

8-2018

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Technology Strategies for Struggling Readers

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August 2018

Abstract

Lack of reading ability could easily be identified as a crisis in education effecting students all over the world. Students who struggle to read, struggle to learn. This literature review evaluates the technology based strategies that have been proven to be beneficial for those students who struggle with reading as a result of a variety of different factors. The role of the teacher is to implement the technology strategies with fidelity in order to provide the most benefit and improvement to students. While many opposing viewpoints exist on technology and its effectiveness, this review identifies technology strategies such as multimedia, computer-assisted tutoring, podcasts, animated storybooks, digital thesaurus, and e-books and the positive results they have had with struggling readers. A primary tool that needs to be evaluated in further research is the use of assistive technology for students who have difficulty obtaining information through reading.

Keywords: reading, comprehension, technology, strategies, implement.

Technology Strategies for Struggling Readers

Although reading is a crucial and necessary component in the acquisition of an education, so many students get stuck in the learning to read stage and are therefore unable to make it to the reading to learn stage. The National Center for Education Statistics (2005) defines reading as an active and complex process that involves understanding written text, developing and interpreting meaning, and using meaning as appropriate to type of text, purpose and situation (Seyit, 2010). It may be difficult to think of reading as said active and complex when it remains as a second nature skill to the vast majority of us.

Unfortunately, vast majority are not words that we are able to use when describing the current population of students and their second nature understanding of the reading and comprehension process. Clay, Zorfass, Brann, Kotula and Smolkowski (2009) stated that:

69% of eighth grade students had scores below the proficient level, the level at which students are able to understand and analyze challenging text. The same study found that an alarming 26% were reading below the 'basic' level, which meant the students were unable to obtain even a literal understanding of the text. (p. 2)

As students' progress from the primary grades to the secondary level, the process becomes less about the concept of reading and more about comprehension with every minute that students spend in school. Therein lies the question, with so many students who are unable to comprehend easily and accurately, what strategies can be used in order to enhance and develop these skills in order to close the gap between struggling readers and their peers. Technology strategies are one of the leading answers in regards to this question. From animated story books, use of digital thesaurus tools, reader's theatre

podcasts, assistive technology options for information delivery, audio books, hypermedia-based reading materials for student engagement, just to name a few. All of the strategies aforementioned are research-based technology strategies that have proven to enhance students' reading comprehension at various age and ability levels.

While technology is a great tool that should be used in order to enhance reading comprehension for struggling readers, it is important that educators incorporate their research-based strategies with technology effectively. "Certainly technology should not be used simply for the sake of novelty. Educators must use technology to create a learning experience that would not be possible without the technology or that is specifically suited to the technology" (Vasinda & McLeod, 2011, p. 488). There are so many crucial pieces that must be in place in order to effectively integrate technology into a reading comprehension curriculum. It is essential that the appropriate technology strategies are implemented with known research-based strategies in order to promote success for struggling readers.

Reading Comprehension Difficulties (History and Present)

Reading comprehension poses a wide variety of difficulties for students of all ages. Ultimately, reading comprehension is the backbone to learning, and without this skill many students struggle in school indefinitely. "Many labels are used to describe students with reading difficulties: delayed reader, struggling reader, disabled reader, dyslexic, print disabled, and learning disabled" (Edyburn, 2004, p. 60). While there is a variety of terminology to describe reading difficulties, there is no denying that a lack of reading skills in general is a widespread problem. Edyburn (2004) also noted that about 80% of those students who receive some type of special education services, receive them at least in part for their reading skills.

Although many students struggle with the same problem--they are unable to comprehend what they read-- the explanations and causes behind these problems may stem from a variety of different reasons. Seyit's (2010) study, *The Effect of Electronic Storybooks on Struggling Fourth-Graders' Reading Comprehension*, cites multiple explanations for comprehension problems including word recognition problems, trouble in analysis, and lack of ability to make inferences. The explanation for the lack of each individual student's comprehension ability can vary greatly, and it is important to ensure that individualized instruction is based on each student's needs.

Another common issue with students' comprehension ability as they progress through the secondary level is that many students lack the vocabulary knowledge needed in order to comprehend complex text. Students in secondary levels need to "learn from 2,000 to 3,500 new words annually in content areas. They also need to understand different kinds of words" (Clay et al., 2009, p. 2). Vocabulary knowledge is a key part of what differentiates students who are successful at reading comprehension from those who are not at the secondary level, specifically in content areas.

