

HOW CAN ENHANCED E-BOOK FEATURES FACILITATE VOCABULARY  
DEVELOPMENT AND PARENT-CHILD INTERACTIONS?

by

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### **Abstract**

This theoretical thesis aimed to investigate and review whether and how enhanced features of e-books can be utilized to help facilitate vocabulary learning for young children, in the context of shared book reading. Research on e-books seemed to be mixed in terms of how well they can promote child vocabulary, and whether parent-child interactions in the context of e-book reading is comparable to that in reading printed books. The current review revealed that these questions are complexified by the ways in which enhanced features such as audio, animations, and hotspots/games are utilized in enhanced e-books. Enhanced e-books need to be more carefully designed and focus on story relevancy in order to be properly used for educational purposes. Using enhanced features to focus on entertainment can result in passive reading, and be detrimental to the vocabulary learning development of young preschooler and kindergarten aged children. Not all children learn the same way, so being able to customize enhanced features, such as simply turning them on and off, can help personalize the reading experience to the learning style of the individual reader. Enhanced e-book features, like programmed readers, can also affect how parents engage with e-books when reading with their children. Parents who are unsure on how to interact with their children when reading enhanced e-books may not be able to engage in learning practices like dialogic reading. This is important because parental interaction has been suggested to be incredibly important for their children's vocabulary acquisition. Utilizing enhanced features to teach parents how to engage in dialogic reading can help prompt them to interact more with their children and ask them more complex open-ended questions.

**Key Words:** e-books, dialogic reading, electronic books, vocabulary, parent-child interactions

## **How Can Enhanced e-Book Features Facilitate Vocabulary Development and Parent-Child Interactions?**

The usage of e-books has increased dramatically since their creation in 1971. With the current accessibility of e-books, they are now more commonly seen in classrooms as schools adopt tablets and online learning. LeapFrog alone has sold their battery powered console books to over 100,000 United States classrooms, and are distributed in over 45 countries (LeapFrog Enterprises, n.d.). Researchers in recent years have been studying how e-books affect language learning for preschoolers and kindergarteners. The discrepancy revolves around how enhanced e-book features are utilized in promoting language learning and book literacy. Categories of enhanced features that will be discussed fall under the broad categories of: sound effects, animations, and hotspots/games. Types of sound effects include features such as programmed readers and music. Animations refer to the edits of storybook pictures to move as the story is being read. Hotspots and games involve interactive features such as minigames, interactive pictures, and quizzes that can appear throughout the book. Can these enhanced features be programmed and used to promote vocabulary development?

Another important aspect of the e-book debate is how parents interact with their children with the digital medium. Parent-child interaction is essential for children in the language learning process (Mol et al., 2008; Troseth et al., 2020). Techniques, such as dialogic reading, have been developed to help encourage parents to engage with their children during reading time (Whitehurst et al., 1988). Dialogic reading focuses on the parents asking open-ended questions to engage in enriched discussion about the reading material (Mol et al., 2008; Zevenbergen & Whitehurst, 2003). Research has shown that parents tend to interact with their children less when utilizing an e-book, in comparison to a physical book (Chiong et al., 2012; Korat & Or, 2010;

Reich et al., 2016). Advertisements also appeared to have a role in how parents perceive new technology and how their children interact with it (DeLoache et al., 2010). This literature review will focus on how enhanced e-book features can be optimized to be educational learning tools to promote language development and parent-child interactions during shared reading time.

### **The Differences Between Basic and Enhanced E-books**

The question as to whether e-books are just as good as printed books is superficial on some level, because at their most basic level they are essentially the same thing. Basic e-books -that is e-books which are exactly the same as their printed counterparts except for being on a tablet device- function the same in printed and electronic formats (Parish-Morris et al., 2013). Basic e-books are e-books with no added enhanced features, such as: animation, audio, and/or hotspots/games.

