

A Breakthrough for Josh: How Use of an iPad Facilitated Reading Improvement

By Barbara McClanahan, Southeastern Oklahoma State University, Kristen Williams, Southeastern Oklahoma State University, Ed Kennedy, Grandview Public School, OK and Susan Tate, Swink Public School, OK

Abstract

As part of a diagnosis and tutoring project in an elementary education reading course, a pre-service teacher was encouraged to use an iPad as the vehicle for intervention strategies with a fifth grade struggling reader with Attention Deficit Hyperactivity Disorder. The device not only helped the student focus attention, it facilitated his becoming much more metacognitive in his reading. Comparisons of pre- and post-assessments showed that the student had gained one year's growth in reading within a six-weeks time period. The student also gained in confidence and sense of being in control of his learning. While generalizations to other struggling readers with Attention Deficit Hyperactivity Disorder cannot be made, the success this student experienced suggests that the use of this device is worth serious consideration and research in similar contexts.

Keywords: ADHD, eBooks, eReaders, intervention, iPad, reading strategies, struggling readers, tablet computers, educational technology, tutoring

Very early in the new century, Leu and colleagues (Leu, Kinzer, Coiro, & Cammack, 2004) directed our attention to how the new technologies have come to redefine literacy in school, work and home. They believed that information and communication technologies (ICTs) are the most critical for schools to be concerned with. Interestingly, they also point out that these technologies are difficult to define because they change so rapidly. Indeed, the particular device used in this account, the iPad, did not exist when their article was written, but it certainly qualifies as an ICT.

First author Barbara's interest in the iPad was generated shortly after its release in April 2010, and the opportunity for some hands-on experience in early fall of that year convinced her as a university professor working with pre-service teachers that the device has huge educational potential. Designated in the trade as a tablet computer, the iPad is based on the same operating system as the popular iPhone. Its standout features include comfortable size and weight, touch screen, Wi-Fi data connection and a plethora of affordable applications that are easily downloaded. In the few months since release of the iPad, school districts from California to Virginia have adopted it to meet various educational purposes, especially to provide enhanced, interactive textbook access (Allen, 2011; Ash, 2011; Ferriter, 2010; Tatum, 2010). Some high-profile educators, including Barbara Ludlow, editor of *Teaching Exceptional Children*, have suggested that the iPad and similar devices are the future of one-to-one educational delivery, if not education itself (Allen, 2011; Ferriter, 2010; Ludlow, 2010). In an unexpected chain of events, the opportunity to observe firsthand the power of the iPad to impact a struggling reader with Attention-Deficit/Hyperactivity Disorder (ADHD) materialized that fall for Barbara and Kristen, a pre-service teacher candidate in a rural K-8 school.

Theoretical Framework

A report published by Chunzhen, Ried, & Steckleberg in 2002 reviewed the research available on the use of technological interventions to support students with ADHD in their academic efforts. Their conclusions were that "there is currently little well controlled experimental research on the effectiveness of technology spe-

cifically for children with ADHD” (p. 224). A search of educational databases for such research since their 2002 review resulted in only two articles, one that studied motor control of boys with ADHD during computer video game play (Houghton et al., 2004) and one dealing with a computer-assisted social skills program (Fenstermacher, Olympia, & Sheridan, 2006). These two articles do not yet meet the research goals that Chunzhen et al. (2002) identified.

Despite this dearth of experimental research, there is extant research relating to students with ADHD that has implications for the issue. A longitudinal study conducted by the MTA Cooperative Group confirmed that the most productive approach to use with students with ADHD was a combination of medication and behavioral treatment that included a school intervention component; behavioral treatment alone had a positive but less significant effect (MTA Cooperative Group, 1999a, 1999b; Sherman, Rasmussen, & Baydala, 2008). Nevertheless, follow-up studies showed the most enduring effects were achieved by behavioral treatment alone (MTA Cooperative Group, 2004a, 2004b). However, a review of the literature by Raggi and Chronis (2006) addressing academic impairment of students with ADHD determined that most of the school interventions focused on targeting behavior *during* academic lessons (e.g., DuPaul, 1991) rather than planning specific interventions to address academic deficiencies brought about by the core symptoms of ADHD, i.e., inattention, hyperactivity, and impulsivity. Nor did these studies include academic outcomes.

While Raggi and Chronis (2006) found that most of the sparse research in this area had significant design flaws or was difficult to generalize because of small sample size or non-naturalistic sites, they felt that there was sufficient evidence to suggest that certain approaches held promise. Specifically they cited peer or parent tutoring involving a one-on-one component, task and instructional modifications including the use of computer-aided instruction (CAI), strategy training, self-monitoring, use of functional assessment, and homework management programs. Nowacek and Mamlin (2007) reached very similar conclusions. These discussions of CAI provide support for the intervention described in this article.

