Abstract
The purpose of this investigation was to determine whether reading intervention was more effective on enhancing a student's comprehension through read-alouds from interactive e-books compared to that from traditional print books. Two 7-year-old first grade students were chosen for this reading intervention; where Student A received intervention through read-alouds from print books and Student B received narrated read-alouds independently through an interactive e-book. Each intervention included three book-reading sessions. Comprehension was evaluated through a sequencing activity of main events in the beginning, middle and end of the book and six comprehension questions, both implicit and explicit.
versus Traditional Print Books

Education is now experiencing a shift from the Industrial Age to the Digital Age, a transition into a new generation of learning (Bennett, Maton & Kervin, 2008). This new paradigm of learners can be referred to as “technology natives” (Larson, 2008) and as a result, instruction is changing and classrooms are becoming more adaptive and connective to the students and their different learning styles through the use of technology compared to those of previous generations (Prensky, 2006; Larson, 2008; Bennett, Maton & Kervin, 2008). Literacy instruction and its purpose are specifically evolving as the introduction and incorporation of informational and communication technologies begin to expand (Leu & Kinzer, 2000). Literacy is increasingly being revealed to students through forms other than on paper; emphasizing digital growth within the classroom context and more specifically in reading instruction (Borawski, 2009; Larson, 2008).

Technology Growth in Education

Technology is extending into the classroom context, integrating into teachers’ instruction and becoming a way of learning for students. Digital natives are introducing new forms of learning styles to the classroom as their engagement level is enhanced and their interest is better accommodated in a digital classroom (Prensky, 2006). Using technology within the classroom not only allows learning to become more authentic for students, but also more aesthetic. Digital natives are defined as students born between 1980 and 1994; as a result they are exposed to a culture of technology advances (Bennett, Maton & Kervin, 2008). This generation is described as individuals that are constantly immersed in a culture exposed to computers, cell phones, video games and other digital resources (Bennett, Maton & Kervin, 2008).

Students of this generation are being raised in a technology-based culture, exposed to an increasing amount of multimedia, which includes electronic picture books, a digitized format of literature for children (de Jong & Bus, 2002; Korat, 2009). A foundation of literacy and reading strategies for young children are supported through meaningful exploration and encounters with books (Labbo & Kuhn, 2000), which extends beyond traditional print books to e-books, a resource that provides interactive experiences with digital text. Conventionally, teachers scaffold student literacy components through modeling, practice and think-alouds as they break down books based on their elements and proposing questions that emanate from the text. As learning progressively becomes more technologically involved, traditional scaffolding strategies are being replicated through technology tools and their multimedia aspects, ultimately enhancing digital learning opportunities. In fact, many studies have investigated the effects of interactive e-books in education, specifically their effect on student comprehension (Doty, Popplewell & Byers, 2001; de Jong & Bus, 2004; Korat, 2009). The majority of the results of these studies support the idea that reading interactive e-books may support and enhance students’ reading comprehension.

E-books

An electronic book (e-book) is a text provided as a digitally designed book that has emerged as part of children’s literature over the past few decades. E-books are referred to as interactive storybooks that allow children to read actively and respond to children’s literature. These digitized books are often reflective of printed books or replicated digital copies of printed storybooks. This type of digital text still includes the literary elements and structure that would be found in conventional books such as characters, setting, sequenced events, plot and theme; rather the format of the text has changed, creating an authentic environment for meaningful reading to take place (Labbo & Kuhn, 2000; de Jong & Bus, 2003; Huang, Liang, Su & Chen, 2012). Similarities can be seen between reading e-books and adult read-alouds of printed books. Essential elements of modeled reading are still used in e-books which assist in the development of emergent readers, including modeling fluent reading (the narration feature), text guidance and re-focusing techniques (the highlighting of text as it is read orally), and thought-provoking cognitive aspects (the multimedia features offered) (Labbo & Kuhn, 2000; Larson, 2008).

The electronic storybook has been integrated into the classroom context as a valuable resource in the past decade; as a result, students’ expectations and learning styles have shifted towards digitized instruction and learning methods (Korat & Shamir, 2012; Huang, Liang, Su & Chen, 2012). Electronic books can be read on different formats, also referred to as e-readers, which include CD-ROMs, the Nook, the iPad, the Internet and the Kindle (Korat & Shamir, 2012; de Jong & Bus, 2004; Larson, 2008; Huang, Liang, Su & Chen, 2012).
books began to flourish and become more accessible as new e-readers were released; for example the Kindle was released by Amazon in 2007 while Apple introduced the iPad in 2010 (Cheng, Huang & Lin, 2012). Reading text on an e-reader introduces students to a new learning tool to which they are possibly more inclined to respond and learn from as it satisfies their attention and learning style (Korat & Shamir, 2012). E-books are not only riveting because they are digital, but they also include many aspects that encourage students to be interactive readers (de Jong & Bus, 2004, 2003). An e-book provides personalized literacy instruction that is provided through different forms of digital resources and aspects that allow students’ specific learning needs to be accommodated (Huang, Liang, Su & Chen, 2012). Noted differences found between electronic books and printed books were established through a content analysis conducted by de Jong and Bus (2003). The significant differences found in this study between the two formats include: additional multimedia resources, interactive visuals and explicit guidance on understanding the content through hidden hotspots (an e-book aspect that provides additional exploration and practice with the five elements of reading through games and explanations) in the story. Digital storybooks have evolved over time when comparing the evolution of “talking books” to “living books” and then “living books” to “interactive books”. Of these three types of e-books, interactive storybooks have provided the most beneficial reading experiences supported through collected data and valuable results in readers’ retention and intrinsic motivation to read. Interactive e-books have developed from the audio reading feature of talking books and the multimedia visuals offered in living books, by additionally providing readers the opportunity to actively read and learn through games, hotspots and multimedia that promote independent exploration (de Jong & Bus, 2003).

