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# Implementing electronic storybooks and the effects on reading achievement at the elementary level

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# Implementing electronic storybooks and the effects on reading achievement at the elementary level

## **Abstract**

Electronic storybooks are an innovative way to support the reading needs of students today. This literature review discusses the positive and negative effects electronic storybooks have on students' reading abilities. It focuses specifically on word accuracy, word recognition, fluency, vocabulary, and comprehension. Examples and information were taken from published journal articles found through online databases and books. The review concludes that electronic storybooks can have a positive effect on a student's reading ability when using an electronic storybook that meets the needs of the learner.

IMPLEMENTING ELECTRONIC STORYBOOKS AND THE EFFECTS ON  
READING ACHIEVEMENT AT THE ELEMENTARY LEVEL

A Graduate Review

Submitted to the

Division of Instructional Technology

Department of Curriculum and Instruction

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Of the Requirements for the Degree

Master of Arts

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by

Chelsey Heidemann

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has been approved as meeting the research requirement for the Degree of Master of Arts.

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Electronic storybooks are an innovative way to support the reading needs of students today. This literature review discusses the positive and negative effects electronic storybooks have on students' reading abilities. It focuses specifically on word accuracy, word recognition, fluency, vocabulary, and comprehension. Examples and information were taken from published journal articles found through online databases and books. The review concludes that electronic storybooks can have a positive effect on a student's reading ability when using an electronic storybook that meets the needs of the learner.

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## **Introduction**

With the pressure of ensuring all students' success in reading while integrating technology, will technological resources help teachers reach their goals? Educators understand that reading plays an important role in creating successful citizens from an early stage. It is a process in which students must interpret and understand written text (Ertem, 2010). Traditional storybooks have played an important role in the success of reading to this day. However, technology is presenting educators with more resources to help enhance the learning of today's students. CD-ROMs, digital storybooks, talking books, computer books, and electronic text are all names that describe electronic storybooks. It is important to understand what electronic storybooks are before determining their effectiveness in the classroom.

For years students have been learning to read by holding a traditional storybook in their hands and physically turning the pages. Traditional books are non-interactive and have two-dimensional images (Ertem, 2010). These books are "restricted by their linear composition" (Ertem, 2010, p. 141). Electronic storybooks assume a different approach to reading by adding additional features (Higgins & Cocks, 1999). Like traditional books, electronic storybooks allow students to read left to right and turn the page. Unlike traditional storybooks, electronic storybooks provide a literal interaction in a nonlinear manner (Matthew, 1997) that includes audio and graphic animation allowing the characters and settings to come alive (Lefever-Davis & Pearman, 2005).

One concern schools have with electronic storybooks is the effect they have on students' academic success in reading. Educators who are trying to incorporate technology into their regular curriculum need to be sure it is going to benefit their students academically. Many children today are familiar with computers. Educators need to find ways in which technology can

meet their learning needs. This review will help teachers decide if electronic storybooks are worth implementing in their reading curriculum as a tool to help enhance their students' reading success.

Reading is an important part of everyday life. Problems that occur with reading in childhood often continue into adulthood and “approximately twenty-three percent of U.S. adults meet only basic reading proficiency levels” (Ertem, 2010). At the early stages in elementary schools, educators are already expressing their concerns about students' reading abilities, including lack of motivation, difficulty with comprehension, poor accuracy, or slow fluency rate. By analyzing electronic storybooks, educators can determine whether they are an asset to maintaining or increasing the reading achievement of elementary students. Educators can determine whether electronic storybooks can bridge the gaps found in reading. Educators are continually looking for ways to help elementary students become better readers, which will hopefully decrease the number of adults meeting basic reading proficiency in the future.

With the 21<sup>st</sup> Century Skills under the Iowa standards stressing the importance of educating youth with technology while fulfilling the other core standards, it is difficult to find time for everything. Schools are seeking ways to incorporate technology into everyday lessons that will not hinder academic achievement. Considering electronic storybooks as tools to use during reading can help meet both reading and technology standards at the elementary level. This review will examine how electronic storybooks are implemented, the effects they have on the reading accuracy for elementary students, whether electronic storybooks can increase students' comprehension scores at the elementary level, whether electronic storybooks can help develop students' vocabulary knowledge, and how electronic storybooks impact fluency.



The results of this review will be used to educate elementary teachers on electronic storybooks and encourage a discussion for possible use of storybooks in future classrooms to meet the needs of all learners. Readers will have a better understanding of the effects electronic storybooks have on students' academic growth. From this analysis, educators will have a better idea of whether electronic storybooks should be integrated into their reading curriculum. The information provided will give teachers the information needed to effectively use storybooks in a manner that ensures their students' needs are being met.

This review will focus on the following questions:

- How are electronic storybooks being implemented in elementary classrooms?
- What effects do electronic storybooks have on reading accuracy versus traditional books?
- How do electronic storybooks affect the fluency of readers at the elementary level?
- Can electronic storybooks expand the vocabulary knowledge of elementary classrooms?
- What effects do electronic storybooks have on the comprehension scores of elementary students?

## Methodology

While researching resources for this review, a variety of online databases were used. Educational Full Text (Wilson), ERIC (EBSCO), and ERIC (U.S. Department of Education) were all used through The University of Northern Iowa Rod Library website. These three databases supplied many journal articles written by experts in education. Google Scholar was also used for locating resources. The author used The University of Northern Iowa Rod Library's access to journal articles requiring subscription through Google Scholar. Other resources were located by referring to the reference lists of quality articles already being used for this review.

A variety of descriptors and keywords were used to locate various sources. Descriptors and keywords used were: *electronic storybooks, achievement, reading achievement, reading accuracy, comprehension, elementary, implementation, effectiveness, vocabulary, and reading*. Many of these descriptors and keywords were combined to include phrases such as: *electronic storybooks in elementary, electronic storybooks effects on comprehension, implementation of electronic storybooks, electronic storybooks' effects on accuracy, electronic storybooks and reading, and effectiveness of electronic storybooks*.