### **The Utilization of Enhanced Features Matters**

The discrepancy about e-books are primarily focused on how these enhanced features, for example background music, influence preschoolers and kindergarteners' language skills. Reich et al. (2016) summarized evidence to this effect in a review of articles investigating how tablet based reading affected preschoolers and kindergarteners. One of the studies they reviewed had results that suggested that preschoolers showed no major differences in story sequencing, print awareness, or comprehension between basic e-books and printed books (Chiong et al., 2012). When the preschoolers read the enhanced e-book version they recollected less story details; despite being more engaged with both e-book versions than the printed book. Reich et al. (2016) explained the argument that e-books and printed books function differently for young children are derived from the effects of enhanced features that publishers implement in e-books. These enhanced features have only continued to grow to be more complex from their basic e-book

1990's origins, starting with *Grandma and Me* on the CD-Rom, on the computer to tablet devices starting in the early 2010's (Ito, 2012; Reich et al., 2016). Are enhanced features inherently bad and harmful for the language development of young children? Research demonstrated that the answer to this question is not necessarily clear cut, but depends on how exactly these enhanced features are being used in the e-books.

### **Commercial versus Educational e-Books**

On the market there are two kinds of enhanced e-books that can be considered either commercial or educational in purpose (Korat & Or, 2010). Commercial e-books utilize enhanced features while focusing on being entertaining and keeping the attention of the reader with 'bells and whistles'. These e-books rely on bright eye catching multimedia, colors, sounds, and graphics. While they may intend to be educational, they tend to fall on the lines of overstimulating and distracting for young readers (Bus et al., 2015). Maintaining the attention of children is important; but if an activity is purely entertaining they may use less mental effort during the task (Salomon, 1984). Educational e-books are designed with promoting children's language and literacy learning in mind. For example, education focused e-books often utilize features such as highlighting text to associate written words to the pronunciation (Korat & Or, 2010).

Some evidence showed that parents and children learn differently from books that have been classified as commercial or educational (Chiong et al., 2016; Korat & Or, 2010). For instance, Korat and Or (2010) studied the differences in how printed and (commercial and educational) e-books influenced the interactions initiated by mothers and their children. With reading techniques like dialogic reading, verbal interactions are incredibly important in promoting language learning (Whitehurst et al., 1988; Zevenbergen & Whitehurst, 2003). The

book titles involved in Korat and Or (2010) were *Just Grandma and Me* and *The Tractor in the Sandbox*. Control groups were given the printed media versions of these books. E-book condition groups were either given a commercial version of *Just Grandma and Me* or an educational version of *The Tractor in the Sandbox*. Both e-books offered features such as animation, replaying the audio text, highlighting words, and vocabulary definitions. Mothers were given a brief introduction on how to operate the e-books, suggesting that they might have never used digital media before. Results found that mothers preferred the printed books over the e-books based on their word utterances and expanding talk. However, their children initiated conversations more with both e-book versions of the books. The educational e-book, *The Tractor in the Sandbox*, was seen to have more expanding talk in comparison to the commercial e-book.

The educational e-book was not overwhelming with unnecessary animations and features that distract both the parents and children from the story. This allowed them to focus more on the plot and word meaning related questions. While mothers did prefer the printed media, there was still an overall difference in how both mothers and children interacted with the two e-books. An e-book at the most basic level is simply a book presented on a digital platform (Parish-Morris et al., 2013). Utilization of enhanced features may affect how both parents and children alike interact and learn from these products. Most companies are not going to advertise the quality of their usage of enhanced features; which puts the responsibility of deciphering the benefits onto the parents (DeLoache et al., 2010; Reich et al., 2016).

### **How Can Enhanced Features Promote Vocabulary Learning Development?**

Not all e-books are designed in the same manner (Bus et al., 2015; Chiong et al., 2012; Korat & Or, 2010; Parish-Morris et al., 2013; Reich et al., 2016). Some e-books may not include any enhanced features at all and are nearly identical to their printed counterparts. It is important

to determine how publishers are developing and utilizing enhanced features in order to understand an e-book's capacity for affecting child language development and parent-child interactions.

**Enhanced Features: Sound Effects.** Audio sound is a commonly used enhanced e-book feature in many aspects such as: programmed audio readers, background noise, music, and even the sound effects found in clicking buttons or pictures (Bus et al., 2015). Some e-books are even programmed to copy the sound of flipping pages of a printed book when clicking the next page button . Having a programmed reader can help children learn how to associate words, pictures, and sound together (Parish-Morris et al., 2013; Troseth et al., 2020). There are e-books that give children the option to click on new words and have the audio reader pronounce, sound out, and even give definitions of the presented word (Smeets & Bus, 2012). However, are minor audio effects, such as the sound of flipping pages, necessary for the e-book reading experience?