**Benefits of E-books in Education**

Electronic books have developed beyond an audio version of a print book because of the interactive elements. The richness of multimedia interpretations of books is said to broaden the reader’s interaction with the text which furthers their construction of meaning and comprehension (Verhallen, Bus, & de Jong, 2006). There are two typical choices offered by the majority of e-books, which include Read Only or Read and Play. The Read Only option focuses more so on the oral reading of the text and less on the interactive game features. The Read and Play option on the other hand, offers games, additional animations and multimedia effects and reading skills practice accessed through hotspots (de Jong & Bus, 2003). The interactivity offered through the Read and Play version is thought to actively engage students more effectively and increase reading motivation, which is essential in heightening students’ interest and engagement in reading (de Jong & Bus, 2003).

E-books have many accessible features that allow students’ literacy instruction to expand beyond the text provided within the book. Written text, narration, highlighted text, phonological games or hotspots, embedded animations and an available dictionary are all features provided by most e-books (Korat & Shamir, 2007; de Jong & Bus, 2002, 2004; Korat & Shamir, 2012). The Read Only option on e-books normally includes oral reading through narration, moving illustrations, highlighted text and a dictionary with student-friendly definitions. The Read and Play version includes all of these elements as well but in addition offers hot spots that can be clicked on to guide the reader to further explore literary elements of the text such as phonemically breaking down words, comprehensive questions or additional explanations to build the story’s plot line through activities, tutorials or games (Segal-Drori, Korat, Shamir & Klein, 2009).

When reading e-books, students can be read to orally through narration, accessing both their listening and reading skills by representing the text through oral reading and visible writing. The oral narration feature is thought to reduce students’ working memory effectively by focusing the reader on comprehending the text rather than having to decode the text, a skill emergent readers have not yet mastered (Korat & Shamir, 2007). The results of a study conducted by Doty, Popplewell and Byers (2001) suggested that students in the emergent literacy stage who were expected to read an e-book without the oral narration had a difficult time effectively comprehending the text due to their focus being on decoding words. E-books bring more attention to the conventions of print due to the multimedia effect of tracking words, phrases and sentences congruently with the narration (de Jong & Bus, 2002; Korat, 2009; Korat & Shamir, 2012; Segal-Drori, Korat, Shamir & Klein, 2009; Korat & Blau, 2010). The text-tracking style may vary in different e-books as it may highlight, underline or change the color of words as they are being read aloud. This feature proved particularly useful in a study done by Wood (2005), which showed how students’ decoding ability increased and their mispronounced words
decreased through the use of the e-book narration and its ability to track and re-read words when clicked. A computerized dictionary is a valuable feature of e-books; this element recognizes potential challenging vocabulary words for the book’s reading level and provides student-friendly definitions. This feature recognizes these complex words by allowing students to click on them during their reading which then redirects them to a resource that pronounces the word, followed by a brief explanation (Korat & Shamir, 2012). Korat and Shamir’s (2012) study investigated the effectiveness of using the e-book dictionary to provide direct instruction on generating new vocabulary meaning found in storybooks, and as a result of being able to build strong word meaning through this digital dictionary resource, students were able to better comprehend the text. This feature mirrors the act of a teacher defining a word during a read-aloud by providing a student-friendly definition. The difference is that the e-book will foster students to question their understanding of word meanings throughout independent reading and to initiate the comprehension strategy of defining unknown words to help the metacognitive process of reading to better understand the content of the story. Another study showed similar results when one group of students read from printed books and used printed dictionaries to define unknown words and another group read from e-books and used the e-dictionary feature to define unknown words (Grimshaw, Dungworth, McKnight & Morris, 2007). The test group using the e-dictionary showed higher comprehension due to their consistent use of the e-dictionary feature to define unknown words throughout their reading.

Hot spots can be found throughout e-books and allow students to discover animations or games during the reading (de Jong & Bus, 2002). Hotspots are accessed by clicking on certain words or pictures in the storybook which then link the reader to an additional resource or activity. These additional features accessed through hotspots may include moving animations, story character development, word work done by manipulating or breaking down phonemes, definitions for complex vocabulary or comprehensive games, all corresponding to the content of the story. Some research studies show how the connectivity and relationship between the reader and the text can be made stronger when these hotspots are accessed as story characters’ personalities, feelings and actions and story plots are brought to life through animation and sound; ultimately making the reader’s ability to make inferences more natural (de Jong & Bus, 2003). These additional features allow readers to further develop and explore their understanding of the text.

E-books are allowing students to become more independent readers no matter their proficiency in reading. Because of these beneficial multimedia effects, e-books are allowing students to read and listen to books without assistance (Korat & Shamir, 2007; de Jong & Bus, 2004; Doty, Popplewell & Byers, 2001). With the availability of e-books, students could be exposed to more books and meaningful reading without adult provided instruction and guidance. Students’ background context and home environment can negatively influence students’ literacy acquisition due to the underexposure of literature caused by care-givers’ lack of time, value in reading, opportunity or resources. This issue can ultimately lead to a deficiency or delay in literacy acquisition due to the lack of vocabulary development, unfamiliarity in book structure and an unexpressed value in reading that is often correlated with the absence of instruction provided by caregivers (Stanovich, 1986).