Although the research on CAI is often flawed or conflicting, their review led Raggi and Chronis to conclude, “CAI may be especially beneficial for improving the academic performance of students with ADHD” (p. 92). They also suggest that CAI may be particularly useful for teachers in general education classrooms to allow them to

provide individualized instruction for their students with ADHD. They point to specific characteristics of CAI that may promote sustained attention and improved work performance of such students; these include presentation of learning tasks in multiple modalities, the capability of chunking tasks into more manageable pieces, and repeated trials with immediate feedback. Additionally, CAI offers one-on-one tailored instruction that is self-paced, often along with the novelty of game formatting which promotes engagement and attention. All of these characteristics directly address the core symptoms of ADHD.

The use of technology, especially CAI, with struggling readers has been investigated by researchers for decades (e.g., Horney & Anderson-Inman, 1999; Horton, Lovitt, Givens, & Nelson, 1989; Rhodes & Milby, 2007; Smith & Okolo, 2010). Commercially developed programs, eBooks often with text-to-speech, and computerized learning games all have research to document their varying degrees of effectiveness (Balajthy, 2007; Hasselbring & Goin, 2004; Moody, 2010).

Although the iPad has eBook capability, it is much more than an eBook. Even so, there is insufficient research evaluating eBooks themselves in the classroom, much less as interventions for struggling readers. The authors were able to locate only one study (Larson, 2010) that reported students using an eReader, specifically the Kindle, to read eBooks in the classroom. In the study, using the Kindle resulted in improved engagement with text and deeper comprehension. Although the students in her study were not struggling readers, Larson provided a thorough explanation of how the features of the digital reading device enabled students to customize their reading experience in several ways. They were able to change font size, write notes in the text using a keyboard and utilize an audio-enhanced dictionary. In addition, the students were able to read in more comfortable physical positions compared to reading on desk computers or laptops.

Cavanaugh (2002) offered justification for using eBooks to create specialized accommodations for students with reading disabilities and described the creation of such accommodations for a text in the public domain. However, no examples of the actual use of such accommodations with students were shared. Rhodes and Milby (2007) provided teachers with detailed instructions on how to create their own eBooks to support learning disabled readers, but again no documentation of the effectiveness of these books was offered.

A tablet computer like the iPad has much more functionality than an eReader such as the Kindle. It is certainly too soon to expect well designed studies of its usefulness with struggling readers or students with ADHD, but as new technologies become available, often the leadership and direction for research come from teachers trying out these technologies in their classrooms (Leu et al., 2004). Such seems to be the case with the iPad.

Context

One of the courses Barbara teaches at a small regional university in southeastern Oklahoma is reading diagnosis and intervention for pre-service teachers. In this course each teacher candidate is asked to complete what is essentially an action research project. Action research is generally thought of in terms of in-service teachers identifying and studying issues of teaching in their own classrooms (Ferrance, 2000; Mills, 2000). In recent years participatory and reflective action research has also come to be thought of as a valid form of professional development and is therefore logically extended to the field work engaged in by pre-service teachers (Noffke, 1997). A typical design for an action research project includes identifying a problem or area of focus, collecting data, analyzing and interpreting data, and developing a plan of action (Mills, 2000). Ferrance (2000) adds a fifth step—evaluating the results through reflection.

The purpose of the project in this course is to provide practice for pre-service teachers in identifying issues and concerns, collecting appropriate data, analyzing that data, developing an appropriate action plan, and implementing the plan. The specific assignment is to assess a fourth or fifth grade student who is reading at least two years below grade level (problem) using an informal reading inventory and an interest inventory (data collection tools). After analyzing the results of the assessments (analyzing and interpreting data), the teacher candidate designs a research-based plan of action (developing a plan of action) as well as structured lesson plans for at least six tutoring sessions. At the end of the tutoring sessions, the teacher candidate re-assesses the student to determine whether reading progress has been achieved and recommends further instructional strategies for the student (evaluating results through reflection). Throughout the duration of the project Barbara meets with each teacher candidate repeatedly, reviews the work done, and guides in the planning and conducting of the tutoring sessions. She fulfills the role of supervisor for the action research

project (Ferrance, 2000). Thus this project for pre-service teachers follows closely the standard procedure for action research. However, one of the key advantages of the action research paradigm is that when unexpected possibilities arise, the researcher, in this case the teacher candidate, is free to incorporate them into the action plan (Mills, 2000).

Problem, Participants, and Initial Data Collection

In early October 2010, second author Kristen, one of Barbara's pre-service teachers, came to her with test results for Josh (a pseudonym), a fifth grade boy with ADHD who was reading on a second grade level. Sink Public School, the tiny rural school he attended, was too small to provide pull-out classes for students identified as qualifying for special services. Josh's parents/guardians have decided not to use medication to treat the ADHD, which was identified at age 9. Josh has been at Swink for his entire school career.