Programmed oral readers are essentially audiobooks that still allow the reader to have access to the text and pictures of the original printed book. Some programmed readers are coded to even sound out the phonics and definitions of certain words (Bus et al., 2015; Smeets & Bus, 2012). The instances where children are allowed to stop the story suddenly to have the programmed reader explain what a word is called a hotspot. Hotspots are areas within an e-book that children are allowed to tap on in order to engage in receiving auditory or visual feedback. Hotspots are considered to be any part of an e-book that suddenly stops the flow of the story to engage in a separate activity such as: having the programmed reader explain a word, initiating extra sound effects, and even minigames.

Smeets and Bus (2012) studied the effects of extratextual instructions in e-books to see if it would benefit vocabulary development in 4-to-5-year-old kindergarteners. Their second study

used a preprogrammed reader, dubbed computer pal, and low/high level engagement hotspots. The experiment conditions involved: a reading-only control group, low level involvement hotspots, and high involvement hotspots. Low level involvement hotspots consisted of the story freezing in order for the computer pal to go over a story segment, and give a vocabulary word to the reader. High level involvement hotspots focused on asking the participant a question and having them pick an answer through multiple choice. Both experimental groups had instructed and uninstructed words that were tested via memorization at the end of the study. Instructed words were found directly in the text or hotspots, while uninstructed words were not present in any of the books.

Results for this experiment indicated that hotspots in the middle of the story did not interfere with the learning of vocabulary for the participants. Participants overall remembered more instructed words than uninstructed words during the memory test. In comparison to the control read only group, there was no difference in test results for either experimental group. Test results for instructed words indicated that questions were more effective in teaching participants than general hotspots. Hotspots were only as effective for words participants were already familiar with. According to Smeets and Bus (2012), having computer pal ask children questions to help engage them with the book would eventually help them learn uninstructed/new words over time. Interactive questions in e-books were seen to be more thought provoking and engaging for children when learning new vocabulary. The introduction of the computer pal created a welcoming space with clear instructions, encouragement, and lack of fear of making mistakes.

With programmed readers, like computer pal, e-books could directly involve children in interacting with the story through thought provoking questions and general hotspots. Mentioned



prior, this is not the only way audio is utilized in electronic media. Background music and sound effects are prominent in many e-books (Bus et al., 2015; Smeets, Dijken, & Bus, 2012). While computer pal served a direct use of reading and engaging readers; background music and sound effects are secondary features. Background music can be inputted to help children associate music to moods or be inputted for purely aesthetic reasons. Bus et al. (2015) wrote about the pros and cons of enhanced features that can be offered in e-books in a theoretical review. It was noted that many e-books did not offer the option to adjust the volume of specific audio; outside of just making the entire program louder or quieter. This can cause conflict between the voice of the narrator and insignificant background noise. In the app store e-book of Disney's *Cars 2*, the programmed reader is drowned out by the noises of background music and the revving of the race cars 'driving' in the story. While the purpose was to help children learn what a car sounds like; it conflicts with the narrator's mission of keeping children engaged in learning literacy. Other e-books like *Magic Goldfish* have hotspots that serve no other purpose but to play sound effects. Unlike in Smeets and Bus (2012), the hotspots in *Magic Gold Fish* did not only focus on the introduction or explanation of new vocabulary. Children were also allowed to click on these hotspots anytime they wanted; which could drown out the narrator. Bus et al. (2015) had found that some e-books do include an option to turn off narration or background music separately. While the feature is useful, it is not universal across all e-books on the market.

The findings of Smeets, Dijken, and Bus (2012) have similar inferences to Bus et al. (2015) on the subject of background music and sound effects. Smeets et al. (2012) focused their study on the effects enhanced e-book features had on kindergarten children with severe language impairments (SLI), without adult support. The study involved 23 participants between the ages of 5- to 7- years old, who were all professionally diagnosed to have some kind of SLI.