In Wood’s (2005) investigation on talking books and their effect on students’ phonological awareness growth as well as enhancing reading strategies, results showed that independent reading intervention through the use of e-books could be equivalently beneficial to intervention provided through one-on-one adult-led tutoring. With this evidence, it can be suggested that e-books are providing sufficient support and could potentially scaffold supplemental independent reading opportunities (Wood, 2005; Doty, Popplewell & Byers, 2001). Because e-books are providing an opportunity for independent learning it is discussed that this digital interactive text is allowing children to enter into the emergent literacy stage more progressively (Korat & Shamir, 2012). The interactive features offered by e-books are thought to be beneficial because of the explicit assistance available to readers when they may encounter difficulty with word meaning, decoding or misunderstanding of the content (Reinking, 1992; Doty, Popplewell & Byers, 2001). E-books are seen as a sufficient addition in providing reading instruction along with adult read-alouds from printed books, but in contrast to traditional printed books, understanding is enhanced beyond the text through interaction with oral narration, hotspots, text-tracking tools and multimedia effects (de Jong & Bus, 2003; 2004).
Another element of reading that the use of an e-book influences is student motivation to read. Motivation is difficult to quantitatively measure; therefore data can be collected by observing students’ level of engagement and interest. Using these two elements of motivation, a positive correlation is shown between technology being incorporated in educational instruction and student engagement and interest in learning (National Reading Panel, 2000). Students who are constantly interacting with technology outside of the classroom context may have a hard time connecting to learning and staying interested when in the classroom. Using technology to address this element of reading acquisition may encourage students to be intrinsically motivated to read more actively. Utilizing technology to facilitate reading intervention is thought to bring privacy to the reader because book levels cannot be seen by anyone else. Students who are in intervention are typically low-achieving. By keeping students’ reading level private, the element of embarrassment can be eliminated, which will affect students’ self-efficacy and motivation in reading as well (Reinking & Watkins, 2000). Increasing the participant’s self-assurance in their reading skill will influence their engagement level and interest in reading.

Limitations of E-books

It is important to recognize that there have been some limitations of e-books identified. Existing arguments about the functionality of e-books and their potential errors or limitations in providing reading instruction include that the e-book lacks explicit instruction and assistance in the reading acquisition process, the multimedia and digital aspects of an e-book are too distracting for effective reading to take place and that e-books are far too technologically complex for elementary students to utilize successfully. These limitations have caused some to believe that e-books are insufficient in providing adequate structure, explicit instruction and ample resources when compared to traditional reading instruction provided through read-alouds of printed books (de Jong & Bus, 2002; 2003; Labbo & Kuhn, 2000).

The various multimedia effects such as animations, additional sounds, games and hotspots have been described as potential distractions that are harmful to students’ ability to focus on the content of the text rather than interactive opportunities to enhance students’ comprehension (Labbo & Kuhn 2000; de Jong & Bus, 2004). Labbo and Kuhn (2000) and de Jong and Bus (2004) investigated how students had been abusing these e-book features by allotting their attention and interest on these game-like effects rather than engaging in the actual act of reading and comprehending. In order to avoid this potential problem it is important that e-books carefully and effectively include animations in e-books that are integrated in a way that authentically supports the content of the story (Labbo & Kuhn, 2000). E-books that include elements and aspects that are beneficial to the student’s reading experience are referred to as considerate books (Labbo & Kuhn, 2000). It is important to recognize and value that considerate e-books can actively engage student comprehension rather than distract. A study completed by de Jong and Bus (2002) provided insight on how e-book features could be a distraction by testing and observing a group of students’ efficiency when using the Read and Play version of an e-book story. The Read and Play version lacks restrictions on accessing the additional digital facets offered, and as a result this group of students abused the time provided to them for reading and spent the majority of the activity time playing games (de Jong & Bus, 2002). With these results, the use of inconsiderate e-books could potentially create less metacognitive readers through the distracting digital features and can emphasize the importance of choosing quality considerate e-books (Labbo & Kuhn, 2000; de Jong & Bus, 2003).

Another probable issue that has been investigated is whether e-books and their functionality are too complex for elementary level students. This complexity does not refer only to the navigation of these technology tools but also that e-books do not provide enough scaffolding for elementary students’ learning level. It was found that not all electronic books offered from 1995 to 2002 allowed students to apply their formal understanding of book orientation and functionality of printed books due to the lack of essential book features such as an introductory title screen, narration options or clickable buttons to move forwards or backwards through the book (de Jong & Bus, 2003). Without these essential features, an e-book may be categorized as inconsiderate because it does not reflect or build on the effective scaffolding provided by conventional read-alouds. Some researchers address that e-books and technology are an attempt to substitute adult instruction, which stresses that technology is incapable of successfully recognizing and accommodating students’ specific needs and as a result cannot be referred to as quality teaching (Segal-Drori, Korat, Shamir & Klein, 2009).

Technology, because it is still in the introductory stage of being used for educational purposes, can often be
misused. Misuse of technology can occur by using ineffective e-books, earlier described as inconsiderate e-book choices, by inappropriately using technology as a classroom reward versus an educational opportunity or through a lack of understanding of the functions of e-books. When used as a reward for students or as an activity to fill free time, the wrong purpose of integrating and using technology in the classroom is communicated (Larson, 2008). Students need to view technology, specifically e-books, as an engaging resource to assist in learning and reading, not as meaningless entertainment, which can be influenced by the teacher’s implementation and perception of technology in the classroom. Through the development of e-books many of these limitations have been investigated in order to enhance e-book quality and conducive ness to purposeful reading experiences.

E-book Influence on Comprehension

Reading comprehension is described as a metacognitive process that occurs when the reader interacts with the text and as a result constructs meaning (Reinking & Schreiner, 1985). In the state of Florida six components of reading are implemented in reading instruction based on the National Common Core Standards (NCCS) that address reading competency. The standards to be met based on the Common Core recognize important elements of reading that allow students to develop the needed skills that allow reading to occur (Calkins, Ehrenworth & Lehman, 2012). Nine skills are addressed in the Common Core standards; all nine skills ultimately allow students to comprehend text in a deep and meaningful way through the process of thinking on a critical level (Calkins, Ehrenworth & Lehman, 2012). Reading competency is measured and attained by the acquisition of six components which include phonological awareness, phonics, fluency, vocabulary, comprehension and oral language (6A-4.0163 Reading Endorsement Competencies, 2011). Reading comprehension is developed through the process of making connections between the text being read and the background knowledge of the reader that relates to the content addressed in the text (Rosenblatt, 2004). Through this interactive and reflective reading process between the text and the reader, constructive understanding occurs (Doty, Popplewell & Byers, 2001). Comprehension is influenced by the reader and their personal learning style as well as their reaction to the visual and language elements of books (Reinking, 1994). This internal process of comprehension is thought to be better accessed through the additional incorporation of technology rather than limiting the reader to traditional print as it addresses students’ context of knowledge and learning styles (Reinking & Schreiner, 1985). Conventional print is static, which could be perceived as a limitation to student learning, further emphasizing the benefits of exposing readers to electronic books and enhancing the interaction and connections between reader and text.