Although his individualized education program (IEP) requires specific accommodations and modifications such as oral administration of tests, reduced assignments, extra time, breaking work into smaller pieces, frequent reminders, etc., implementing these accommodations and modifications is sometimes inconsistent due to the high population of other students with similar IEPs. Nowacek and Mamlin (2007) in reporting two multiple-case studies found that the elementary and middle school teachers did not implement modifications consistently. Additionally, they tended to use "modifications that could be performed without advanced planning, that did not require differentiated instruction, or behavioral intervention, or that could be addressed by another professional or support person" (p. 34). Based on conversations with school personnel, this probably describes the modifications Josh received in the years since he was identified as having ADHD. Sherman and colleagues (Sherman et al., 2008) found similar results in their review of the literature, but also concluded that teachers' views and behaviors toward ADHD students directly influence the behavior and consequently the academic outcomes for these students. During the 2007-2008 school year when Josh was in second grade, his STAR reading assessment showed approximately one year's growth in reading, from an end-of-year kindergartner (0.9) in the fall to an end-of-year first grader (1.9) in the spring. STAR assessments for other years were not available. A review of Josh's scores on the state reading

test shows that between third and fourth grades Josh improved slightly but still scored “unsatisfactory.” It was during the fourth grade year that modifications and accommodations were implemented, which may help to explain some of the improvement.

During the testing session with Kristen, Josh either rocked his chair back and forth on its two back legs or stood with the knuckles of his fists on the table top while the rest of his body swung back and forth. He continually interrupted the flow of the assessment by bringing up random topics and questions. It was obvious to Kristen that Josh was trying to cooperate but he just could not stay focused.

Concerned that any tutoring she attempted would likely be ineffective, Kristen consulted Ed Kennedy (third author), superintendent of Swink. He suggested that since Josh was already familiar with the iPad from using it in his classroom, perhaps Kristen could use it as a reward for focusing on the tutoring assignments. In fact, he even suggested using the iPad in the tutoring lesson itself. Knowing that Josh would get little parental support of the tutoring, his reasoning was that, beyond the general allure that technology has for most students, the self-paced, individualized format that the iPad offered would be beneficial for Josh, as Raggi and Chronis (2006) have suggested. Kristen shared this possibility with Barbara, who gave Kristen permission to utilize the iPad in her tutoring sessions so long as the applications used were consistent with her approved plan of action and researched-based reading strategies.

Data Analysis and Developing the Plan of Action

When Kristen analyzed the data from the IRI, she confirmed that Josh’s instructional level was second grade. He did not read in phrases or with expression and paid little attention to punctuation. He, in fact, was not bothered by his miscues and made no attempt to figure out unknown words. He generally pronounced the beginning of an unknown word correctly but guessed at the rest of it. In terms of comprehension, he frequently missed detail, sequence, and inference questions.

Kristen next drew up her plan of action, which outlined Josh’s areas of need and the specific kinds of instructional activities she proposed to address those needs. Her plan addressed word recognition strategies for decoding, recognizing compound words, and utilizing context clues to decrease his miscues. To address comprehension issues, she decided to focus on sequencing and

Sidebar

Swink Public School is a tiny K-8 school located in Southeast Oklahoma. It is situated in one of the most economically depressed rural areas in the nation. When Ed Kennedy arrived to take on the duties of superintendent in 2009, he found a school with almost no technology and little understanding of the need. Having a strong background in educational technology himself, he quickly developed a plan. During that first year, he rearranged the budget and aggressively applied for grants that would allow Swink to enter the Digital Age. By mid-year all teachers had SmartBoard interactive systems, and teachers’ desktop computers that were more than ten years old were replaced with modern laptops. By the end of the school year in May 2010, Kennedy was able to provide every one of his skeptical teachers with an iPad. Presenting them as “gifts” on the last day of school, Kennedy in effect provided teachers with two and one-half months of play/professional development time with the iPads in their own homes at their leisure.

During that summer Swink also retrofitted a small library into a technology lab, requiring new cabling, the addition of SmartBoard interactive components, computer tables, and 28 new laptop computers. A reorganized class schedule for 2010-11 included daily technology classes for all students, elective classes that integrated technology, and after-school enrichment programs. Also offered were parent technology training and family access to the technology lab, critical to secure community buy-in.

Kennedy was convinced that for teachers to believe in the impact that educational technology could have, they had to feel confident using it and see examples of its impact on learning. He contends the professional development implemented throughout the year was the biggest factor in the school’s progress. The training included basic computer skills, internet teaching resources, Oklahoma Priority Academic Student Skills, SmartBoard integration, and finally, iPad training, both structured and self-directed. By the beginning of the 2010-2011 school year, Swink teachers had become knowledgeable implementers, with a newfound level of commitment to educational technology. See their story at the OETA website: <http://www.oeta.tv/component/video/908.html>.

remembering details, drawing inferences, and identifying cause and effect. She found several applications for the iPad that she felt would be useful, as well as strategies and graphic organizers on the Internet that she downloaded directly to the iPad.