With the results produced from the online database searches, a quick review of the sources was completed. The author looked at the headings in each article or review, and in which journal the article or review was published. The abstract was also used when analyzing the information to determine the relevance to the questions being researched. Once the number of sources was reduced, a more detailed analysis was conducted using the following criteria: (a) date on which the article was published, (b) credibility of the authors involved in writing the source, and (c) relevance to the questions being researched by the author. The date of the source needed to be within fifteen years of the current year, 2012, to ensure updated information was

being used. The credibility of the author or authors was checked by locating other work completed by them and whether they were cited in other journals or reviews. Relevance to the questions being answered in this review was decided by reading through the introduction, results, and conclusion sections of each article. Information found that did not meet the criteria was not used.

## **Analysis and Discussion**

“Technology is changing the face of modern life as many everyday tasks are computerized” (Lefever-Davis & Pearman, 2005, p. 446). An everyday task for students is reading. The differences between electronic text and regular text can influence reading for young students (McKenna, Kieffer, Reinking, & Labbo, 1999) in a generation growing up with technology. Electronic books “provide opportunities to explore more literacies (music, movement, visual, etc.), thus dually supporting notions of multiple literacies” (Chen, Ferdig, & Wood, 2003, p. 3). “This form of multimedia presentation, which includes text, graphics, sound, still and animated images, is highly motivating to children” (Underwood & Underwood, 1998, p. 95).

Traditional books are passive with limited interaction between the reader and text and static pictures (Ertem, 2010). These books are “restricted by their linear composition” (Ertem, 2010, p. 141). Electronic storybooks take on a different approach to reading and come in a variety of styles. Like traditional books, electronic storybooks make students read left to right and turn the page. Unlike traditional storybooks, electronic storybooks provide a literal interaction in a nonlinear manner (Matthew, 1997) that includes audio and graphic animation allowing the characters and settings to come alive (Lefever-Davis & Pearman, 2005). This section will address how teachers are implementing electronic storybooks as a tool in their reading curriculum, as well as their role in the development of the necessary reading skills: accuracy and fluency, vocabulary, and comprehension.

## **Implementation**

The Alliance for Childhood claims that computers are detrimental to health and learning in an environment with ample time for adults to read to their children (Trushell & Maitland,

2005). Those who believe in computers and how they “contribute to a child’s social and intellectual development must vigorously refute such criticism” (Trushell & Maitland, 2005, p. 58). In fact Underwood (2000) found a positive socio-emotional reaction from students reading electronic storybooks when working in homogenous groups. She completed a study in which the students were grouped in pairs to support each other when reading through the electronic storybook.

There were two different homogenous groups consisting of girl/girl and boy/boy and another heterogeneous group consisting of boy/girl. The homogenous groups seemed more focused and task oriented. In a study by Underwood and Underwood (1998) there was even a significant difference in the recall of the story with the girl/girl outperforming the others (Underwood & Underwood, 1998). Unfortunately, when working in heterogeneous groups the reaction between students in this particular environment was not as high. There were continuous issues when it came to controlling the mouse and agreeing on what to do. Teachers need to be mindful of which students are partners and the effects that could have on their reading achievement (Underwood, 2000).

Ertem (2010) found in his research that electronic storybooks can improve motivation for children who have difficulties reading and who may have low self-confidence in their reading abilities (Ertem, 2010). Electronic storybooks offer tools for struggling readers to support their reading (Lefever-Davis & Pearman, 2005) without making them feel as if they need to request help, which in turn may make them feel like failures (Dungworth, Grimshaw, McKnight, & Morris, 2007). Those reluctant to read at a young age can develop a negative attitude towards reading and other educational activities (Adam & Wild, 1997). Electronic storybooks can give

students a positive attitude and motivation, which is important to developing effective reading skills (Matthew, 1997).

Instructional programs, such as electronic storybooks, can be effective depending on their purpose, use, and the person using them (Higgins & Hess, 1999). “Electronic environments can improve and support reading comprehension of struggling readers” (Ertem, 2010, p. 150). Electronic books should support learning (Underwood & Underwood, 1998) and act as a supplement to reading books and not as a replacement for adults reading books with children (DeJong & Bus, 2004). Adam and Wild (1997) suggest the computer as an intervention strategy. Computer-based instruction, such as electronic storybooks, are more effective in bridging literacy gaps for those students who are struggling, or below grade level (Adam & Wild, 1997). Higgins & Hess (1999) found supplemental instruction with electronic books by an adult increased vocabulary instruction significantly (Higgins & Hess, 1999). Supplemental instruction can be addressed by the teacher in a small group setting or extra adults available during the reading block.

Research does suggest that electronic storybooks can be a valuable contribution for those who have difficulty reading and those that are reading at a normal reading level. It is the teacher’s responsibility to assess and review electronic books before exposing them to the students (Korat & Shamir, 2006). When Lewin (2000) compared enhanced electronic storybooks and basic electronic storybooks, it was discovered that the animated features initially prompting the readers for alternative strategies was a new idea for readers and most began clicking the animations too soon. Only one student tried the strategies before requesting the word identification, some students were playing around with it, and the students with higher understanding just selected the hint when using the enhanced software to play around. Proper

understanding of hints needs to be addressed before the students begin reading electronic storybooks (Lewin, 2000).

Teachers need to “select CD-ROM storybooks with features that promote their intentions” (Lefever-Davis & Pearman, 2005). Lewin (2000) found the enhanced software had a negative effect toward reading, whereas the basic software had a positive effect on students’ attitudes (Lewin, 2000). “In evaluating 750 software programs designed and marketed for young children, Haugland and Wright found that only 20% of the software met young children’s developmental needs” (as cited in Korat & Shamir, 2006). It is the teacher’s responsibility to expose students to the software that is right for their students and that meets their needs (Korat & Shamir, 2006). Students also need instruction on how to use the software effectively through modeling and mentoring (Labbo, 2000).