Previous studies have been conducted to further investigate the broad question of how e-books can affect reading comprehension. De Jong and Bus (2002) considered how reading from different formats, a CD-ROM based e-book versus an adult read-aloud of a print book, affected kindergarten students’ emerging comprehension. This study was conducted by exposing all of the participants to two different conditions, experiencing reading through adult read-alouds and then through e-books. Two different books were used for the two conditions; in each condition, the participant was read one of these books. After the readings, participants were assessed for comprehension through oral retell of the narrative stories. Evidence from both conditions showed parallel results, which did not provide clarity to the question of how an e-book can influence comprehension. Students who read independently using the e-book were able to recall 50% of the ideas found within the story, which was similar to the results of students’ retell ability after the read-aloud condition.

Also in that same study by de Jong and Bus (2002), students using the e-book showed use of similar reading techniques to the strategies often used by adults in read-alouds, which include re-reading through the text multiple times and reading through the story in a traditional manner without getting distracted by the multimedia features offered by e-books. This evidence shows that students are capable of implementing background knowledge on the functions of books and reading strategies when reading in a different format such as an e-book. Prior studies have labeled additional e-book features such as animations to be distracting from the purpose of reading when using an e-book (Labbo & Kuhn, 2000; de Jong & Bus, 2004), but this study shows that these additional features can be used productively to benefit the overall reading experience. Conclusively, it was determined by this study that learning and reading comprehension did occur through interactive reading from an e-book.
Doty, Popplewell and Byer’s (2001) study continues to clarify the question of whether or not reading from an e-book affects student comprehension by comparing student comprehension levels after independently reading the same book from either an interactive CD-ROM storybook or a traditional printed book. Comprehension was assessed and compared through oral retelling of the book and six comprehensive questions after the participants read the assigned stories. The participants, 39 second grade students, were all familiar with the interactive CD-ROM storybook format, as it was used consistently as a part of the classroom reading instruction prior to this study. The results from the retell portion of the assessment did not show a significant difference between the two conditions, which is thought to be caused by the students’ inability to focus on content detail due to the requirement of reading the storybook independently versus having been read to orally. Based on the responses to the comprehension questions, the group who read independently using the interactive CD-ROM storybook showed a greater level of understanding. The six comprehension questions not only assessed students’ understanding on information provided explicitly in the story, but also required students to infer potential meanings and understandings implied by the text and author. These results can support the interactive benefit of e-books and their ability to strengthen students’ authentic connections to the content of the stories being read.

Another study investigating e-books and their influence on students’ reading experience compared to adult read-alouds was conducted by Korat and Shamir (2006). Two groups from different socio-economic status (SES), low and middle, participated in this study adding students’ SES as another variable influencing their emergent reading skills. The specific literacy skills that were developed and then assessed were phonological awareness, vocabulary, word recognition and comprehension (recall and making inferences). Korat and Shamir modified a printed book, The Tractor in the Sandbox written by Meir Shalev (1995), for this investigation so that it was both in the form of an e-book and as a printed book providing parallel content for testing under two different conditions. This modified e-book eliminated the issue of distractible features by allowing animations to be played only after the text had been orally read as well as only providing definitions and expanded text for key parts of the story. By eliminating these elements of distraction, Korat and Shamir intended to increase e-books’ efficacy. Results of this study showed that improvement of both low SES and middle SES existed through the use of e-books and independent reading.

Method

Purpose

This investigation was conducted to observe the potential influence of e-books on reading comprehension by comparing the accuracy of responses to comprehensive questions and sequencing of story events in a reading intervention provided through e-books versus that provided by traditional print book read-alouds. Engagement was another element observed during this inquiry by monitoring student actions and responsiveness to the intervention procedure in order to better understand how the use of e-books may motivate an interest in reading. A need for radical change within the classroom context addressing pedagogy, instruction and student activity is being demanded by technology natives in order to bridge the gap that is occurring between the teaching style of a traditional classroom and the learning style and interest level of a technology-rich generation (Bennett, Maton & Kervin, 2008). Ultimately, the purpose of incorporating technology into reading intervention is to better address elements of authentic instruction, meaningful interaction with educational resources, and student engagement in learning, and to consequently enhance students’ reading comprehension skills.

Participants

Researchers have demonstrated a correlation between building emergent word reading in Kindergarten and comprehension in the first grade (Segal-Drori, Korat, Shamir & Klein, 2009). The majority of research that has been implemented on e-book instruction and its influence on literacy acquisition has focused on students of the age 5 and 6, ages that are typically categorized as emergent readers (de Jong & Bus, 2004; Korat & Shamir, 2007; Korat & Blau, 2010). It was suggested by researchers that a reading intervention through the use of e-books would prove interesting on first and second grade students because of the formal instruction on reading and writing provided throughout this grade level (Segal-Drori, Korat, Shamir & Klein, 2009). This particular application project observed children of the age of 7; placing these participants on a different reading instructional level than those in Kindergarten. The difference between this project and those used in prior
The research is that the techniques used and advantages seen in fostering literacy through e-books addressed participants on the emergent reading level in kindergarten, inferring that they are on-level in literacy acquisition. In contrast, this investigation focuses on students that are emergent readers in first grade and are below reading level compared to grade level expectations. It is also important to recognize that this age difference may result in different interest levels in the use of e-books to read (Korat & Blau, 2010).