Hall (2004) noted similar difficulties with students in regards to reading expository texts. In the meta-analysis of strategies for struggling readers, Hall (2004) cited issues when students are comprehending expository texts in areas such as math, science, or social studies. "These problems can include: (a) having difficulty decoding the texts, (b) having poor metacognitive skills, (c) not comprehending what they read, and (d) struggling to apply comprehension strategies appropriately" (Hall, 2004, p. 75). It was also noted in the meta-analysis that many students have difficulty comprehending texts in specific secondary subject areas due to the content-area vocabulary these texts contain that

students are unfamiliar with, as well as the lack of background information that students with reading difficulties possess in comparison to their peers (Hall, 2004). Since many upper level content-area texts are complex and contain an abundance of information that students may or may not need to know, students with reading disabilities tend to be overwhelmed by the sheer amount of information at hand and are in turn unable to comprehend text efficiently. Even when students have been instructed on comprehension strategies through reading intervention, students with reading difficulties often fail to apply those specific strategies when encountering expository texts in comparison to literary texts in which the strategies are typically initiated. Hall (2004), noted that difficulty in reading comprehension of expository texts can lead to a variety of long-term issues for students such as low self-esteem, failure to learn content needed in order to be successful in school, difficulties in high-stakes testing that is often more reading comprehension than content based, and even behavioral issues. Reading comprehension across content areas is an essential skill that many students lack, with effects that may be detrimental to their overall educational success.

Many students find the reading comprehension process and instruction disengaging, which often attributes to difficulties in that area. Since reading comprehension involves an endless amount of repetition, specifically for those students who are struggling, it is easy for students to get bored and check out. In Vasinda and McLeod's (2011) article on reader's theatre, they found that through the use of podcasting combined with reader's theatre, they were able to engage more of their students—thus eliminating the issue of lack of the engagement. They found that by matching the "Reading fluency strategy of repeated readings with the technology of podcasting" they were able to engage students more

meaningfully in content although it was being repeated over and over (Vasinda & McLeod, 2011, p. 2). This study is just another example of a common reading comprehension difficulty that students face and how it was overcome through the use of technology.

Edyburn (2007), strives to identify an often-overlooked difficulty of reading comprehension in his article *Technology-enhanced reading performance: Defining a research agenda*. In this article, questions are posed about at what point we shift to more intensive assistive technology interventions for reading when students lack basic skills.

Edyburn (2007) made the bold and thought-provoking statement that:

Unfortunately, when students struggle to learn to read in grades K-3, their problems are magnified in grade 4 and beyond when the predominant instructional model in schools is based on learning from print. If the predominant models of learning to read remain based in print alone, many students who can't read may come to believe that they can't learn. (p. 148)

Edyburn (2007) proposes the use of technology in order to assist those students who are stuck in the learning to read stage, so that they don't miss out on the learning stage—a stage that continues not only throughout school, but throughout their entire life. Being unable to get past learning to read creates many difficulties for students such as lack of engagement, motivation, and sometimes behavioral issues. More and more students are facing achievement gaps of multiple years, and the gaps continue to grow as they get older. This affects their ability to learn, since the primary learning tool available to students is print text. Edyburn (2007) argues that print text does not have to be the answer for students with high achievement gaps, but that technology can provide them with learning experiences needed in order to find success.

Research-Based Strategies

While many studies have been performed on the use of digital story books in order to support reading comprehension for struggling readers, the results have varied greatly. In Seyit's (2010) study, the results of three different types of books were tested and evaluated. All participants in the study were reading below grade level, possess basic decoding skills, but still have comprehension difficulties (Seyit, 2010). The 77 participants in the study were split into three groups, which were all given a different format of the same story (Seyit, 2010). The first type of text was an e-book with animation, the second text was an e-book without animation, and the final text was a print copy (Seyit, 2010). As predicted, students with the animation performed highest in retelling scores, followed by the students without animation, and then the students with the printed versions. In conclusion, "animations were shown to positively affect the comprehension of the fourth-grade struggling readers" (Seyit, 2010, p. 151).