Kristen and Barbara met to discuss her findings, plan of action, and first lesson plan, as well as Kristen’s use of the iPad to carry out these plans. Kristen clarified how these strategies supported her plan of action. Kristen and

Barbara spent several hours in both face-to-face and electronic consultation during the period of time the tutoring was ongoing. After the tutoring sessions ended, Kristen and Barbara met on several occasions during which Kristen dictated more detail of the events of the sessions, using her notes to spark her memory. In addition, Kristen's assessment papers, plan of action, lesson plans, and notes made during each tutoring session became data from which much of this article is drawn.

The lessons themselves were structured according to research-based procedures (Gillet, Temple, & Crawford, 2008) to include a mini-lesson on a skill with which Josh needed help, a reading passage that was implemented using before, during, and after reading strategies, a brief assessment in the form of a running record, recreational reading at the student's independent reading level, and journal writing.

On the advice of Susan Tate, one of Josh's teachers, Kristen broke the tutoring sessions into two parts. In the first half of session one, Kristen tried a traditional activity using sentence strips to teach context clues, but it was unsuccessful. At the end of the short session, Kristen let Josh play a game on the iPad, one with which he was familiar. She noted that while he was working on the iPad, he sat perfectly still for at least 10 minutes and stayed totally focused on the game. At that point she was convinced that the iPad would play a major role in her intervention with Josh. The second half of Lesson One took place two days later. Kristen continued the lesson on context clues, this time utilizing a game she had downloaded to the iPad from an educational website on the Internet. Josh was much more responsive using this interactive method.

Kristen also used an eBook called *The Wonderful Palace* that she had downloaded to the iPad that was written at Josh's instructional level. This particular eBook allowed the student to record himself as he read aloud. Next he listened to himself reading, following along in the text with his finger. He began to realize that when he was reading, he needed to slow down to say the words more carefully. He commented, "Sometimes when I read, I read too fast and it doesn't make sense." In other words, he was becoming metacognitive about his reading. At the very end of the session, he asked to read the story again to "make it make sense." When he read the story this time, he slowed down too much in order to pronounce each word correctly, but this time he was intent on making sense of it. Josh had a new understanding of what reading is supposed to be.

Over the next five weeks, Kristen and Josh met together at least twice a week for 20-minute sessions in which the iPad figured prominently as a presentation method for content and strategies. Sometimes the use of the iPad was student-led. For example, when in the third lesson Kristen tried to introduce the topic of compound words using a traditional set of flash cards, Josh said, "It's hard for me to read when two words are put together." Then he asked if they could do the flash card activity on the iPad instead. Kristen found the FlashCards+ application and quickly created several flashcards of compound words. As they paged through the flash cards on the screen, Kristen was able to demonstrate for Josh how compound words are constructed. After this mini-lesson, Kristen used a version of the "Compound Boogie" game which she had already downloaded to the iPad from the Internet to use for this lesson to provide guided practice. In this application, two words are presented at a time. The student taps on the word on the screen that he thinks is the compound word. If he chooses an incorrect word, the program (actually a PowerPoint) provides feedback and offers an opportunity to make a correct response. Josh played "Compound Boogie" at both sessions of Lesson Three. This exercise helped Josh understand for the first time that a compound word could be broken into two recognizable words.

Next Josh read *The Tortoise and the Hare*, a story on his instructional level, recording his own voice just as he had in Lesson One. He was very cautious in his reading, and Kristen felt it was because he knew that at the end they would listen to it and catch all his mistakes. By slowing down he made significantly fewer mistakes than in the first session, and seemed to comprehend more of the story. He listened to his reading of the story and followed along with his finger accurately.

To determine if it was his own voice that made the difference, Kristen read the same story to him from the iPad screen. He seemed to have more difficulty following along as she read than when he was listening to himself read. Thus, she decided that having him record and listen to his own reading was valuable. Since some of the books they read were not available on the iPad, Kristen used a tape recorder to achieve a similar effect.

In subsequent lessons, Kristen and Josh worked on word recognition and comprehension. They worked on word recognition skills using Vocabulary Builder, Miss Spell's Class, and ABC Alphabet Phonics. Specifically, she was teaching Josh to read all parts of a word and

demonstrating how changing one or two letters changes the meaning of the word.