Two seven year old first grade participants were chosen specifically as the subjects of this study. The two participants are twins, both having similar background and contextual knowledge, and exposure to literacy prior to formal education. Through discussion, it was brought up by both of these students that, “(their) parents do not read to (them) at home.” This was alarming as it is known that literacy acquisition occurs naturally through social interactions and modeling read alouds by important people such as parents (Valencia & Sulzby, 1991). The participants of this intervention were chosen purposefully because of their lack of literacy skills that show below grade level reading abilities. Through consistent field notes, quantitative reading assessment scores from most recent FAIR testing and discussions with the participants’ teacher it was concluded that based on these two students’ motivation to read, emergent reading ability and exposure to books and reading in their home environment, they would be appropriate candidates for this investigation. A formative experiment conducted by Reinking and Watkins (2000) found that through integrating literacy and technology, students were more inclined to read independently, which is the motivation and purpose of this investigation. Students of low-ability showed a higher level of engagement after working with the multimedia resources, which then influenced students’ confidence in their aptitude to read (Reinking & Watkins, 2000).

Setting

The school in which the participants attend is a Title 1 school, meaning that it receives government funding due to the high population of families with low socio-economic status (LSES) enrolled. Students who are raised in LSES are suggested to have less experience and exposure to literary resources and reading support compared to that of students raised in high socio-economic status homes (Segal-Drori, Korat, Shamir & Klein, 2009). Korat and Blau (2010) were able to show that intervention conducted through the use of e-books allowed students to progressively acquire literacy despite their LSES backgrounds. Quality instruction provided by e-books was particularly valuable as students benefited from the experience despite their lack of reading mediation and exposure to books in their home environment.

The context within the first grade classroom of these participants provides multiple opportunities for students to read independently. During students’ morning routines they are expected to pick out two or three books from the school library or classroom library to read independently for 30 minutes. The students also attend literacy stations for 40 minutes every day during the reading instructional block. These literacy stations allow students to work in groups of two on skills that include letter recognition, phonological and phonemic awareness, writing, listening and comprehension of audio read books and independent reading in the class library. Students are exposed to different sources of technology as well during literacy stations including listening to an audio book from a CD player, playing games that practice phonological awareness skills on the iPad and reading skill games on the computer. The students have never used e-books before in their reading experience but are familiar with adult read aloud instruction as it occurs daily in their classroom.

Intervention Procedures

Two forms of intervention were provided in this study and both students were exposed to the same three story books. The independent variable was the format of the book read to the student. Student A was exposed to the text through an adult read aloud using a paper book, while Student B explored the text independently through a narrated e-book. The intervention for each student was conducted on three occasions in thirty minute sessions. The intervention took place in the first grade classroom while the remainder of the class received instruction from the first grade curriculum. The students were taken into a secluded area of the classroom and received one-on-one attention by a pre-service teacher who was accustomed to the context of the classroom and previously worked with these specific students for five weeks prior to this investigation, therefore understanding their abilities and learning styles.

The three books chosen for this intervention were on a first grade reading level but were above the participants’ independent reading level. The story structure of the books, including the setting, characters,
events of the story and ending were fitting and authentic for the participants’ age and context. The process of choosing books for this particular study considered text that supported the instructional points targeted through intervention, such as a plot that involved story events that could be sequenced. Not only was book choice important but it was also essential that these books were of equal quality when altered into an e-book format. When choosing literature for this application project it was essential that the e-book format of the book had considerate illustrations and animations embedded throughout the story compared to that of the printed version of the text (Labbo & Kuhn, 2000). Valuable e-book features that were imperative when choosing literature included text-tracking, an e-dictionary and oral narration; all features that would optimize the process of literacy acquisition.

After implementing a study on the effect of interactive storybooks on student comprehension, Doty, Popplewell and Byers (2001) discussed how preventing students from using the narration feature offered by e-books, hindered students’ comprehension because of the demand on students’ working memory in order to decode unfamiliar words (Reinking & Schreiner, 1985). Considering this, it was important that the e-books used in this investigation offered oral narration of the storybook, especially when taking into account the participants’ grade level and literacy level impeding their ability to read fluently. It was also essential for these e-books to have the text-tracking feature so that as the text was read orally by the narrator, each word was highlighted and students’ orthographic knowledge and word recognition could be enhanced. This was important because, as previously shown effective, the highlighting text feature allows students’ conceptual understanding about print to develop and strengthen (Segal-Drori, Korat, Shamir and Klein, 2009). To make this intervention even more effective, the participants were limited to the Read Only mode, which still provided the multi-media effects and reading features but limited the participants from playing interactive games that could potentially distract the purpose of the activity (Labbo & Kuhn, 2000; de Jong & Bus, 2004).

**E-book intervention.** The e-book intervention condition was conducted through the use of an iPad accessing the e-books that were chosen through the iBook application. Oral instructions on how to utilize the iPad and the e-book features offered by the iBook application were provided prior to the independent reading. The structure of the e-book was examined previously by reviewing an e-book to better examine and familiarize the different features and format. The various features offered by these e-books included multi-media graphics, oral narration, an e-dictionary, and text-tracking by changing the color of the word while being read. After this, no other form of instruction was provided during the actual reading of the book unless the participant was in need of technical support or redirection to complete the reading. One book was read during each intervention session, and three sessions occurred in total.

**Printed book read-aloud intervention.** The intervention provided by an adult read-aloud of traditional printed books was conducted similarly to that of the e-book. The same three books were read in this intervention as the ones used in the e-book intervention in order to make post-test scores comparable. The instruction provided to the student during the read-aloud was designed to closely imitate that provided by the e-book. When the book was read to the student the title was introduced as well the author and the illustrator. Discussion about the book elements and story events were limited by the adult supervisor so that this study could focus more so on the student’s ability to comprehend the text independently. Again, three books were read-aloud during this intervention over a span of three sessions.

**Scoring**

Before the interventions took place, the participants’ emergent reading level was assessed using the most recent scores on the participants’ Florida Assessments for Instruction of Reading (FAIR), a state-wide reading assessment for Kindergarten through second grade students. The FAIR assesses students’ letter sounds, phonemic awareness, word reading, listening and reading comprehension and vocabulary knowledge. Students’ records from Kindergarten were also reviewed in order to gain insight on the two students’ reading levels at the end of Kindergarten and the literacy skills they needed to develop further. Rather than considering quantitative data as the only source of information, field notes and observations were used as well throughout the intervention (before, during and after the intervention processes) to record influences on and differences between the participants’ reading comprehension and engagement level. The field notes recorded concrete observations such as quotes stated by the participants or certain actions that suggested a change in interest or
engagement in reading activities and instruction in the classroom as well as during intervention.