Based on the prior success regarding the use of technology tools for students who are struggling with reading comprehension, a study was conducted on the use of The Visual Thesaurus to enhance students' content area vocabulary knowledge and increase comprehension in that area (Clay et al., 2009). "The Visual Thesaurus is an online tool designed to support readers and writers in building word knowledge, identifying synonyms, and exploring multiple word meanings in text" (Clay et al., 2009, p. 4). Using this tool, there are several options available to students to explain, learn, and connect the word to prior knowledge. In addition, the thesaurus provides students with a visual display in order to appeal to different types of learners. The study was conducted on 212 eighth grade students in 10 inclusive social studies classrooms, taught by two teachers (Clay et al.,

2009). During the intervention period, students worked with the digital tool for 20-25 minutes per class period for a total of 3-4 weeks. The findings revealed that the use and implementation of Visual Thesaurus may be overwhelming for struggling readers, but using a tool such as Merriam-Webster Online was easier to use and improved students' reading comprehension.

Reader's theatre is another well-known researched based strategy in regards to the improvement of reading comprehension skills in students who have difficulty in this area. In past research, it has been found that using the reader's theatre strategy consistently for a period of 10 weeks created achievement progress equal to more than one year (Vasinda & McLeod, 2011). "Repeated reading as a way to improve both fluency and comprehension is well established, but finding an authentic purpose for this type of reading and rereading can be challenging" (Vasinda & McLeod, 2011, p. 2). By combining the researched based strategy of reader's theatre with the well-known technology tool of podcasting, students are provided with an authentic audience which creates a more meaningful experience for students as they partake in the use of this strategy.

In this reader's theatre podcasting study, six total classes of second and third graders were chosen with 100 students total. Out of those 100 students, 35 of the selected students were identified as struggling readers based on reading at least one year below their grade level (Vasinda & McLeod, 2011). Each classroom spent 10 to 15 minutes per day on their reader's theatre time based on a weekly routine, in which students were divided into groups ranging from four to eight participants. Upon completion, the podcasts were uploaded to teacher's individual class sites in order for parents and students to be able to access and listen at home. The pretest determined that the group of 35 struggling

readers were reading at an average of early first grade level, ranging from non-readers to second-grade level comprehension overall. The post-test data after the 10-week intervention determined that the students were now reading in the second-grade level on average, individually ranging from mid-kindergarten to fifth-grade levels (Vasinda & McLeod, 2011). In summary, the pre-test to post-test data determined that students made growth of more than one grade level on average, with mean pre-test score being 1.09 and the mean post-test score being 2.22 upon the completion of 10-week intervention (Vasinda & McLeod, 2011).

The technology strategies of embedded multimedia and computer-assisted tutoring were put to the test in a study of first-grade students (Chambers, Slavin, Madden, Abrami, Tucker, Cheung, & Gifford, 2008). The authors of this study stressed the importance that multimedia embedded in the teachers' lessons does not replace instruction, but rather supplements it as seen here. Through the use of multimedia videos embedded in instruction, students link their knowledge with moving pictures and words, activating both visual and auditory senses, which in turn enhances student learning and memory (Chambers et al., 2008). In addition, the use of computer-assisted tutoring also gives teachers the opportunity to supplement instruction, particularly for those students who are struggling in reading and need more individualized support (Chambers et al., 2008). "It also aims to increase student motivation and learning through the use of relevant, understandable multimedia" (Chambers et al., 2008, p. 5). Through the use of these two strategies, authors of this study were able to acquire positive results for struggling readers when combining technology strategies in conjunction with instruction by the classroom teacher.

The study evaluated a total of 159 students across two schools who were identified as both high poverty and high minority (Chambers et al., 2008). The demographics at the schools were as follows: school number one was a charter school in Los Angeles with 94% of students on free lunch, 95% of students being Mexican-American, 5% of students African-American, and 90% being English Language Learners (Chambers et al., 2008). School two was a public school in Las Vegas where 81% students received free lunch, 69% of students were Mexican-American, 17% Caucasian, 7% Asian-American, and 6% African-American with an English Language Learner rate of 70%. Students in this study were assigned to technology based instruction (75 students) or non-technology based instructional groups (84 students) and were evaluated over the course of an entire school year (Chambers et al., 2008). The median effect size across a comprehensive assessment of first grade level skills on the experimental group was +0.53 in comparison to a median effect size of +.027 in the control group (Chambers et al., 2008). The results of this study determine significant benefits in the use of multimedia embedded instruction and computer-assisted tutoring on first-grade students.