Participants in the Smeets et al. (2012) study participated in all conditions: control, static image e-book with sound, static image e-book without sound, video e-book with sound, and video e-book without sound. Static e-books consisted of still images, while video e-books had added animations. Eight books were used in total and were randomized for each participant during the eight sessions that took place in four weeks. They were introduced to instructed vocabulary words throughout all four experimental groups. Participants were then tested on their phonological word memory, language skills, and target vocabulary knowledge. For the phonological word memory test, participants were given an audio recording and pictures of nonwords they had to pronounce correctly. The language skills test had the experimenters ask participants questions based on sentence interpretation and word correlation. Experimenters read a sentence out loud to participants who were given several pictures to pick from to find the related picture.

Results indicated that participants who were more advanced in word literacy learned more words overall regardless of sound being present in static or video e-books. Children with more severe SLIs were found to do worse with static and video e-books if background audio were included. The presence of animation alone did not affect how participants with SLIs learned vocabulary. Audio was correlated with overstimulation in multitasking for participants with severe SLIs. The results suggested that not everyone would benefit from the same enhanced features; even if they were programmed to be educational. Having customizable features to turn off or even just adjust different audio in e-books would help benefit vocabulary learning (Bus et al., 2015). Customization would allow e-books to be more personable and adaptable for the needs of individual children. For educational purposes, background audio could be turned off to help prevent distractions and cognitive overload (Bus et al., 2015; Smeets, Van Dijken, & Bus,

2012; Reich et al., 2016). Sound effects like background music are not as necessary as a programmed reader. Having the programmed reader be able to explain and sound out vocabulary should be the focus of attention when reading an e-book. Having secondary sound effects could overpower the programmed reader and take away from the learning experience due to overstimulation (Bus et al., 2015; Smeets, Van Dijken, & Bus, 2012; Reich et al., 2016; Parish-Morris et al., 2013). Some children may be able to read comfortably with background music, however the same cannot be said for children who have a SLI (Smeets, Van Dijken, & Bus, 2012). While only about 7% of 5- to 6-year-old children are diagnosed with SLIs (Tomblin et al., 1997), it is still important to consider them when developing enhanced feature customization so that e-books can be accessible. Together (Bus et al., 2015; Smeets & Bus, 2012; Smeets, Van Dijken, & Bus, 2012), the research provided evidence that sound effects can be both beneficial and detrimental to learning vocabulary; based on the cognitive abilities of the individual child.

**Enhanced Features: Animation.** Animation in e-books involves any part of an illustration that is programmed to show the illusion of movement; usually through gifs or flash animation. Like sound effects, there are primary and secondary/incongruent animations. Primary animations focus on story-relevant plot points; such as showing a character move as the story text is read out loud. Secondary/incongruent animations are similar to background music; these animations are usually for aesthetic design (De Jong & Bus, 2004). These non focal point animations are usually aspects such as: trees blowing in the wind, water rippling in a pond, or even birds flying in the sky. These aesthetic animation decisions are made with the idea to make a story feel more lifelike in design. In order to develop educational e-books, to facilitate

language development in preschool to kindergarten aged children, should animation be included at all?

Animation in e-books have been used as a tool to supposedly help children associate words, sounds, and actions. As either the programmed reader or parent would read the story, the animation on the current page would reflect what was being read. Verhallen and Bus (2009) studied to see if this word to movement association would actually help young kindergarten aged children who struggled with learning a second language. The experiment involved 106 children around the age of 5 who were randomized into these conditions: control, two levels of story formatting (video or static), and two levels of repetition (one or four). Static e-books are e-books with no animation whatsoever. Repetition was used in the study to see how well the e-books would keep the attention of the participants in learning the material. The book involved was *Winnie the Witch*, which featured twenty-two pages with images. For the video e-book groups the images would be zoomed in, panned out, and coded to animate the character with ‘puppet-like’ movement. Participants were tested with electrodes to keep track of heart rate, and how well they were able to read twenty-four sentences out loud without assistance. Results of the study found that participants lost interest in the static books over the course of multiple readings. However, this did not mean that repetition always resulted in a gradual loss of interest over time. Video e-books were found to have participants remember 4x more words than both static e-book conditions. In the video e-book condition the main character, Winnie, would be seen picking up her wand and casting magic when the programmed reader would read those particular lines. The results showed that the animation helped participants in regards to associating the actions to new words in a different language.