Kristen designed lessons on comprehension including sorting out main idea and details, understanding sequence, and making inferences. She used a combination of iPad applications and activities downloaded to the iPad from the Internet that were useful in teaching these concepts. In one lesson, for example, she used the Stories-2Go application to teach Josh how to sequence main ideas in a story. In this application, the stories are read aloud by the device as the words are presented on the screen. After listening to and reading the simple story, Kristen had Josh give the sequence of events in order. As a pre-reading strategy for several stories downloaded from an educational website, she used the prediction guide available on the site, which automatically generates a guide for making predictions about a story. In addition, Kristen downloaded anticipation guides for several of the stories she and Josh read, which Josh completed. To work on making inferences she also downloaded a graphic organizer called the inferencing poster. It uses a drawing of an umbrella to help students sort out main idea and details and make inferences based on the sorting. This and other graphic organizers were presented to Josh directly on the iPad.

Besides the specific applications and stories downloaded to the iPad, other aspects of the device enabled Josh to use comprehension strategies to aid his reading that he would have struggled with in a paper text. For instance, Kristen demonstrated the INSERT strategy (Vaughan & Estes, 1986) using a paper text and then taught Josh how to use a stylus to mark the text in the same way on the iPad screen using the INSERT markings. At the time, Kristen did not make detailed notes as to the precise procedure and applications she used to do this, and at the time of this writing is unable to remember how she did it. However, the authors have noted that applications are now readily available that allow marking on the screen display.

INSERT involves using a few specific simple marks to indicate response/reaction to the text; for example, a check mark indicates something already known, a question mark something that doesn't make sense, and exclamation mark something that is very important. Josh found this strategy much to his liking and quickly progressed from making simple markings to writing real notes in the text to help him find details later. When Kristen questioned him about these additions, he said, "Well, I know you are going to ask me questions about this later, and this way I can go back and find the answers." After

the INSERT strategy was introduced in Lesson Four, he used it consistently and independently for every reading passage after that. In fact, he commented that he felt this was going to help his reading in his regular classes, suggesting a genuine attempt at transfer of what he was learning to new contexts.

As Kristen worked with Josh over the six weeks, it seemed to her that he was definitely making progress not only in his reading ability, but his attitude as well. He seemed excited to read on the iPad; he seemed to have an improved attitude toward his schoolwork and toward himself. At one point he commented, "If I would have learned [sic] how to do these things when I first started school, I wouldn't have had such a hard time."

Results and Evaluation

During the final session, Kristen administered a different form of the informal reading inventory she had used for the initial assessment. On the initial testing at second grade, Josh's word recognition was 96% and comprehension was 75%; this was his instructional level. At third grade, word recognition was 88% and comprehension was 90%, indicating frustration level (see Table 1). She began the final assessment with his previous independent level of first grade and continued through the fourth grade. On the first and second grade assessments, his word recognition scores were 100% and comprehension scores were 75% and 100% respectively, indicating that second grade was now an independent level. On the third grade level, word recognition was 98% and comprehension was 85%, meaning this was Josh's new instructional level. On the fourth grade level passage he skipped four lines, which dropped his word recognition score below 85% and his comprehension score to 60%, indicating frustration level. The results of the initial and final assessments are displayed in Table 1 and suggest that in a matter of six weeks, Josh had improved one full grade level in reading ability.

Beyond the numerical data, however, it is important to see the less tangible results revealed in Kristen's observations of Josh's reactions, responses, and comments. For example, his request to re-read the story in Lesson One "to make it make sense this time" strongly suggests Josh now understands that reading should be done to construct meaning. His explanation of his rationale for making notes in the text shows that he has developed some control over his own reading strategies. His declaration that he felt the INSERT strategy would help him in

Table 1. Josh's Scores on Initial and Final IRI Assessments

Grade Level of Assessment	Initial Scores as a Percentage		Final Scores as a Percentage	
First	WR	99	WR	100
	Comp	100	Comp	75
Second	WR	96	WR	100
	Comp	75	Comp	100
Third	WR	88	WR	98
	Comp	90	Comp	85
Fourth	WR*		WR	<85
	Comp*		Comp	60

Key: WR = Word Recognition; Comp = Comprehension

*Fourth grade test was not initially administered because it was above frustration level.

other classes indicates an improved and more positive attitude toward learning in general. His poignant statement that if he had learned these strategies earlier, he would not have had so much trouble in school reveals a child who *will* learn and *can* learn if given the appropriate tools and instruction.

Reflection and Implications

Six months after Kristen's tutoring sessions with Josh, he is still a child with ADHD reading below grade level, though his teachers report that he has made noticeable progress. To capitalize on that progress, however, Josh will need continued one-on-one intervention based on ongoing assessment, and the authors believe that use of the iPad as the medium of that intervention will be important.

This article reports the experience of one pre-service teacher with one struggling reader who was also dealing with ADHD. Consequently, these results cannot be generalized to other situations. However, the potential of transferability is real (Mills, 2000). It is important to ask why the iPad enabled Josh to focus on academic tasks and make such progress when five years of schooling and remediation had not offered such success. What was different?