Impact on Students and Teachers

As technology has progressed, e-books have become a popular option for all students, not just those who are struggling with reading comprehension. E-books allow teachers to “integrate text, graphics, animation, music and other multimedia components in order to bring support to the story line” (Seyit, 2010, p. 141). Since reading comprehension has been afore defined as a process that involves interaction between the reader in the text, it would make sense that students have difficulty reading traditional texts. “Even though traditional print text requires interaction between reader and texts, traditional print is

passive, non-interactive with non-adaptable features, static with two-dimensional images, and cannot respond to individual readers” (Seyit, 2010, p. 141). With technology, we have more interactive reading comprehension tools right at our finger-tips that have been proven to enhance reading comprehension. Providing students with digital options increases motivation, engagement, and in the end, comprehension.

In Clay’s (2009) study regarding the use of two separate thesaurus tools in order to enhance students’ vocabulary knowledge at a more accelerated rate while in turn improving their content area reading comprehension, it was found beneficial to the students to use these tools. Although the study found that the Visual Thesaurus was too visually stimulating for students who struggle with reading, it did show positive effects for students who used a more simplistic alternative, the Merriam-Webster Thesaurus (Clay et al., 2009). An online thesaurus tool such as the ones mentioned in this particular study is beneficial for teachers because the work is done for them. Once they introduce the students to the tool, it can be used to both increase content-area vocabulary knowledge and encourage independence since the students can continue to utilize the resource in the future across settings and content areas.

By using reader’s theatre strategy combined with the technology strategy of podcasting, several benefits were noted by both students and teachers. Students noted that reader’s theatre provided an authentic opportunity for reading, social collaboration, and a sense of accomplishment through their experience (Vasinda & McLeod, 2011). Teachers who participated in the same study noted that reader’s theatre was easy to connect to standards and fit into their classroom routine easily. The use of reader’s theatre proved to be beneficial for struggling students’ reading levels. In addition, the study participants

identified themes that they found surrounding the technology benefits. “The three themes identified were (1) having a wider audience, (2) the permanency of the work, and (3) using audio as a visualizing medium” (Vasinda & McLeod, 2011, p. 6). By having a wider audience and permanency, students were able to share their work with their family as well as have a finished product that they were able to look back on continually.

Edyburn (2007) delved into a less common form of technology for reading-comprehension, but one that should be evaluated through research on an on-going basis—assistive technology. Although limited research is currently available regarding the use of assistive technology for students with reading difficulties, it is fair to say that there are definite benefits involved for both students and teachers. Assistive technology tools can benefit students by eliminating the frustration of not being able to read, understand, or comprehend material by giving them the opportunity to acquire content knowledge through alternative methods (Edyburn, 2007). For teachers, assistive technology such as text-to-speech or scan-and-read systems to name a couple, can often minimize the need for additional leg work on behalf of the teacher in the realm of differentiated instruction by providing the student with alternative material and tools that they are able to use independently (Edyburn, 2007). As aforementioned, due to the lack of research in this area it is not clearly determined the vast amount of benefits that assistive technology can provide for students and teachers, but the potential in this area is promising.

Benefits for teachers were prevalent in Chambers (et al., 2008) study with the integration of computer-assisted tutoring and multimedia embedded instruction. While the study was certain to emphasize these tools be used solely for supplemental instruction and not as a replacement for instruction, the benefits when the tools were integrated correctly

were prevalent. Both tools—multimedia (videos connecting words to pictures) and computer-assisted tutoring benefit the teacher greatly. Both tools require minimal planning on behalf of the teacher and computer-assisted tutoring can also provide differentiated instruction for those students who need it (Chambers et al., 2008). In regards to benefits for students, both technology tools appeal to multiple learning styles (visual, auditory, etc.) as well as engage students through content and interaction.

Not only do teachers and students see great benefits through the use of technology, but there are also additional benefits for education as a whole as educators strive to provide valid and reliable assessments as well as differentiated instruction. Through the use of technology tools, teachers can quickly and easily provide differentiated instruction to meet the needs of a wide variety of learning styles in their classroom (Biancarosa & Griffiths, 2012). This is a time saver for teachers compared to when many differentiated instruction tools had to be created on a case by case basis by the teacher. In addition, technology for reading comprehension provides teachers with assessments that can also be molded to fit each students' needs and levels. This allows teachers to gather and compile data using streamlined technology tools. Teachers are able to quickly and easily view the data and monitor it over time through the use of technology based assessments.