De Jong and Bus (2004) found similar results in their own study comparing printed books to e-books. The study focused on whether e-books embedded with programmed readers and animation would help facilitate learning similarly to reading a printed book with an adult. Eighteen 4-to-6-year-old children were exposed to all three condition groups: control, an e-book with a programmed reader, and a printed book with an accompanied adult. All of the e-books involved in the study had animations present on the pages to emphasize the actions written in the story. Animations incongruent to the plot were also present in each of the books; such as the trees being animated to move in the background. The experiment took a total of twelve sessions and was timed around to take about 120 minutes per participant. After the story was read by the programmed reader or adult experimenter the participants were prompted by the experimenter to read the story out loud on their own, and scored based on accuracy. To encourage participants to finish the story the experimenters told them that they could make stuff up if they were unable to read the words. Results found that participants in both the printed book and e-book conditions had received better scores than control group participants. Participants were seen to be just as engaged with the e-book, and the results suggest that the animation was not detrimental to the learning process. Incongruent animations in the e-books did not appear to be distracting for the participants. This may have been related to the age group of the children and their present understanding of story elements.

Similarly to Smeets, Dijken, and Bus (2012), animations in e-books appear to help children stay more engaged with reading and learning new words. However, as seen with Smeets et al. (2012), not all children would benefit from a singular formatted enhanced e-book. Children with SLIs may be affected negatively by added enhanced features that are designed with education in mind, such as sound effects. Bus et al. (2015) wrote about how crowded e-books

could be overstimulating to individual children. This further emphasized the point in which enhanced e-book features should be customizable for the individual reader's learning experience. While animated e-books did result in more accurate storybook reading in De Jong and Bus (2004) and Bus et al. (2015), it did not rule out the idea of passive reading. Passive reading is the experience when the reader does read the text, but does not absorb the knowledge (Parish-Morris et al., 2013). An example of this can be seen in Smeets and Bus (2012) when the participants interacted with low level involvement hotspots. Hotspots that had high levels of engagement resulted in more remembered words because the participants had to actively remember the story in order to answer questions correctly. The participants involved in the De Jong and Bus (2015) study had no learning/reading impairments, and already understood the basics of story elements and book reading. There was a possibility that children who are younger or have SLIs may find incongruent animations to be just as distracting as background music (Smeets, Dijken, & Bus, 2012). Giving readers the option to customize their animation experience similarly to sound effects and background music could help avoid overstimulation while reading e-books.

The research (De Jong & Bus, 2004; Smeets, Van Dijken, & Bus., 2012; Verhallen & Bus., 2009) suggested that animation can be beneficial in helping children learn new vocabulary. Animation alongside a programmed reader could help children associate new words to familiar actions. Repetition and engaging media (Verhallen & Bus, 2009) combined could help children feel more confident with learning and help them maintain focus on the reading material. Incongruent animations were not suggested to be harmful for vocabulary development (De Jong & Bus, 2004), unlike background music (Smeets, Van Dijken, & Bus, 2012). Enhanced features may be developed to be educational, but they appear to have different effects on cognitive

learning based on the medium (Bus et al., 2015; De Jong & Bus, 2004; Smeets, Van Dijken, & Bus, 2012; Verhallen & Bus., 2009).

**Enhanced Features: Hotspots/Games.** Hotspots are specific areas within an e-book that can initiate several functions such as games, sound effects, animations, and even give definitions for specific words. Some hotspots can be activated even while the programmed reader is speaking. On the topic of hotspots this review will focus on the types of minigames that are included in e-books, and how they benefit or hurt vocabulary development. Video games that are designed to be educational are designed with the purpose and idea of teaching children skills like reading and math through engaging media. Educationally designed computer games like *Math Blasters I* have children climb through levels answering math equations of varying difficulty in order to save the galaxy. The game even allowed the user to pick what kinds of math questions they wished to answer on a difficulty scale of easy to hard. The idea was for children to build confidence in their math skills before moving on to a harder difficulty level. Children would feel inclined to play again and practice their math skills because of the obtainable reward of completing the story of the game. Some e-books are programmed to include games with the purpose of being just as educational. However, games included in e-books are not built with the same complexity as video games like *Math Blasters I* or even *I Spy*. Many e-books do not even allow general customization in audio that you would find in most video game settings (Bus et al., 2015).