### **Accuracy and Fluency**

An important part of learning to read is being able to read text fluently. Fluency “consists of rate, accuracy and automaticity of word recognition, as well as smoothness, phrasing, and expressiveness” (Oakley, 2003, p. 1). Two key elements of a fluent reader are word accuracy and recognition (Rasinski, 2006). Educators examine accuracy in terms of whether students are able to recognize a word and decode those that are unfamiliar correctly (Hudson, Lane, Pullen, 2005). Decoding is one of the most important stages in reading and can hinder students developmentally if they are stalled at this stage (McKenna, et al., 1999). It “is the ability to transform printed letter strings into a phonetic code” (Aarnoutse, Van Leeuwe, Voeten, & Oud, 2001, p. 62). Word accuracy requires knowledge of the alphabet, blending sounds (Hudson, et al., 2005), and being able to recognize a large range of words effortlessly (Rasinski, 2006).

Traditional books offer students support in word accuracy and recognition only if an adult is available and the student is comfortable asking for help. Electronic storybooks offer students immediate help without having to look like a “failure” (Dungworth, et.al., 2007). If there was a question about how to pronounce a word or what a word means, the electronic storybook will assist them immediately (Matthew, 1997) without having to wait until an adult is available.

It is essential educators find the electronic storybooks that will help assist students with decoding if that is the skill being addressed. Choosing the incorrect electronic storybook for decoding purposes can have a negative effect on a student’s ability to decode for themselves. Choosing the right text may result in an increase in students’ reading levels. Doty, Popplewell, and Byers studied research done by McKenna, Cowart, and Watkins in which twenty second graders began the study reading at a first grade reading level or lower (cited in Doty, Popplewell, & Byers, 2001). The researchers focused specifically on whether electronic books could increase sight word vocabulary and instructional reading levels (cited in Doty, et al., 2001). After completing the study with electronic storybooks, sixty percent of those second graders were reading at a second grade level or higher.

With traditional books, the students are responsible for decoding each word independently. Electronic text offers narration and word pronunciation to support the text, but it removes the effort from decoding words that are difficult (Dungworth, et al., 2007; Lefever-Davis & Pearman, 2005). Lefever-Davis and Pearman (2005) completed a study to determine the behaviors students had while reading electronic storybooks. During this study it became apparent that one of the boys was not learning the words he struggled with (Lefever-Davis & Pearman, 2005) while reading the text. He would continuously seek help from the audio text on the same



words throughout the book (Lefever-Davis & Pearman, 2005). Audio text can eliminate the need for students to decode words (Ertem, 2010) which in turn lowers their ability to read effectively (Adam & Wild, 1997). Therefore, teachers need to be careful when choosing electronic storybooks in order to ensure their use as effective classroom tools.

Designers of electronic storybooks continue to develop features that will assist a child with his/her reading. When assistance is needed, students who are comfortable asking for help will seek out a teacher to help them sound out the word. The particular act of sounding out a word should be available to the student through the electronic storybook. In a study completed by Lefever-Davis and Pearman (2005), they observed some of their readers using the pronunciations spoken by the computer as a model “for their own reading” (Lefever-Davis & Pearman, 2005, p. 451). Electronic storybooks that enhance awareness of sound-symbol correspondences would be beneficial (McKenna, et al., 1999). These are electronic storybooks that allow students to hear a narrated voice when clicking on pictures or text. CD-ROM *Discis* books are electronic storybooks that allow students to slowly hear how a word is pronounced by syllables (Adam & Wild, 1997). The word is highlighted so that students can recognize which alphabet letters or groups of letters are related (Adam & Wild, 1997).

Features that are “well matched for phonemic awareness, phonics, fluency, and vocabulary” (Ertem, 2010, p. 144) such as “read story only”, “read story and play”, or “read story with dictionary” electronic storybook modes (Korat & Shamir, 2006) can offer a positive effect on a student’s fluency abilities. The “read story only” option contains an actor reading the text with dramatized visuals, scenes, and effects (Korat & Shamir, 2006). “Read story and play” is designed to enhance phonological awareness by having students activate interactive functions throughout the text (Korat & Shamir, 2006). While the interactive functions may be helpful for

some children, stronger readers were frustrated by having to wait for animations to end or load when turning the page, in turn lowering their fluency rate (Lefever-Davis & Pearman, 2005).

New vocabulary words can be previewed prior to reading the text to give the students a chance to connect spoken words to the text (Lefever-Davis & Pearman, 2005). These types of features can help eliminate decoding frustrations (Ertem, 2010). The mode “read story with dictionary” provided an author reading the story in the same manner as “read story only”, but with the added feature of explanations for words that appear difficult (Korat & Shamir, 2006).

Dungworth, et al. (2007) did a study on nine- and ten-year-olds reading electronic storybooks. Of the 51 students who read *The Magicians of Caprona*, 26 of the students were chosen to read the electronic storybook with the dictionary option and 25 of them read a printed copy with a printed dictionary available to look up any unknown words (Dungworth, et al., 2007). The researchers reported that only one student out of twenty-five used the printed dictionary but eighteen of the twenty-six used the dictionary with the electronic storybooks (Dungworth, et al., 2007).

Offering storybooks with digitized speech that will read the story to the students or provide them with the word with which they are struggling in an approach that is quick and easy (Matthew, 1997) is more influential than regular text. The choral reading between the student and computer voice builds struggling readers’ fluency by pushing them to keep up with the computer voice (Labbo, 2000). Korat and Shamir (2008) conducted a study on 149 kindergarteners with a lower social economic status and middle social economic status. They found that children from both social economic statuses improved their word recognition skills (Korat & Shamir, 2008). However, there was a greater improvement in the lower social economic status group than the middle social economic status group (Korat & Shamir, 2008).

The “interpretation of the text provided by the actors may help overcome any weakness that the reader has in terms of decoding the vocabulary, syntactic ability, and working memory”

(Dungworth, et al., 2007, p. 585).