A post-test was used to assess the two participants’ level of understanding of each storybook and then compared to one another. In a study conducted by Korat (2009) results provided evidence that first grade students were benefiting significantly more than the tested kindergarten participants in recalling the events of the stories read from an e-book. The first grade students who participated were able to reproduce the story with details and vocabulary words used in the e-book, which showed a greater ability to retain information from the text. With this data, it was decided that the participants of this investigation would be assessed for comprehension of the story through a sequencing of story events activity and comprehension questions reflecting on the text. Using both forms of assessment were thought to provide a clearer understanding of the participants’ level of comprehension (Doty, Popplewell & Byers, 2001). The post-test process took place immediately after the entire book had been read once. Discussion about the book was avoided after the reading in order to limit adult guidance and allow the results to focus specifically on the participants’ working memory. The post-test process remained consistent throughout all three sessions for both intervention conditions and was conducted after each book was read.

**Sequencing activity.** The purpose of using a sequencing activity was to allow the participants to recognize the main events and ideas from the story and then put them in order based on their place in the story. A guideline (see Appendices A, C, E) created by the investigator was used to hold both participants accountable for focusing on the same story events and their order of occurrence in the story. In order to provide the participants with a structure that accommodated their literacy level, text-based cue cards were used to highlight the main events found in the beginning, middle and end of the story. The cards were read-aloud to the participants and the participant was asked to reorganize the cue cards according to their sequence in the story. A point was awarded for every event that was correctly sequenced by the participant during the assessment. Additional comments about details from the story were recorded as well.

**Comprehension questions.** The second portion of the assessment process included six comprehension questions (see Appendices B, D, F) written by the investigator. These questions were answered by the participants orally while their responses were recorded. Three of these questions had explicit answers found directly within the text, while the remaining three questions were answered by making inferences based on the participants’ ability to critically think and make outside connections between the self, other texts and the author. The purpose of using comprehensive questions, both implicit and explicit, was to address the student’s interaction with the story.

**Data Analysis**

Data for this application project was collected through a series of post-tests assessing comprehension and participants’ understanding of the story. For the sequencing activity ten main events were chosen from each of the three books, so that the two participants’ results could be compared based on their ability to order the same ten events correctly. If the event was placed in the correct order that it appeared in the story a point was awarded, creating a total of ten possible points. These results were represented as the number of events sequenced correctly out of the number of possible events to sequence and then calculated as a percentage. An average of the scores from the three sequencing activities was calculated as a percentage to compare the overall results of the participants’ performance. The average also allowed the two intervention procedures, e-books versus adult read-alouds of printed books, to be compared and analyzed for their effect on reading comprehension.

Another form of assessment conducted consisted of asking six comprehension questions orally after reading each book. For every question answered correctly by the student a point was awarded, making six the total possible points. These six questions asked three implicit and three explicit questions. The participants’ total score was then represented as how many implicit questions were answered correctly from the three that were asked. The number of explicit questions answered correctly was similarly scored. This was done to further analyze whether the students’ ability to recall directly from the text or make inferences about the meaning of the text were influenced by the intervention format. Participants’ total scores of how many comprehension questions in all were answered correctly were then calculated as percentages.

**Results**
The sequencing activity scores for Student A, who received adult read-alouds from printed books, were 7 out of 10 events ordered correctly for all three sessions. The score of 7/10 events sequenced correctly was then calculated as a percentage of 70% accuracy. Student B, who received intervention from the narrated e-book, showed more variability in their results in the sequencing events activity. In session 1 and session 3 Student B ordered 9 of the 10 events correctly resulting in 90%. During the second session, Student B answered 5 of the 10 events correctly, meaning the student ordered 50% of the 10 events accurately. The results from the three sessions were then averaged for both students. The average scores of the results from the sequencing activities over the three sessions for Student A were 70% and the average for Student B was 76.6% events were answered correctly (Table 1).

Table 1

<table>
<thead>
<tr>
<th>Participants</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
<th>Average of 3 sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student A</td>
<td>70%</td>
<td>70%</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td>Print Book</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student B</td>
<td>90%</td>
<td>50%</td>
<td>90%</td>
<td>76.7%</td>
</tr>
<tr>
<td>E-book</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Maximum score = 10/10 events sequenced correctly resulting in a 100%.

Table 2 shows the results of both Student A and Student B on answering the six comprehension questions. The participants’ results are expressed as the number of explicit questions and the number of implicit questions answered correctly, which was then added together to show the total number of comprehension questions answered correctly. The number of questions answered correctly out of the six total possible questions was then calculated as percentages.

Again Student A showed consistent results of answering 5 out of 6 questions correctly, resulting in a percentage of 83.3% total accuracy throughout the three intervention sessions. Variability was seen on the amount of implicit versus explicit questions Student A answered correctly. Student A answered the explicit questions with complete accuracy more frequently than implicit questions, answering all three explicit questions correctly two of the three during two of the three sessions.

The scores on the comprehension questions for Student B varied throughout the three sessions. The participant answered 5 of the 6 questions correctly during the first session, resulting in 83.3% accuracy. Then 4 of the 6 questions were answered correctly in the second session, calculating to 66.7% accuracy. During the final intervention session, Student B answered all six questions with 100% accuracy.

Table 2

<table>
<thead>
<tr>
<th>Sessions</th>
<th>Explicit</th>
<th>Implicit</th>
<th>Total</th>
<th>Percentage of Total Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student A</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>83.3%</td>
</tr>
<tr>
<td>Student B</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>83.3%</td>
</tr>
<tr>
<td>Session 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student A</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>83.3%</td>
</tr>
<tr>
<td>Student B</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>66.7%</td>
</tr>
<tr>
<td>Session 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student A</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>83.3%</td>
</tr>
<tr>
<td>Student B</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note. The six comprehension questions were represented as the number of implicit and explicit questions answered correctly. These two scores were then combined to show the total amount of questions answered correctly out of the 6 questions asked all together. The total number correct was then calculated as a percentage.