Video games and hotspots in e-books include opportunities to allow readers to interact with the story more personally than they would in a printed book. In one app called *PopOut! The Tale of Peter Rabbit*, by Loud Crew Interactive, the reader is encouraged to interact with the screen and click on objects like berries and leaves to move them. The app was even programmed

to have children shake their tablets to move marbles around in one of the games. In another app called *The Three Little Pigs* by Game Collage there is a feature that allows the reader to activate x-ray vision to look into the houses in the story (Bus et al., 2015). Unlike programmed readers or story-relevant animations, these games and hotspots are not designed to focus on the story itself. It is even possible for children to activate these hotspots while the programmed reader reads the story; thus drowning out the more important sounds. These types of games would likely result in passive reading as the attention is drawn more towards playing a game rather than reading (De Jong & Bus, 2004).

How can hotspots then be utilized in an engaging way to promote better vocabulary and story understanding for children? Games and hotspots could involve vocabulary or story based questions in order to maintain focus on the story itself as seen in Smeets, Van Dijken and Bus (2012). Participants were able to memorize more new vocabulary words if the hotspots were designed to be relevant and engaging. Thought provoking questions reduced the risk of passive reading from occurring because participants had to be actively aware of the book they were reading. Hotspots that simply gave the participants the definition were also effective, but were not as good as thought provoking questions. If participants got an answer wrong they would be given the correct answer via the computer pal. Computer pal being programmed to be encouraging and helpful helped make getting the wrong answer less stressful for participants. While these question-based hotspots might not be as ‘fun’ as a typical minigame mentioned prior, they help keep the reader focused on the relevant story elements. In order to keep the questions interesting and engaging, programmers could code the questions to be randomized and even offer difficulty settings. This would allow e-books to be reusable for more advanced children and help avoid immediate staleness of the same questions being asked on repeat. If



publishers wish to still include minigames, like in PopOut! The Tale of Peter Rabbit, it would be best to keep those out of the story itself. Putting options for minigames in the main menu rather than in the story would be preferable to avoid overstimulation, distractions, and passive reading (Bus et al., 2015; De Jong & Bus, 2004; Parish-Morris et al., 2013; Smeets, Van Dijken, & Bus, 2012).

The collected research (Bus et al., 2015; Parish-Morris et al., 2013; Smeets, Van Dijken, & Bus, 2012) suggested that it is possible for enhanced features such as audio, animation, and hotspots/games to be used to facilitate vocabulary development for preschoolers and kindergarteners. Programmed readers and animations could be used to help children associate written words with phonics, definitions, and actions. Hotspots and games could be used to help children review what they read in order to increase familiarity with new vocabulary words. Designing these features to focus on the target vocabulary and literary elements of an e-book can make them efficient tools both at home and in school. With school in mind, it should be noted that children are often accompanied by an adult during reading time during their preschool and kindergarten years. Therefore, it is important to understand how parents interact with their children during reading time, when using enhanced e-books. Understanding why parents may struggle reading enhanced e-books (Chiong et al., 2012; Korat & Or, 2010; Parish-Morris et al., 2013; Troseth et al., 2020) can help in the future development of enhanced features to be more efficient in promoting parent-child interactions during shared reading time.

### **Why Do Parents Struggle With Enhanced e-Books?**

Designing e-books to be educational to facilitate language development is important in our modern era of advancing technology. However, e-books cannot replace the importance of human interaction when it comes to learning entirely (Reich et al., 2016). E-books can be

programmed to ask questions and offer on hand definitions for children, but e-books are confined to that programming. This is an important distinction to make when there are advertisements out there targeting parents, telling them that DVDs, e-books, and general technology alone can teach their children (DeLoache et al., 2010; Parish-Morris et al., 2013; Reich et al., 2016).