As with any technology tool, teachers need to make sure they aid in students’ learning and not do the learning for them (Lefever-Davis & Pearman, 2005). Educators must find the type of electronic storybook that will meet the needs of their learners. “Read story with dictionary” and “read story and play” were the most effective types of electronic storybooks in the study done by Korat and Shamir (2008) and therefore would be beneficial to use in a classroom with students (Korat & Shamir, 2008).

### **Vocabulary**

Educators and researchers agree that vocabulary is an important aspect of academic success (Kieffer & Lesaux, 2007) and is continually developing well past third grade (Aarnoutse, et al., 2001). Korat states “children’s rich vocabulary is considered to be one of the important vehicles for reading comprehension and academic achievement” (Korat, 2010, p. 25). Difference in vocabulary affects students’ future literacy and academic progress (Korat, 2010). Many immigrant students start school with English as their second language. These students suffer from word poverty when they enter school because their vocabulary is limited. Limited English vocabulary is a result from the lack of exposure to books and through communication with adults. Digital storybooks offer opportunities for children who suffer from word poverty (Bus & Verhallen, 2010). Every time they read an electronic storybook these children were being exposed to many words in a productive manner. “Wide reading plays a major role in the vocabulary development of readers” (Bus & Verhallen, 2010, p. 54).

It has been reported that when adults pause to ask questions regarding the story children are reading, there is a positive effect on their vocabulary growth. “Children learn ten to eighteen percent more words when readings include extratextual questions” (Smeets & Bus, 2012, p. 37). Some electronic storybooks are designed with built-in questions throughout the story; these are extratextual questions. In an experiment, Smeets and Bus (2012) focused on the effects these questions may have. They studied 20 junior kindergartners between the ages of four and five years old from two Dutch schools. As the children read through the electronic storybook, they were prompted throughout the story to answer multiple choice questions. The results showed a significant gain in favor of using multiple choice questions throughout the text. With no additional instruction the students had an eighteen percent gain in both receptive and expressive vocabulary (Smeets & Bus, 2012).

Higgins and Hess (1999) conducted a study to see what the effects would be on a student’s vocabulary if an actual adult, not necessarily a teacher, offered supplemental help while reading through an electronic text. Both researchers used 22 third-graders from a middle-class elementary school in a suburban area. The students were divided into two groups- a control group and an experimental group. In the control group, the students were asked if the animation for each word helped. If the student said “yes” then they moved on. If the student said “no”, however, then the researcher had him or her repeat the animation until the child understood the meaning of the word. The experimental group went through the same process as the control group with the difference being that these students were asked to define the word to the researcher. When words were defined correctly the student could move on. If the word could not be defined then the researcher would provide a definition of the word for the student, along with

a synonym of that particular word. The students were then questioned about the word again (Higgins & Hess, 1999).

The results of this study were similar to what Smeets and Bus found. The data showed that the experimental group receiving supplemental help from the researcher was able to retain the meaning of the target words better than the control group. In fact, the control group was only able to correctly define one to five words. The experimental group was able to define four to six words correctly. Four of the eleven children were able to define all six target words. When students were able to have supplemental instruction with the animations, their performance was significantly better (Higgins & Hess, 1999).

Many electronic books have animations that students can select for support. In order for them to be useful to the students, the students must choose to use them. Higgins and Cocks (1999) found several studies reporting the positive effects electronic storybooks have on reading achievement. They wanted to determine what features make electronic books successful. Together both researchers completed a small study on fifteen third graders from a different middle class, suburban school than mentioned above. A pre-/post-test was used for the same six target words from the story *The New Kid on the Block* to assess student growth, as used in previous research completed by Higgins and Hess. The researchers required the students to select the animated cues. As a result, 14 of the 15 students made statistically significant growth. The researchers still had to interact with the fourteen students who did show significant growth by directing them to use the animated cues (Higgins & Cocks, 1999).

When students chose to select the animations (Higgins & Cocks, 1999), “the close temporal proximity of words and images in video storybooks makes it more likely that the learner is able to build mental connections between verbal and visual representations (Bus

&Verhallen, 2010, p. 55). Biemiller and Boot found similar results that support Higgins and Cocks's small study. In looking at different studies, Biemiller and Boote (2006) found four studies in which there was a 15 percent gain in a single reading with word meaning explanations provided within the text. There was a 26 percent gain in a repeated reading setting in six studies. Each time the story was read again or repeated, the students were given the opportunity of prompting the word meaning explanations (Biemiller & Boote, 2006).

In six studies reviewed by Biemiller and Boote (2006) there was only a nine percent gain in repeated reading setting without word meaning explanations. This setting allowed the student to read the story again, but there was no support needed from the electronic storybook. Not having the word meaning explanation did show a slight gain, but being able to use the word meaning explanation option could improve the students' scores by 17 percent. Biemiller and Boote also found two studies with a 17 percent gain in repeated reading setting with interactive word discussions (Biemiller & Boote, 2006).

“Static illustrations make it hard for children to connect the word with the correct image, whereas animations often present corresponding portions on the narrative and picture at the same time” (Bus & Verhallen, 2010, p. 55). Static illustrations are illustrations in which the pictures are not moving or changing. Students are not able to select these illustrations for additional help. Biemiller and Boote (2006) believe that instruction of word meaning in context through animations has more of an impact than no instruction of word meaning (Biemiller & Boote, 2006). However, Bus and Verhallen (2010) note that children are able to narrow down possible meanings with static illustrations (Bus & Verhallen, 2010).

Bus and Verhallen (2010) completed a study on five-year-olds whose parents had low educational levels creating difficulty when helping their child read. The story *Winnie the Witch*

read by both participating groups was identical in content and language. The difference was that one group was reading a book with static illustrations, while the other read a book that included animated pictures with music and other sounds. The group reading the electronic book with static illustrations and the group reading the electronic book with animation were given a test prior to and following the study, focusing on two parts (Bus & Verhallen, 2010).