Discussion
Current research argues that reading through an e-book with adult instruction enhances students’ literacy acquisition more so than read-alouds of printed books and independent e-book readings (Segal-Drori, Korat, Shamir & Klein, 2009). The purpose of not providing adult-led discussion and instruction during these two forms of intervention was to focus on the students’ ability to foster independent literacy skills, specifically comprehension. This inquiry was conducted with a brother and sister who came from the same home environment, it was expressed by both students that their parents did not take the time to read aloud to them at home, which was then explained as the cause for their inability to read. This proposed an interesting element to this investigation because if the results showed positive growth through the narrated reading of the e-book, then it could be suggested that e-books provide quality support for emergent readers in independent reading situations.

When looking at the results of the sequencing event activity, Student B showed a greater accuracy percentage when considering the average scores of the three intervention sessions (as seen in Table 1). These results might imply that independent reading from a narrated e-book might allow the reader to better recognize and retain the order of events and main ideas of the story. Student B’s accuracy in ordering events from the story may be attributed to the aesthetics of reading from a digital device.

Student B’s results in the sequencing event activity could also have been caused by their level of interest in reading from a digital device. When the participant was introduced to reading an e-book from the iPad the child immediately took the iPad and placed it in their own lap, exploring how to navigate through the e-book independently. This action suggested that the child felt autonomous in this intervention process, a fundamental need suggested in the cognitive evaluation theory (CET) presented by Ryan and Deci (2000) to further understand the underlying cause of intrinsic motivation.

To assist in observing the two participants’ level of engagement certain behaviors and actions were recorded, including eye contact with the text, unrelated and related comments made by the students, questions from the students and the amount of cues given by the instructor to refocus the child. When comparing the two levels of engagement between Student A and Student B throughout the three intervention sessions, Student B showed a greater level of engagement and interest in the reading process. This was observed in the student’s ability to read through the entire book without being reminded or refocused on reading through the entire story. Student A on the other hand, was reminded at least twice throughout the adult-led read-aloud process to keep their eyes on the book. These observations throughout the intervention sessions were essential in further understanding and comparing the two participants’ level of interest in the techniques and approaches in providing reading instruction.

When looking at the scores of the comprehension question responses, a significant difference between the two averages of questions answered correctly over the three sessions was deficient. Both participants scored an average of answering 83.3% of the questions accurately during the three comprehension question assessments. The results of Student B show inconsistency throughout the three assessments. Student B answered 5 of the 6 questions correctly during the first intervention session. During the second session, the student answered 4 of the 6 questions accurately. Student B answered all 6 comprehension questions correctly during the final session. By answering all 6 questions accurately in the final intervention session, Student B’s performance showed an overall improvement. The progression seen in Student B’s accuracy in responding to the comprehension questions could suggest that the student’s ability to retain details from the story was enhanced when reading from the e-book. The features embedded in the e-book stories, such as text-tracking, used in the intervention process could have supported the results of Participant B as their attention to details from the story was heightened.

Participant A did not show any form of variation throughout the two assessment processes of the three intervention sessions. This student tested consistently, receiving the same accuracy percentages in both forms of assessment throughout all three sessions. It could be suggested from these results that adult-led read-alouds from traditional printed books no longer provide reading instruction in a way that students can successfully learn from. Scaffolding emergent readers to successfully develop comprehension reading skills and strategies may need to go beyond reading from printed books. Traditional printed books may not be the most adequate form of literature for students as their interest is not being maintained successfully due to students’ learning
styles progressively shift towards technology-based instruction. The overall results of the two participants in both forms of post-intervention comprehension assessment (comprehension questions and event sequencing), Student B showed a greater growth of improvement throughout the three intervention sessions. When comparing the results from the first intervention session to the final intervention session with Student B, the student’s percentage in accurately answering the six comprehension questions increased from an 83.3% to 100%. The student’s increased familiarity with the intervention process and e-book format may explain the cause for the improvement between the first and final assessment results. The improvement seen in Student B’s performance between the first and last intervention sessions supports the idea that reading comprehension can be deepened and more connective when literature is read from an e-book rather than a traditional print book.

The intervention process in this investigation took place over a three week period. Because the results from this investigation supported the original argument that reading from an e-book can enhance readers’ level of comprehension, the intervention process of reading from a narrated e-book was implemented in the first grade classroom. All of Student A and Student B’s first grade peers were then exposed to reading from a narrated e-book. The purpose of this expansion was to promote independent literacy acquisition in the classroom context. The e-book was integrated into a literacy station, where students utilized the iPads for 20 minute sessions to read an e-book and then complete the two post-tests to assess reading comprehension. This expansion will not exclude Participant B from participating, ultimately allowing this student to continue the process of receiving reading instruction and literacy exposure in a digitized format which was proven to successfully enhance reading comprehension.

Conclusions

With this technology-inclined generation, students are requiring instruction and learning opportunities that correlate to the growing technologies in which they relate to in a digitized world (Larson, 2008). Literacy instruction, in order to be beneficial and successful, should be implemented in a way that allows the student to feel intrinsically motivated through authentic interactions with literature (Korat & Blau, 2010). Meaningful instruction allows the child to recognize the importance of the content and its contribution to their education and learning process. Incorporating technology into reading instruction addresses students’ learning styles from this technology-based generation and allows for more successful and meaningful interactions with literature. Interactive e-books provide multiple facets of multimedia that allow active reading and metacognitive practices to develop in a supportive and effective way (de Jong & Bus, 2003). E-books are not being suggested to replace adult read-alouds of printed books but are to be used as a supplemental resource that could provoke students to actively engage in independent reading. E-books could be an especially valuable resource when emergent readers are not receiving additional reading instruction and exposure in the home context. Technology, in this investigation, provided a more aesthetic interaction between the text and the reader, ultimately creating a more meaningful opportunity for the reader to connect and comprehend the text. Evidence from this investigation, as well as evidence from previous research (Doty, Popplewell & Byers, 2001; de Jong & Bus, 2004; Korat & Shamir, 2006), indicates that reading comprehension can be enhanced through the process of reading interactive digitized books.

