them	Students must be aware of the expectations and how to accurately assess themselves in order for this intervention to work

Tech	What it does	Cost	Availability	Pros	Cons
Bouncy Bands 	Provides students with the opportunity to move and exercise their legs while sitting down	$15	Readily available, can be purchased online	Allows students to exercise their legs and burn off excess energy	Students may use this as a distraction rather than for movement
Weighted Lap Pad 	Comforts students and increases on-task behaviors	$20	Readily available, can be purchased online	Calms students with ADHD who have difficulties moderating their levels of arousal	May look unattractive or bulky or be a distraction

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