The first part of the test was receptive vocabulary where the child had to choose an illustration amongst three distracters to match the target. The second part of the test was expressive vocabulary where the child filled in the last word of a sentence. The word the children chose needed to come from the picture matching the sentence. Bus and Verhallen found that there was no significant difference found in receptive vocabulary; however, there was a statistically significant difference found with expressive vocabulary in favor of electronic storybooks. The results of the receptive vocabulary assessments were three times larger than expressive vocabulary (Bus & Verhallen, 2010).

By the end of second grade, the average child should know 6,000 root word meanings (Biemiller & Boote, 2006). Many of those words come from reading on their own, being read aloud to, and conversations. Korat and Shamir (2007) conducted a study of 128 kindergarteners; there were four groups of kindergartners from a lower social economic status and four groups of kindergarteners from a middle social economic status. All students read an electronic book Korat and Shamir designed based on the Hebrew book *The Tractor in the Sand Box*. They noted in their article that the book they created has fewer animations than typical electronic storybooks. The researchers compared the electronic storybook they designed with adults reading to the children (Korat & Shamir, 2007).

It was found that the kindergarteners demonstrated improvement on the meaning of new words after being exposed to the electronic storybook. The results from the pre-/post-test showed a significant improvement in vocabulary for both children reading the electronic book and those listening to an adult reader as well. The tests appear to show those students reading the electronic version scored slightly higher than those listening to the adult. When Korat and Shamir examined how the two social economic groups compared in vocabulary, it was discovered that the most improvement occurred in the middle social economic status group (Korat & Shamir, 2007).

Researchers did see a higher improvement in vocabulary with the children reading the electronic book; the difference between having an adult read to the child versus an electronic storybook was not significant (Korat & Shamir, 2007). Regular pronunciation of words could enhance access of sight vocabulary (Underwood & Underwood, 1998) and students would not have to worry about frustrating an adult by asking them repeatedly when a word needed to be read aloud several times to enhance the knowledge of pronunciation (Pearman & Chang, 2010). Instead students can echo read as they listen to the computer voice and then repeat the word aloud until they know how to say it (Pearman & Chang, 2010). This option can help meet a student's developmental needs in vocabulary (Korat, 2010).

Korat (2010) conducted another study on her own with 90 Israeli children taken from five kindergarten classes and five first grade classes in a middle social economic status neighborhood. She studied word meaning and word reading using the story *Yuval Hamebulbal* (Confused Yuval) in traditional text and an electronic text format. To assess word meaning, the children were asked to identify the meanings of ten words. When assessing word reading, the children were asked to read nine high frequency words. These words appeared four or more times



throughout the text. When the word was read correctly, the children would receive four points. If the children could partially read the word with two correct sounds he or she received three points. Two points were awarded if they read the word partially correct with one sound. If the children could not read the word or did not attempt to read the word they only received one point (Korat, 2010).

Both kindergartners and first graders benefited from the electronic storybooks compared to the traditional text. The results showed word meaning and word reading to have greater improvement in the electronic storybook group than the group reading the traditional text. There was a significant difference between the two grade levels. While the kindergartners showed greater improvement in word reading, the first graders significantly outperformed the kindergartners when it came to frequency of words, idioms, and the level of the story. This particular study showed evidence of electronic storybooks' ability to support vocabulary at the lower elementary level (Korat, 2010).

### **Comprehension**

Many factors affect comprehension and unfortunately those students with limited vocabularies tend to struggle with the meaning of the text (Kieffer & Lesaux, 2007). Harris and Hodges (1995) defined comprehension as, "intentional thinking during which meaning is constructed through interactions between text and reader" (cited in Ertem, 2010, p. 140). Comprehension requires readers to connect prior knowledge with new information to create a new knowledge (Matthew, 1997). It is "an extremely complex cognitive, motivational, and affective activity" (Torgesen, 2000, p. 56).

Lefever-Davis and Pearman believed that electronic storybooks can enhance comprehension through the animations that signal story events and moods (Lefever-Davis &

Pearman, 2005). Having a computer assist the learner with the reading reduces the time wasted decoding words or struggling with new vocabulary, in turn allowing more time to process the meaning (Lefever-Davis & Pearman, 2005). Early studies done by Casteel, Helfeldt and Hank; Manzo; and Standish found no statistically significant difference in comprehension between electronic text and traditional text (cited in Matthew, 1997). However, more recent studies conducted by Reinking and Schreiner; Stine; Wepner; Feeling; and Minery did find a statistical difference in students' comprehension when reading electronic text versus traditional text in favor of electronic text (cited in Matthew, 1997).

A study completed by Matthew (1997) found that comprehension scores for pairs of third graders were higher when using electronic storybooks over traditional books. Matthew conducted two experiments. The first experiment compared the comprehension of two groups, one who read the electronic storybook and the other group who read the traditional storybook. The second experiment tested the comprehension of the students who read the traditional storybook in the first group after reading an electronic storybook. 37 matched pairs of third-graders from a large school district participated in the experiments. Matthew paired each student with another student who was reading at an equivalent reading level, for a total of 74 students participating. Three types of questions were written for the open-ended responses according to Pearson and Johnson's taxonomy of comprehension questions which includes: textually explicit, textually implicit, and scripturally implicit (Matthew, 1997).

Answers to textually explicit questions are found directly in the text in one location. These types of questions are given to the students by the author without having to critically think on their own. Answers to textually implicit questions are also found in the text, but the answers are spread throughout the text. For these questions, the answer might be found in one spot as

well as another spot in the text. An example of a textually implicit question might be to summarize the passage they read. This requires students to rationalize which information in the passage is important. Scripturally implicit questions ask the students to use the information in the text and prior knowledge to answer the question. The open-ended questions were scored using Baumeister's three-point scale and the story retellings were scored using Morrow's 10-point retelling scale. No statistically significant difference was found with the open-ended questions of the comprehension questions between electronic text and traditional text. However, an educationally significant difference was found in favor of electronic text with the story retellings aspect of the comprehension assessment (Matthew, 1997).