In offering the following interpretations, the authors are well aware of the impact of story as

a research tool, and the limitations that our own lived stories have on these interpretations (Carter, 1993). As Carter states, "A story...is a theory of something. What we tell and how we tell it is a revelation of what we believe. (p. 9)" Thus we understand that we are interpreting the events of the story we have told through the lens of our own beliefs.

Certainly the fact that the tutoring sessions offered one-on-one intervention may have been a factor in Josh's growth (Nowacek & Mamlin, 2007; Raggi & Chronis, 2006). However, Josh's inability to focus during the initial testing session suggests that the tutoring sessions would have been no different. Kristen's lesson plans teaching word attack and comprehension strategies were well designed and supported by research, but without some way to gain and hold Josh's attention, they would have been unlikely to facilitate the academic achievement he experienced. The thing that seems to have made the difference was the use of the iPad as a mediator of the intervention (Raggi & Chronis, 2006).

As Kristen and Barbara discussed what aspects of the iPad seemed most likely to have made the difference for Josh, several possible explanations surfaced. The manipulative touch screen promotes the use of several modalities (Raggi & Chronis, 2006), especially visual and tactile/kinesthetic. The added aspect of recording his own reading and being able to play it back and hear his own mistakes while looking at the text (Chalmers, 1991) may have enabled him to integrate the aural modality with the visual and tactile/kinesthetic more readily and effectively. This is supported by the fact that Josh's teachers had noted that his comprehension was greater when someone else read a story or explained a concept, and Kristen's discovery that it was still greater when he listened to his own reading. The optimal stimulation theory of ADHD suggests the possibility that the higher levels of sensory stimulation using the iPad may have allowed Josh to engage in the learning task in ways that typical classroom experiences do not (Zentall, 1975). In addition, the touch screen and use of the stylus may have added to Josh's sense of being in control (Newton, Ard, & Horner, 1993). The stylus promoted engaging in a note-taking strategy in a multimodal environment, an approach supported by the work of Evans and colleagues (Evans, Axelrod, & Langberg, 2004; Evans, Pelham, & Grudberg, 1995).

Matt Dunleavy of Radford University is currently conducting important research on the impact of mobile devices of all kinds, including iPads, on learning for the general school popula-

tion (Allen, 2011). His work and that of others, such as that being conducted by TimeLab2100 at the Massachusetts Institute of Technology (Allen, 2011) is fundamental to how we use such technology in schools. However, we also need to examine just as carefully how devices such as the iPad do or do not positively impact the exceptional student population that is at a disadvantage for learning in the traditional school setting. Until actual research on the use of iPads with struggling readers is published identifying what these factors are, such stories as Josh's can provide direction just as Leu and his colleagues (Leu et al., 2004) suggest.

In considering other important aspects of the use of technology for students with ADHD, Chunzhen and colleagues (Chunzhen et al., 2002) specified two major practical concerns: limitations of hardware and software availability and teacher training. These are concerns when technology is being considered in any educational setting. The iPad or similar devices may provide a solution to these concerns, first because of the relatively smaller cost of tablet computer applications and licensing compared to PC applications and licensing. Secondly, since a tablet computer generally utilizes the same or similar operating system as the ubiquitous smartphones—Ed Kennedy called it a cell phone on steroids—very little teacher training is required to become comfortable with how the device works. Research is unquestionably needed to explore these possibilities. Certainly, from Kristen's point of view the availability of applications and the ability to download Internet "finds" directly to the iPad facilitated her planning and the implementation of the lessons. Moreover, she was able to very quickly master the use of the iPad virtually on her own.

As we wait for the results of research, the authors encourage more teachers to explore for themselves ways that the iPad and similar electronic tablet devices can provide support for struggling readers. We encourage teachers involved in Response to Intervention programs, for example, to consider experimenting with tablet computers to allow students to gain insight into their reading by hearing themselves read (Chalmers, 1991) as more eBooks with such capability become available, to improve comprehension with the use of electronic graphic organizers (Smith & Okolo, 2010), and to interact with reading passages by making electronic notation in the text (Evans et al., 1995, 2004). Teachers attempting to differentiate instruction may explore using tablet computers to allow students to work in the learning modalities in which they are stronger (Beam, 2009), while simultaneously

offering them the opportunity to further develop modalities in which they may be weaker. In the 21st Century, teachers can indeed lead the way for researchers, as one pre-service teacher at Swink did.

Barbara McClanahan received her doctorate in education from Texas A&M-Commerce and is currently an assistant professor at Southeastern Oklahoma State University, based at the McCurtain County Campus in Idabel, OK. She teaches graduate and undergraduate reading courses and is the Coordinator for the Master's Reading Specialist Program. Her research interests include teacher professional development and struggling readers.