Opposing Viewpoints

A common opposing viewpoint for the use of technology with struggling readers are the distractions that technology can bring into the learning environment. Although it is true that technology can easily become a distraction for students and defeat the intended purpose, the benefits of technology should be considered. Technology can be difficult to monitor depending on the resources available in the school and it can be easy for students

to get off track. Sternberg, Kaplan, and Borck (2007) noted that while a wide variety of technologies are available in schools and should be researched in depth, it is important to recognize that technologies may not always be used in the most beneficial or effective ways. When implementing any strategy, it is important to do so with reliability and validity, as well as limit distractions as much as possible.

According to Seyit's (2010) article, previous similar research regarding the use of animated storybooks yielded different results and "claimed that the electronic environment has detrimental effects on comprehension" (p. 150). However, as further explained, while technology is evolving, our students are also evolving as learners and it is important to be able to appeal to this new type of 21st century learner (Seyit, 2010). While technology can be (and consistently is) a distraction in the classroom, the results of using the proper tools with the correct population of students are clearly beneficial in the area of reading comprehension, specifically for those students with reading difficulties.

In a review by Biancarosa and Griffiths (2012) of the ever-popular use of e-reading tools as both a conservator of time and money, results demonstrated that there have been few studies demonstrating positive outcomes in reading achievement through the use of this particular tool. "Although e-reading technology offers real promise for improving literacy outcomes, evidence of its effectiveness is relatively limited" (Biancarosa & Griffiths, 2012, p. 8). Biancarosa and Griffiths's (2012) review stresses the importance of teachers taking the time to properly evaluate the technology tools that they implement into their classroom in order to ensure effectiveness and benefits for their students. Many teachers feel so much pressure to incorporate technology at any cost due to the 21st century standards that they are often overlooking that not all technological tools have the same

benefits, particularly in the area of reading comprehension for the struggling reader. It is critical to not just assume that all technology benefits all students, but instead to rationally select research based technology and literacy strategies to pair together, such as the strategies previously mentioned in this review.

Future Research

In meta-analysis, Sternberg, Kaplan, and Borck (2007) provide a detailed list of technologies that should be researched in depth in regards to reading. The technology identified in their review for further research includes virtual courses and delivery, communication tools, artificial intelligence, word processors, literacy strategies, professional development, and technology for parents (Sternberg, et al., 2007). While this article outlines a wide variety of technology with potential for research studies, it is important to pinpoint research in order to ensure clear and concise results. “Today’s students are living in a time when technological innovations are increasing at a pace never before seen” (Sternberg et al., 2007, p. 416). With the pace of technology continuing to increase, it is essential that on-going research is conducted in regards to technology in the classroom, particularly that research which addresses one of the most prevalent issues in education—the large amount of struggling readers in today’s classrooms.

In Hall’s (2004) meta-analysis *Comprehending Expository Text: Promising Strategies for Struggling Readers and Students with Reading Disabilities?* she evaluated the research and lack there-of for this particular but very important population of students that teachers are faced with serving. It was noted that many studies that have been conducted on reading comprehension have not included the struggling reader population explicitly and with the appropriate amount of depth as is considered necessary (Hall, 2004). In addition, it was

also evaluated that only small numbers of struggling readers have been included in these studies (Hall, 2004). Based on these statements, more research in regards to students (particularly at the secondary level) needs to be conducting in the area of reading comprehension of expository text. Based on the wide range of long-term problems that struggling readers face as a result of being unable to comprehend expository text, it is essential that research and implementation of the best strategies in conducted and published. Content-area texts such as science, mathematics, and social studies are an essential part of students' education and content-area teachers need to be made aware of research-based strategies that are considered beneficial to struggling readers in order to implement them to promote student success.

Another note that Hall (2004) made in meta-analysis is that much of the research that is done in this area involves expository text that is written at frustration level for students with reading disabilities. This is another common theme in expository texts due to the majority of textbooks being written several grade levels above the grade level they are being used in. This can make comprehension of content-area texts difficult for all students, and often near impossible for students who struggle with reading comprehension. However, with a wide variety of interactive technology tools available for use, content-area teachers can ease the overwhelming amount of content provided through textbooks by combining it with other forms of media such as videos, interactive games, or thesaurus tools that are available. Research needs to be done in secondary content-areas with the regards of the effectiveness in combining and/or multimedia tools with the expository text written well-above a students' grade level. Since technology has been proven to enhance students' reading comprehension ability, it is important that additional studies are

conducted in order to determine the best strategies and tools that can be paired with content-area texts in order to help students overcome this hurdle.