In Matthew's (1997) second experiment 30 of the third-grade students from the traditional storybook group from the first experiment participated in this experiment. For this experiment, the third-grade students read two books, different than the ones they had read in experiment one. The questions to which the students responded following reading the stories were in the same format as experiment one. The results showed a significant difference between students' retellings of the traditional storybooks and electronic storybooks. Their comprehension scores were higher when they read the electronic storybooks than the traditional print storybooks (Matthew, 1997).

Similar to Matthew's results, Pearman (2008) found that the retelling scores were significantly higher for second graders reading electronic text over traditional text. She completed a study looking at 54 second grade students comprised of low, middle, and high reading levels. Appropriate text was selected for each of the different reading levels in both traditional print and electronic. The electronic storybooks included a highlighting option, definitions, pronunciations, sound effects, and animated graphics. Since Pearman's intentions

were to assess comprehension during independent reading, she turned off total narration as an option. After reading the stories, both groups were asked to retell the story. Prompts were given to children when necessary during the story retelling. During this study, Pearman also looked at the difference in reading proficiencies. The results of her study showed that the average retelling was significantly higher for lower level students reading electronic text. There was no significant difference for those reading at a middle or high level (Pearman, 2008).

DeJong and Bus (2002) found that when it came to different learning levels, higher learners used features that assisted with learning, while lower learners used the features provided in the illustrations. DeJong and Bus completed a study of 48 kindergartners from a small school in the Netherlands. The children were divided into low, middle, or high literacy levels. Once into these three groups, the children were separated into four groups: restricted electronic storybooks group, unrestricted electronic storybook group, traditional storybook group, and a control group. Those in the unrestricted electronic storybook group spent half the time playing the games provided within the text and did not progress as far in the text as the restricted electronic storybook group. The group with the lower learners did not even read one-fourth of the book. The middle learners only progressed about half way through the book and the higher learners read about two-thirds on the book. While all participants did improve from the pre- to post-test, those reading the traditional print and restricted electronic text improved the most (DeJong & Bus, 2002).

There are researchers, such as Pearman and Chang (2010), who feel electronic storybooks may not always create a positive learning experience that is productive for students. The features provided within illustrations are a concern Pearman (2008) stated “hypertext features allowing readers to explore options leads to superficial learning” (p. 595) thus, the features provided

within illustrations may hinder student learning by not allowing them to develop competency in reading (Pearman, 2008). The “cued animations and sound effects (CASE) may encourage children to ignore the written portion” (p. 81) of a story (Trushell, Maitland, & Burrell, 2003). Pearman and Chang (2010) believed that the hotspots (hyperlinks) create more of a game aspect to stories rather than supplemental help in learning related to the story (Pearman & Chang, 2010).

Sometimes the electronic opportunities are a distraction. In a study done by Lewis and Ashton, a group of readers participating in Project Literacy Instruction found that 65 percent of students played with the hotspots rather than read (Pearman & Change, 2010). DeJong and Bus (2004) found that many electronic storybooks provide animations that are unrelated to the text. This is especially true for books targeted towards younger children, as the animations can distract them and interfere with their comprehension (DeJong & Bus, 2004). However, “appropriately designed computer programs and internet sites contain multimedia features that can support young children’s engagement with ideas, words, and various genres of text” (Labbo, 2005, p. 288).

Underwood and Underwood (1998) completed a study involving sixty-two eight-year-olds at a suburban primary school. The children were paired up based on similar reading levels. The groups were boy/boy, boy/girl, and girl/girl. Each pair was observed individually, how they interacted with the electronic storybook, and with each other. The researchers observed the number of times the animations, or hotspots, were clicked and also recorded each child’s purpose of clicking on the animated features. After reading the story, there was a written test given to each individual child to assess comprehension. Recall of the story was assessed by having each individual write about the story they had read. It was found that hotspots had a positive reaction

in assisting with the students' comprehension. Even though the hotspots had a positive reaction none of the children mentioned the hotspots in the comprehension test given to them weeks later. The girl/girl groups recalled twice as many facts as the other two groups (Underwood & Underwood, 1998).

Animations can deter the focus away from text to the pictures alone. While pictures can help tell a story, they also lack details that pull a story together. Trushell, Burrell, and Maitland (2001) conducted a study in East London, England, with year five students. Trushell, et al. found that few students read the electronic text completely or in a linear fashion. The students' recollection of the story was insufficient. Any recollections they did have involved the hotspots. The hotspots appeared to allow them to recall outcomes and story setting better than the beginning, ending, and reactions to the story (Trushell, et al., 2001).

On the contrary, DeJong and Bus reported that Ricci and Beal, "did not find that visual and sound effects disrupted comprehension among a group of first-grade students" (cited in DeJong & Bus, 2004, p. 381). In fact, research has also indicated audio features help set the mood for the story (Pearman & Chang, 2010). The reader could understand what was going on or what would happen based on the music or tone of voice (Pearman & Change, 2010). One study reported that a boy knew something scary was going to happen in the story because of the ominous music (Pearman & Chang, 2010).

When animations are used effectively they offer support to the readers. Ertem (2010) conducted a study on 77 fourth graders in a Florida school district. The students selected were reading one to two years below grade level. The study looked at comprehension scores when reading *Sheila Rae, the Brave* in three forms: an electronic storybook with animation, an electronic storybook without animation, and a traditional storybook. Once students were finished

reading their version of the book their comprehension of the story was assessed using Morrow's 10-Point Scale. This scale is a reliable instrument used to assess many retellings. It is broken down into different aspects of a story retelling, including setting, theme, plot episodes, resolution, and sequence with the highest score possible being a ten (Doty, et al., 2001).

Ertem's study would disagree with the one completed by Lewis and Ashter. He found that reading comprehension scores involving story retell were higher when reading electronic storybooks with animation, compared to electronic storybooks without animation as well as traditional books. There was a significant difference between the electronic storybook with animation and traditional text. When comparing the electronic storybook with animation group and electronic storybook without animation group there was no significant difference. There was also no significant difference found between the electronic storybook without animation and traditional text (cited in Ertem, 2010).