Kristen Williams completed her bachelor's degree in elementary education at Southeastern Oklahoma State University in 2011. She is currently focusing on her role as a wife and mother in Hugo, OK.

Ed Kennedy is a former teacher, who also spent several years working through a grant to the University of Idaho to implement technology into public schools in Idaho. He currently serves as superintendent for Grandview Public School in northeastern Oklahoma after two years as superintendent at Swink Public School.

Susan Tate teaches technology and science at Swink Public School in southeastern Oklahoma. She implemented the technology program at Swink, which now boasts a 1:2 ratio of computers to students and a 1:1 ratio of iPads to students in the 3rd to 8th grade. She frequently presents regional workshops on iPad use for teachers and recently was a panel member at the Hawaii International Conference on Education discussing "Teaching with iPads: Multiple Perspectives."

References

- Allen, R. (2011, February). Can mobile devices transform education? *Education Update*, 53(2), 2, 6-7.
- Ash, K. (2011, February 4). Calif. district pushes digital-text initiative forward. *Education Week Digital Directions*. Retrieved February 9, 2011, from <http://www.edweek.org.org>
- Balajthy, E. (2006). Using text-to-speech software with struggling readers. In Sampson, M. B., Szabo, S., Falk-Ross, F., Foote, M. F., & Linder, P. E. (Eds.) *College Reading Association Yearbook 28*, (pp. 364-370). Retrieved from <http://www.eric.ed.gov>
- Beam, A. P. (2009). Standards-based differentiation: Identifying the concept of multiple intelligence for use with students with disabilities. *Teaching Exceptional Children*, 5(4), 2-13.
- Carter, K. (1993). The place of story in the study of teaching and teacher education. *Educational Researcher*, 22(1), 5-12, 18. Retrieved from <http://www.aera.net/publications/?id=317>
- Cavanaugh, T. (2002). eBooks and accommodations: Is this the future of print accommodation? *Teaching Exceptional Children*, 35(2), 56-61. Retrieved from <http://www.cec.sped.org/content/navigationmenu/publications2/teachingexceptionalchildren/>