In the meta-analysis of assistive technology for use in reading, Edyburn (2007) points out the lack of research that has been done in this area. It seems as though rather than identifying alternatives to primarily learning through reading alone, educators have continued to put text in front of students who lack basic reading skills, let alone advanced higher-order thinking skills on how to interpret text. It was suggested that research be conducted on the use of reading technologies like adapted books, text-to-speech, scan-and-read systems, and books in multiple formats in order to determine whether or not these alternatives would be more beneficial for struggling readers who face a multiyear reading achievement gap (Edyburn, 2007). “At the present time, little is known about the effect routine access to such enhancing reading technologies have for fostering interest, motivation, engagement, and for scaffolding skill development in emergent or remedial readers” (Edyburn, 2007, p. 148). With the overwhelming amount of struggling readers aforementioned in this review, it is essential that technologies such as those mentioned by Edyburn (2007) be tested and researched with students who have large achievement gaps in the area of reading. If the technology to assist in learning through alternative methods is available, there is no reason why these technologies should not be put to use in order to aid students who struggle to learn solely due to their reading difficulty.

In an additional article, Edyburn (2004) points out that students should not be expected to continue to attain reading levels when their disability prevents them from reading at a lower level. While it is important to ensure that we maintain high expectations for all students, it is also important to recognize when there are alternative methods to

learning that can assist students in breaking down learning barriers. Students should not be prevented from the process of learning solely due to their lack of reading ability.

Although Edyburn (2004) discusses the possibility of using assistive technology in order to aid those students with reading difficulties and disabilities in learning, the article also takes time to address the limitations of such research. The key issue is the assessment of learning. With so many different reading assessments available and none being universal, Edyburn (2004) poses the concern that if assistive technology tools were used in order to deliver information to struggling readers, it would require an entirely new assessment system in order to determine the effectiveness of such tools on student learning. Assistive technology in reading is a very intriguing field of research that has much potential.

Conclusion

Technology has posed a lot of questions, an intense learning curve for educators, and a wealth of benefits for all students, particularly for struggling readers as evaluated in this review. While technology is a tool that can continually benefit students, it can also be integrated poorly or easily become a distraction in the process of implementation. In regards to use with struggling readers, technology provides teachers with the tools that they need in order to help differentiate instruction, enhance student engagement, and/or supplement their instruction through technological means. When motivation is often lacking with struggling readers, technology provides a way to get students interested in reading by creating a new turn on it. In addition, technology can enhance learning for those students who reach frustration when attempting to acquire information through written material.

While there has been a great variety of research in the area of technology for struggling readers and reading comprehension skills, there is much that still needs to be done in order to benefit students. Assistive technology is one area of question that has yet to be researched in great depth. Students who struggle to acquire knowledge through reading may benefit from learning by way of assistive technology, but the research in this area will require a new form of assessment in order to perceive results. The alarming number of students who fail to read at grade level will continue to grow without the research and implementation by teachers in the field. Technology has provided this field of research with an endless variety of tools and strategies that have yet to be discovered, created, or tested. In order to continue to benefit students, teachers must appeal to their 21st century needs by implementing technology based strategies that are engaging, beneficial, and research-based.

Annotated Bibliography

Biancarosa, G. & Griffiths, G. (2012). Technology tools to support reading in a digital age.

The Future of Children; Princeton, 22(2). Retrieved from <https://search-proquest-com.ezproxy.nwciowa.edu/education1/docview/1519298203/fulltextPDF/9F72711DB16C4B80PQ/1?accountid=28306>

Biancarosa and Griffiths discuss the wide variety of technology tools that can be incorporated with struggling readers, their benefits and their limitations.

Chambers, B., Slavin, R. E., Madden, N. A., Abrami, P. C. Tucker, B. J., Cheung, A., & Gifford, R.