Trushell, et al. (2003) completed a study on year four, nine and ten-year-old students in Essex, United Kingdom. Two groups read the electronic storybook *Sheila Rae, the Brave* but the electronic format was different. One group was assigned the *Read to me* option while the other group was allowed to access the *Let me play* option. The *Read to me* option only allowed the students to hear the story being read. *Let me play* gave students access to the cued animations and sound effects (CASE). These students would be able to select animations and other prompts provided within the text. Researchers took observation notes, tape-recorded the students' verbal retelling, and collected the responses from the multiple-choice test taken after the children read.

Observations showed that most groups read through the text in a linear fashion without skipping pages. As one group read through the entire story, their use of accessing CASE decreased, although when they finished they went back to other screens to access more CASE

intensively. When the students took the Qualifications and Curriculum Authority reading test again after the study, those in the *Let me play* group scored significantly higher than those in the *Read to me* group. Overall there was no significant difference in the recall of both groups. However, further analysis did show that the recall of names and micro-propositions was higher in the *Let me play* group. These results supported what DeJong and Bus found in their study, mentioned earlier, that the animated features offer support for students. While recall was higher in the *Let me play* group inferential questions were higher in the *Read to me* group (Trushell, et al., 2003).

Being able to retell a story with multiple details is an important part of proving your understanding of a story. Doty, et al. (2001) completed a study to determine if students scored higher on oral retellings and comprehension questions when reading a traditional text or an interactive storybook. 39 students from a Title 1 elementary in the United States Midwest participated in their study. Both groups read *Thomas' Snowsuit*. Since the researchers were assessing reading comprehension they removed the narration aspect from the electronic storybook but allowed the students to retrieve word pronunciations and definitions. The traditional text group did have someone present to provide assistance from if needed. Once they were finished reading the text the students retold the story immediately using Morrow's 10-point scale. They were then asked six comprehension questions, three were literal and the other three were inferential (Doty, et al., 2001).

The results from the retelling for the interactive storybook were slightly lower than traditional print, however these results were of no significant difference. Comprehension scores also found no significant different between the two groups. The results of the comprehension test were significantly higher, though in favor of those reading the electronic storybook. The results



from this study do show that electronic storybooks can have a positive effect on reading comprehension (Doty, et al., 2001).

Grimshaw, et al. (2007) found that the electronic storybooks offered students the “privacy of ‘failure’” (p. 585) if they need additional assistance. Taking the time to ask the teacher presents downtime that could interfere when comprehending the text. They completed a study with 132 children from ages nine years and nine months to eleven years and two months. The study included electronic storybooks with animation, electronic storybook without animation, and printed text. The researchers looked at how long it took the children to complete the comprehension test as well as their scores on the comprehension test.

Grimshaw, et al. found a significant difference in the time that it took the students to complete the comprehension test. It was found that those who read the traditional text took longer to complete the comprehension test (20 minutes) compared to those who read the electronic version with narration (16 minutes). There was also a significant difference in the length of reading time between the electronic version with and the electronic version without narration. Those reading the electronic version took the longest to go through the comprehension test. When looking at the comprehension test as whole, children who read the electronic storybook with narration scored significantly higher than those who read the electronic version without narration.

However, the mean scores were higher for both retrieval and inference questions for those reading the traditional text. Even though the scores were higher there was no significant difference between the electronic version with narration and the traditional story. This study also showed that those children reading the electronic version with narration took longer than the children reading the traditional book. DeJong and Bus point out that animations may be activated

as a child is reading the story (DeJong & Bus, 2004) which may take a child longer if he or she needs that extra help (Grimshaw, et al., 2007).

## **Conclusions and Recommendations**

Many educators see the value of incorporating technology into everyday curriculum. The key is finding technology that will benefit students' learning needs to help them become better students. Electronic storybooks sound like a solution to solving the reading problems of today's students. It is important for educators to realize that no technology can "solve" the problems that exist. However, technology can support various learning needs when used in a manner that will benefit the student. Electronic storybooks can provide the support needed to help develop students' literacy (Chen, et al., 2003). They have the "potential to support readers and promote reading skills" (Lefever-Davis & Pearman, 2005, p. 451).

### **What effects do electronic storybooks have on reading accuracy versus traditional books?**

When looking at the effects of electronic storybooks on students' accuracy, educators need to find the best electronic storybook to meet the need of each individual learner. Carefully designed electronic storybooks can have a positive impact on the development of word meaning, word recognition, and phonological awareness (Korat & Shamir, 2007). The option of digitized speech provides students with the correct pronunciation (Matthew, 1997), allowing them some independence when it comes to pronunciation accuracy. Educators need to use electronic storybooks that allow students to hear each word being pronounced slowly, syllable by syllable, so they can recognize the alphabet letters grouped together (Adams & Wild, 1997). Stronger readers can use the digital pronunciations to fine-tune their reading for expression (Lefever-Davis & Pearman, 2005). Since unfamiliar words can be read aloud to them, using electronic storybooks that allow students to preview the vocabulary words allow for them to connect the spoken words to the written words (Lefever-Davis & Pearman, 2005).

Educators need to be cautious when using electronic storybooks as a tool to support accuracy. Electronic storybooks that pronounce words through narration can remove the effort from decoding individual words (Dungworth, et al., 2007). The students may automatically click on the pronunciation of a word without even attempting to pronounce it for themselves because the computer will do it for them (McKenna, et al., 1999). Students may become dependent on the computer and stop taking decoding risks on traditional books.

As a teacher I feel as though well-designed electronic storybooks would serve as a useful resource in assisting students with learning new words. Hearing the words spoken will help students increase the number of sight vocabulary words they know. The electronic books that allow for words to be broken up in different sounds is another great feature students can use to practice the different sounds, especially in the earlier stages of elementary grades.

### **How do electronic storybooks affect the fluency of readers at the elementary level?**

It is important teachers monitor the students' progress when they are working with electronic storybooks so they are not becoming dependent on the computer's digitized speech. Teachers will also want to choose electronic books in which the digitized speech is effective in terms of the voice narrating the story. Students need a model voice that reflects consistent rate, accuracy, phrasing, and expression (Oakley, 2003). Teachers also need to be aware that while the choral reading can help build fluency (Labbo, 2000) the animations can frustrate and slow the stronger readers down (Lefever-Davis & Pearman, 2005).