One of the most important ways parents can engage with their children during shared reading time is asking open-ended questions (Mol et al., 2008; Whitehurst et al., 1988; Zevenbergen & Whitehurst, 2003). This process is called dialogic reading; in which parents ask open-ended questions to start two-way dialogue with their children. Instead of asking general yes or no questions, dialogic reading relies on several types of prompts. These prompts include the general 'w' questions, such as who, what, when, and why. Other prompts include distancing prompts to make the child relate to the book with their own lived experiences (Parish-Morris et al., 2013; Whitehurst et al., 1988; Zevenbergen & Whitehurst, 2003). The purpose of dialogic reading is to steer away from passive listening and strengthen the effects of book reading (Mol et al., 2008).

How do parents engage with e-books in comparison to printed books? For the studies that included the ages of the parents, it was seen that most parent participants were born around the 60s-80s. Their children were born around the 00s-10s at the time the studies were conducted (Korat & Or, 2010; Troseth et al., 2020). Technological differences between these two generations are extreme. Several mothers in the Korat and Or (2010) study had to be instructed on how to operate an e-book before the study could commence. This suggests that this may have been the first time these parents have ever used an e-book in general. However, in Parish-Morris et al. (2013) about 96% of the parent participants reported having e-books at home and were familiar with the format. The study focused on how e-books affected dialogic reading between

parents and their children. There were 92 participants ranging from the ages 3- to 5- years. Participant child-parent dyads were randomly placed into one of three conditions: control, e-book, or printed book. The control group consisted of a basic e-book to ensure that there was nothing particular about the enhanced e-books. The e-books used were produced by Fisher Price and included popular media such as *Dora the Explorer* and *Clifford the Big Red Dog*. Results showed that parents asked more story-related questions in the printed and control groups. Parents in the e-book condition, with the enhanced features turned on, asked more questions based on their children's behaviors towards the e-book. Children spoke less in the enhanced e-book condition, but it was theorized that this may have been in relation to how their parents interacted with the book's features or lack thereof. The format of the book did not appear to matter, but enhanced features like the programmed reader appeared to change how parents behaved. In several studies there appeared to be a consistent divide in how parents interacted with printed books in comparison to enhanced e-books; with parents showing a preference for printed books (Bus et al., 2016; Korat & Or, 2010; Reich et al., 2016; Troseth et al., 2020). Parents reported feeling frustrated or unsure on how to engage with their children using enhanced e-books. Their children, on the other hand, preferred the enhanced e-books and appeared to have no issue navigating them (Chiong et al., 2012; Korat & Or, 2010; Reich et al., 2016; Troseth et al., 2020).

### **Effects of Advertisements on Parent-Child Interactions**

The way that technology is advertised can affect how parents choose to interact with e-books (DeLoache et al., 2010; Parish-Morris et al., 2013). Fisher Price advertised their children's educational products to "put the power of reading at your child's fingertips," and promised that their consoles would help children learn concepts like phonics, spelling, music, and math skills (Reich et al., 2016, p. 201). DeLoache et al. (2010) interviewed their parent

participants on their opinions of the DVD presented to them during the study. Parents in the educational DVD with no interaction condition reviewed the DVD with confidence that their children were learning fine on their own. The results of the study suggested that their children learned the least amount of vocabulary in comparison to the condition group that consisted of only parent-child interactions without the DVD. Parents felt inclined to buy these educationally promoted books and toys with the belief that the company was providing the full services that were advertised (DeLoache et al., 2010; Parish-Morris et al., 2013). Parents in turn may interact less with their children, and therefore do not engage with enhanced e-books with their children. While enhanced e-books may help children with SLIs in engaging with books, children cannot be expected to learn on their own without the help of a caregiver (Chiong et al., 2012; DeLoache et al., 2010; Parish-Morris et al., 2013; Reich et al., 2016).