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The Elementary School Journal, 109(1), 1-15. Retrieved from <https://www-jstor-org.ezproxy.nwciowa.edu/stable/pdf/10.1086/592364.pdf?refreqid=excelsior%3A1c1b9d0faa5fe0dd448f8e7ddb437d4e>

The authors of this study evaluate the use of two strategies (computer-assisted tutoring and multimedia integration) with first grade students in order to improve their reading skills. Study took place in high minority and high poverty schools.

Clay, K., Zorfass, J., Brann, A., Kotula, A. & Smolkowski, K. (2009). Deepening content

understanding in social studies using digital text and embedded vocabulary

supports. *Journal of Special Education Technology*, 24(4), 1-16. Retrieved from

<https://search-proquest-com.ezproxy.nwciowa.edu/education1/docview/228524096/251287DD68D94352PQ/1?accountid=28306>

This study implements the use of Merriam-Webster Online and Visual Thesaurus to enhance content area vocabulary knowledge in eighth grade social studies students.

The results suggest that the use of a less complex dictionary like Merriam-Webster Online may be more appropriate for struggling readers, but that the use of some type of online tool increased their comprehension.

Edyburn, D. L. (2004). Measuring assistive technology outcomes in reading. *Journal of Special Education Technology; Norman*, 19(1), 60-64. Retrieved from <https://search-proquest-com.ezproxy.nwciowa.edu/education1/docview/228406506/fulltextPDF/6493ADC710A44577PQ/1?accountid=28306>

Edyburn discusses the potential for research and practice in the area of assistive technology for struggling readers. Although this is not a common option, Edyburn presents information on when assistive technology should be considered.

Edyburn, D. L. (2007). Technology-enhanced reading performance: defining a research agenda. *Reading Research Quarterly; Newark*. 42(1), 146-152. Retrieved from <https://search-proquest-com.ezproxy.nwciowa.edu/education1/docview/62041937/9592AF44B22147CFPQ/1?accountid=28306>

In this meta-analysis, Edyburn acknowledges and evaluates the potential benefits and lack of implementation of assistive technology tools that are currently available in order to aid struggling readers and help them overcome learning barriers.

Hall, L. A. (2004). Comprehending expository text: promising strategies for struggling readers and students with reading disabilities? *Reading Research and Instruction; Coral Gables*, 44(2), 75-95. Retrieved from <https://search-proquest->

[com.ezproxy.nwciowa.edu/education1/docview/205370938/EF377D64F29748DA4PQ/1?accountid=28306](https://www.ezproxy.nwciowa.edu/education1/docview/205370938/EF377D64F29748DA4PQ/1?accountid=28306)

In the meta-analysis of reading comprehension strategies for struggling readers, Hall notes the difficulties that this population of readers faces, the lack of inclusion in research, and the problems with expository text.

Seyit, I. (2010). The effect of electronic storybooks on struggling fourth-graders' reading comprehension. *TOJET: The Turkish Online Journal of Educational Technology*, 9(4), 140-155. Retrieved from <https://search-proquest-com.ezproxy.nwciowa.edu/education1/docview/1288355540/BE71B2267D7B4B14PQ/1?accountid=28306>

Seyit discusses findings from a study based on the use of digital animated books, digital non-animated books, and traditional print books. Findings suggest that there is a link between success with reading comprehension and use of digital animated books.

Sternberg, B. J., Kaplan, K. A., & Borck, J. E. (2007). Enhancing adolescent literacy achievement through integration of technology in the classroom. *Reading Research Quarterly*. 42(3), 416-420. Retrieved from <https://www.jstor-org.ezproxy.nwciowa.edu/stable/pdf/20068306.pdf?refreqid=excelsior%3A80b4e9a5d24b20d8b181497bdae1fc64>

Sternberg, Kaplan, and Borck discuss the wide variety of technology tools that are available in schools. In this meta-analysis, the authors discuss future research areas in technology in order to help students with reading difficulties.

Vasinda, S. & McLeod, J. (2011). Extending readers theatre: a powerful and purposeful match with podcasting. *The Reading Teacher; Newark*, 64(7), 486-497. Retrieved from <https://search-proquest-com.ezproxy.nwciowa.edu/education1/docview/861741441/E9131A27CAB24BEA/PQ/2?accountid=28306>

Vasinda and McLeod discuss at length their study involving using reader's theatre and podcasting in order to engage struggling reader's in repeated reading and in turn increase their reading comprehension ability. They found that their struggling readers were successful in a 10-week intervention using this strategy.