While being able to listen to a model reader narrate the story is good practice for students, I believe that students reading is also a key component to developing fluency. If the students are continually just listening to the story and reading the words in their minds, they are not practicing the oral aspect of reading. Having the students actually reading the story out loud

with the narration would be a better way to practice their fluency. They can imitate the narrator's voice while the narrator pushes the students to keep up with his or her pace.

### **Can electronic storybooks expand the vocabulary knowledge of elementary classrooms?**

Reading is a key factor in expanding the vocabulary for any person, especially students who are learning so many new words each day. Kindergarteners and students whose first language is not English suffer the most when starting school (Verhallen & Bus, 2010). Electronic storybooks with narration as a feature offer students the support when they struggle with words they do not know. An important feature is being able to click on a word and hear what it sounds like or learn the meaning (Pearman & Chang, 2010). Students can hear words and definitions as many times as they need in order to reach clarification and understanding. (Pearman & Chang, 2010). Biemiller and Boote (2006) found a 26 percent increase in vocabulary when students were able to use an electronic storybook that provided the meaning of words and repeated reading.

As an educator I want my students reading as much as possible. However, I am not always available to read them a word or explain the definition of a word they might not know. A dictionary is a great traditional text for students as a resource, but for the younger students, using a dictionary is a difficult skill for them. Electronic storybooks provide students instant assistance when needed. An electronic storybook should not replace whole group and small group discussions. Students generate several new words when listening and talking to others. I do believe that electronic storybooks would provide adequate support in a child's vocabulary development.

### **What effects do electronic storybooks have on the comprehension scores of elementary students?**

After reviewing the research, many suggest that electronic storybooks can support students' vocabulary and comprehension. Several researchers, such as DeJong and Bus; Korat and Shamir; McKenna, et al.; and Ertem, found the most growth in those students who were reading at or below grade level. Even though reading scores proved to be higher with electronic books, the difference was not significant. There will always be the concern that electronic storybooks may shift the focus away from the text and put it more on the illustrations, which in turn does not support the internalization of content (DeJong & Bus, 2002). Teachers need to be responsible in making sure the electronic books they choose are quality ones that have hotspots integrated into the content to foster understanding of text (Korat, 2010).

Comprehension is a difficult skill to teach students as a teacher, let alone a computer program. Many electronic storybooks address the literal questions where the answer is right there. These types of questions provide students with the practice of using the text for help when they are unsure of an answer. What happens when the student is continually missing the questions? The computer may be able to see the questions they are missing, but it is unable to provide the scaffolding needed in understanding how to answer the questions. Many teachers spend a lot of time teaching their students how to answer questions which is something I do not believe an electronic storybook can replace. In terms of comprehension, I believe as though electronic storybooks should be a review tool for the skills being taught by the teacher.

### **How are electronic storybooks being implemented in elementary classrooms?**

Electronic storybooks should not replace the teacher's role during reading time. Teachers should know the distinction between learning from the computer and learning with the computer

(Lefever-Davis & Pearman, 2005). Electronic storybooks should assist the teacher in helping his or her students grow as fluent readers. At a reading center electronic storybooks would be great tools to use while the teacher is working with small groups. Some electronic storybooks allow teachers to print a record of what skills the students have not yet mastered. This feature gives teachers information to use as a guide for one-on-one or small group instruction after they have read an electronic storybook.

Electronic storybooks can also be used during large group instruction when the class is reading a story altogether. With so many stories available through electronic storybooks you may find a story that is included in your reading curriculum. This would give the students an opportunity to use the electronic storybook or traditional text to follow along, allowing the teacher to meet the needs of several students. Electronic storybooks offer a number of possibilities. Educators need to remember that electronic storybooks should not replace their reading instruction, but be used as support to enhance students' reading skills.

### **Future Research**

While there is research regarding the effects electronic storybooks have on student learning, researchers agree that more research is still needed. After completing a study many researchers were left with more questions. It was often stated in the articles reviewed how little research has been done on specific topic being studied. Most of the research done was completed in the twentieth century. Research completed in the twentieth century provides educators with a lot of valuable information about how electronic storybooks have evolved and the effects they have had on students throughout the years. The information gives us valid information regarding the use of electronic storybooks in the classroom.

As technology has continued to change over the years, electronic storybooks have as well. Electronic storybooks started out with a narrator reading the story to the listener. Now there are cued animations and sound effects (CASE), hotspots, and games built into the electronic storybooks. Some companies created electronic storybooks with entertainment in mind detracting from the initial story. Other companies are more focused on creating electronic storybooks that supplement the story to help students' reading achievement. How are teachers supposed to assess which ones are best for their students? Is there a guideline they should be following when choosing an electronic storybook.

Research is continually being done and evolving along with technology. More current research regarding the newer electronic storybooks' capabilities would give educators an idea on how to use them best with different devices such as iPhones or iPads. In order to use electronic storybooks, teachers need access to computers, which is sometimes limited. Educators may want to consider the idea of 1:1 laptops for students or other hand held devices like tablets. This would allow students access to electronic storybooks on a regular basis. If they had access on a regular basis, would elementary schools be more likely to involve electronic storybooks into their daily curriculum. Would schools be more likely to look at text that is offered online through these devices rather than the traditional texts for the older grades? If they did, which text would be more beneficial: the "read only" type, or the electronic books with hotspots that can offer support to those students who need it?

With all the various assessments schools perform, researchers may look into where electronic storybooks fall in terms of assessment. Formative assessments are continually being used to assess which skills the students have and which skills need to be taught more. Would electronic storybooks that offer a print out of the students' progress be useful in serving as a



formative assessment? Can they be used as a form of summative reading assessment? If not, is that a possibility in the future as schools become more technology savvy? With the new technology available researchers have several opportunities to research how electronic storybooks can affect our classrooms.

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