- Chalmers, L. (1991). Classroom modifications for the mainstreamed student with mild handicaps. *Intervention in School and Clinic*, 17(1), 40-42, 51.
- Chunzhen, X., Reid, R., & Steckelberg, A. (2002). Technology Applications for Children with ADHD: Assessing the Empirical Support. *Education & Treatment of Children*, 25, 224-248. Retrieved from <http://www.educationandtreatmentofchildren.net/index.html>
- DuPaul, G. J. (1991). Attention deficit-hyperactivity disorder: Classroom intervention strategies *School Psychology International*, 12, 85-94. doi:10.1177/0143034391121007
- Evans, S. W., Axelrod, J., & Langberg, J. M. (2004). Efficacy of a school-based treatment program for middle school youth with ADHD. *Behavior Modification*, 28, 528-547. doi: 10.1177/0145445503259504
- Evans, S. W., Pelham, W. E., and Grudberg, M. V. (1995). The efficacy of note taking to improve behavior and comprehension of adolescents with attention-deficit hyperactivity disorder. *Exceptionality*, 5, 1-17. Retrieved from <http://www.tandf.co.uk/journals/titles/09362835.asp>
- Fenstermacher, K., Olympia, D., & Sheridan, S. (2006). Effectiveness of a computer-facilitated, interactive social skills training program for boys with attention deficit hyperactivity disorder. *School Psychology Quarterly*, 21(2), 197-224. Retrieved from <http://www.apa.org/pubs/journals/spq/index.aspx>
- Ferrance, E. (2000). Action research. Providence, RI: LAB at Brown University. Retrieved from <http://www.lab.brown.edu/>
- Ferriter, W. (2010). E-readers: Get ready for the revolution. *Educational Leadership*, 68(3), 84-85.
- Gillet, J.W., Temple, C., & Crawford, A. N. (2008). *Understanding reading problems: Assessment and instruction (7th ed.)* New York: Pearson Allyn & Bacon.
- Hasselbring, T. S., & Goin, L. I. (2004). Literacy instruction for older struggling readers: What is the role of technology? *Reading & Writing Quarterly*, 20, 123-144. doi:10.1080/10573560490262073
- Horney, M., & Anderson-Inman, L. (1999). Supported text in electronic reading environments. *Reading and Writing Quarterly*, 15, 127-168. Retrieved from <http://www.tandf.co.uk/journals/titles/10573569.asp>
- Horton, S. V., Lovitt, T. C., Givens, A., & Nelson, R. (1989). Teaching social studies to high school students with academic handicaps in a mainstreamed setting: Effects of a computerized study guide. *Journal of Learning Disabilities*, 22, 102-107. Retrieved from <http://ldx.sagepub.com/>
- Houghton, S., Milner, N., West, J., Douglas, G., Lawrence, V., Whiting, K., & ... Durkin, K. (2004). Motor control and sequencing of boys with Attention-Deficit/Hyperactivity Disorder (ADHD) during computer game play. *British Journal of Educational Technology*, 35(1), 21-34. doi:10.1111/j.1467-8535.2004.00365.x
- Larson, L. C. (2010). Digital readers: The next chapter in eBook reading and response. *The Reading Teacher*, 64, 15-22. doi:10.1598/RT.64.1.2
- Leu, D. J., Kinzer, C. K., Coiro, J. L., & Cammack, D. W. (2004). Toward a theory of new literacies emerging from the Internet and other information and communication technologies. In R. B. Ruddell & N. Unrau (Eds.), *Theoretical models and processes of reading* (5th ed., pp. 1570-1613). Newark, DE: International Reading Association. Retrieved from <http://www.reading.org/General/Default.aspx>
- Ludlow, B. (2010). The future of reading. *Teaching Exceptional Children*, 43(1), 4. Retrieved from <http://www.cecsped.org/content/navigationmenu/publications2/teachingexceptionalchildren>
- Mills, G. E. (2000). *Action research: A guide for the teacher researcher*. Upper Saddle River, NJ: Merrill.
- Moody, A. (2010). Using electronic books in the classroom to enhance emergent literacy skills in young children. *Journal of Literacy and Technology*, 11(4), 22-52. Retrieved from <http://www.literacyandtechnology.org>
- MTA Cooperative Group. (1999a). A 14-month randomized clinical trial of treatment strategies for Attention-deficit/Hyperactivity Disorder. *Archives of General Psychiatry*, 56, 1073-1086.
- MTA Cooperative Group. (1999b). Moderators and mediators of treatment response for children with Attention-deficit/Hyperactivity Disorder. *Archives of General Psychiatry*, 56, 1088-1096.
- MTA Cooperative Group (2004a). National Institute of Mental Health Multimodal Treatment Study of ADHD follow-up: 24-month outcomes of treatment strategies for Attention-deficit/Hyperactivity Disorder. *Pediatrics*, 13, 754-761. Retrieved from <http://pediatrics.aappublications.org/>
- MTA Cooperative Group (2004b). National Institute of Mental Health Multimodal Treatment Study of ADHD follow-up: Changes in effectiveness and growth after the end of treatment. *Pediatrics*, 13, 762-769. Retrieved from <http://pediatrics.aappublications.org>
- Newton, J. S., Ard, W. R. Jr., & Horner, R. H. (1993). Validating predicted activity preferences of individuals with severe disabilities. *Journal of Applied Behavior Analysis*, 26, 239-245. Retrieved from <http://seab.envmed.rochester.edu/jaba>
- Noffke, S. (1997). Professional, personal, and political dimensions of action research. *Review of Research in Education*, 22, 305-343. Retrieved from <http://rre.sagepub.com>
- Nowacek, E. J., & Mamlin, N. (2007). General education teachers and students with ADHD: What modifications are made? *Preventing School Failure*, 51(3), 28-35. Retrieved from <http://www.tandf.co.uk/journals/titles/1045988X.asp>
- Raggi, V. L., & Chronis, A. M. (2006). Interventions to address the academic impairment of children and adolescents with ADHD. *Clinical Child and Family Psychology Review*, 9, 85-111. doi:10.1007/s10567-006-0006-0
- Rhodes, J. A., & Milby, T. M. (2007). Teacher-created electronic books: Integrating technology to support readers with disabilities. *The Reading Teacher*, 61, 255-259. Retrieved from <http://www.reading.org/General/Default.aspx>
- Sherman, J., Rasmussen, C., & Baydala, L. (2008). The impact of teacher factors on achievement and behavioural outcomes of children with Attention Deficit/Hyperactivity Disorder (ADHD): a review of the literature. *Educational Research*, 50, 347-360. doi:10.1080/00131880802499803
- Smith, S. J., & Okolo, C. (2010). Response to Intervention and evidence-based practices: Where does technology fit? *Learning Disability Quarterly* 33, 257-272. Retrieved from <http://www.cldinternational.org/Publications/LDQ.asp>
- Tatum, K. (2010, August 30.) 21st Century Classroom: Sylvester (pseudonym). *Oklahoma News Report*, Oklahoma Educational Television Authority. <http://www.oeta.tv/component/video/908.html>
- Vaughan, J., & Estes, T. (1986). Reading and reasoning beyond the primary grades. Boston: Allyn and Bacon.
- Zentall, S. (1975). Optimal stimulation as theoretical basis of hyperactivity. *American Journal of Orthopsychiatry*, 45, 549-563.

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