Appendix A

Event Sequencing Activity Reference Sheet

Title of Story:  Pete the Cat: I love my new white shoes  Date:

Directions: Give one point for each story event placed in the correct sequence from beginning to end. If the sequence is set out of place from one misplaced event, give credit for the remainder of the events. Read aloud each card (out of sequence) and allow student to place the card in the correct place.

Pete the Cat was walking down the street in his new white shoes.

  Pete’s shoes turned the color RED.
  Pete stepped in a large pile of strawberries!
Pete stepped in a large pile of mud!

Then, Pete stepped in a large pile of blueberries!

Pete’s shoes turned the color BLUE!

Pete’s shoes turned the color BROWN!

Pete stepped in a bucket of water…and all the brown, blue and red washed away.

Pete’s shoes were white again but now they were wet.

The moral of Pete’s story is: No matter what you step in, keep walking along.

Appendix B

Comprehension Questions for Pete the Cat: I love my white shoes

• What color were Pete the Cat’s shoes at the beginning of the story? (Explicit)
  Acceptable Answer: White

• What three colors did Pete’s shoes turn during the book? (Explicit)
  Acceptable Answer: Red, Blue and Brown

• In the end of the story, how did Pete’s shoes turn white again? (Explicit)
  Acceptable Answer: He stepped in a bucket of water.

• How did Pete feel about his shoes turning different colors? (Implicit)
  Possible Answers: He kept singing his song. He kept on walking. He didn’t mind. He was always happy.

• What color would Pete’s shoes turn if he stepped in a pile of mustard? (Implicit)
  Possible Answer: yellow

• How was Pete a happy cat? (Implicit)
  Possible Answers: He was always singing his song. He didn’t care about his shoes turning different colors.

Number Correct Explicit: ________
Number Correct Implicit: ________
Total: ________
Title of Story: Doctor de Soto  Date: 

Directions: Give one point for each story event placed in the correct sequence from beginning to end. If the sequence is set out of place from one misplaced event, give credit for the remainder of the events. Read aloud each card (out of sequence) and allow student to place the card in the correct place.

One day, when they looked out, they saw a well-dressed fox with a flannel bandage around his jaw.

Being a mouse, he refused to treat animals dangerous to mice, and it said so on his sign.

Doctor De Soto, the dentist, did very good work, so he had no end of patients.

The gold tooth was placed in the fox’s mouth.

In order to protect themselves, the De Sotos came up with a plan.

“Let’s risk it,” said Mrs. De Soto. She pressed the buzzer and let the fox in.

The fox wondered if it would be bad to eat the De Sotos when the job was done.

Doctor De Soto outfoxed the fox.

The fox tried to open his mouth—but his teeth were stuck together!

Doctor De Soto offered a treatment that would prevent the fox from ever feeling pain again.

Appendix D

Comprehension Questions for Doctor de Soto

• What was Doctor De Soto? (Explicit) 
Acceptable Answer: a dentist

• What was Doctor De Soto’s rule about dangerous animals? (Explicit) 
Acceptable Answer: Cats and other dangerous animals not accepted for treatment
• What did the De Sotos do when a fox asked for help? (Explicit)
  Acceptable Answer: They let him in and worked on him

• Why was treating the fox a bad idea? (Implicit)
  Possible Answer: Because the fox wanted to eat the De Sotos after they fixed him

• How did the De Sotos keep the fox from eating them? (Implicit)
  Possible Answer: They glued his teeth together

• What lesson did the De Sotos learn? (Implicit)
  Possible Answers: To listen to their rules. To not treat dangerous animals.

Number Correct Explicit: ________
Number Correct Implicit: ________
Total: ________

Appendix E
Event Sequencing Activity Reference Sheet

Title of Story: Make Way for the Ducklings Date:
Directions: Give one point for each story event placed in the correct sequence from beginning to end. If the sequence is set out of place from one misplaced event, give credit for the remainder of the events. Read aloud each card (out of sequence) and allow student to place the card in the correct place.
When they swam to the park they met Michael, the policeman.

They flew over the Charles River and decided to live there.

Mr. and Mrs. Mallard tried many places, but were not satisfied.

Mr. and Mrs. Mallard were looking for a place to live.

Event 1: After the ducks knew how to walk in a line, Mrs. Mallard brought them into town.
Event 2: When the eggs hatched, Mrs. Mallard taught the ducklings how to walk, swim, dive and stay safe.
Event 3: Mrs. Mallard laid eight eggs and stayed with them until they hatched.
The family of ducks decided to make this island their new home.

Finally, Mrs. Mallard and the ducklings met Mr. Mallard at the new island.

The policemen kept the ducklings safe when they crossed the streets in town.

Appendix F

Comprehension Questions for Make Way for the Ducklings

1. What were Mr. and Mrs. Mallard looking for? (Explicit)
   Acceptable Answer: A safe place to live.

2. How many ducklings were there? (Explicit)
   Acceptable Answer: Eight

3. Who was Michael in the book? (Explicit)
   Acceptable Answer: A policeman.

4. Why did Mr. and Mrs. Mallard fly to different places before they found the right place to live? (Implicit)
   Possible Answer: They were looking for somewhere safe to live.

5. How did the ducklings stay safe when they walked through town? (Implicit)
   Possible Answers: The policemen helped them. Their mother taught them how to be safe.

6. How was Mrs. Mallard a good mother to her eight ducklings? (Implicit)
   Possible Answer: She taught them how to swim, dive, walk in a line and to be safe. She kept them safe when they walked through the town.

Number Correct Explicit: _______
Number Correct Implicit: _______
Total: _______

Children’s Book References
References