### **How Can e-Book Features Help Facilitate Parent-Child Interactions?**

Enhanced e-book features can be utilized to help promote language development if they are designed to be educational and customizable for the individual. Even then, as previously mentioned, children need interaction with their caregivers in order to properly learn language and basic reading skills. There are parents who are unsure on how to interact with e-books; seen from a lack of experience or being influenced by advertisements made by companies selling e-books (DeLoache et al., 2010; Korat & Or, 2010; Parish-Morris et al., 2013; Reich et al., 2016). How can e-books be utilized to help teach and prompt parents to interact with their children?

While there may be parents who become frustrated with programmed readers in e-books, it may be one of the best options to help them as well (Bus et al., 2015; Troseth et al., (2020) developed a research study to see if it was possible to use e-books as a learning tool not only for children, but to also train their parents to use and engage with dialogic reading. The study

emphasized the usefulness of dialogic reading for at risk children in low socioeconomic status (SES) families. Low SES families have been documented to have language gaps in comparison to upper class families, emerging as early as kindergarten (Korat & Shamir, 2007; Schady et al., 2014). Participant families were randomized into either the control or enhanced e-book group. The study involved an edited version of the book *Peg + Cat's The Big Dog Problem*. Two versions of the enhanced e-book were made that introduced participants to the programmed reader Ramone, who was a character in the book's cartoon series. Both groups interacted with the altered versions of Ramone for two reading sessions that lasted forty-five minutes each. Ramone started the reading sessions with a short introduction of the importance of dialogic reading; without explicitly giving parents on how to engage with the teaching practice. Ramone would then read and end each page with a question of varying difficulty for the child participant. Ramone V1 asked easy wh- questions, such as, "Who is taller, Peg or Cat?" and open-ended questions such as, "Do you think the dog is scary? Why?" Ramone V2 asked more complex open-ended questions, recall questions, and distancing prompts. An example of the types of complex questions asked is, "Why do Peg and Cat want to be taller than the dog?" During the second session Ramone stopped appearing on every page and prompted the parents to take over for him. He was still available as a help option at the corner of every page.

Results of Troseth et al. (2020) showed that parents who were exposed to examples of dialogic reading asked both simple and complicated questions to their children. In response to more complex open-ended questions, their children answered with more enriched vocabulary in comparison to the control group. Most enhanced group parents asked at least one question per page; while the control group parents asked about one question every five pages. Reports of feedback from enhanced group parents showed surprise as to the kinds of questions they could

ask their children. Some spoke about how Ramone helped them think about the different kinds of age-appropriate questions they could ask their children that they never thought about before. Both the control and enhanced groups rated the book usually a four or a five out of five; even though the control group parents never met Ramone. Parents in the control group may have believed that their version of the e-book was just as beneficial because of the general assumption of how children's educational media works (DeLoache et al., 2010). Ramone goes to show how programmed readers can be customized to both teach parents and instigate parent/child interactions, without causing frustration. Ramone being programmed to be an optional feature in the second version of the enhanced e-book allowed parents to feel more comfortable starting conversations with their children. If children wanted to read independently, they could simply turn Ramone back on through the e-book settings. Having programmed readers like Ramone could help change the mindset about e-books that parents receive via advertisements. Ramone was designed to be influential, polite, and a great introduction to the practice of dialogic reading. Programming enhanced e-books to have options for independent reading and co-reading would be a great way to help parents feel more confident and encouraged to interact with their children during reading time.

### **Discussion**

This paper sought to determine that enhanced e-books are not inherently detrimental to the vocabulary learning development of children or parent-child interactions. A review of the evidence leads to the conclusion that enhanced e-book features are utilized properly to facilitate vocabulary development and parent-child interactions. For e-books to be considered educational for preschoolers and kindergarteners, they should be adaptable to the needs of the individual reader. Children do not all learn the same way and may not even benefit from certain enhanced

features like audio due to learning impairments (Smeets, Van Dijken, & Bus, 2012). If e-books are going to implement video-game-esque hotspots they should offer similar customizable features you would get from the average video game. The phone/tablet game *Fire Emblem Heroes* offers players a variety of different options to turn off specific animations and separates music into categories, such as: voice volume, sound effects, and background music. The technology is there for these features to be applied to enhanced e-books as well. Allowing the customization of enhanced features makes the educational experience more personal for the child to focus on their current strengths and weaknesses. Customization in games and hotspots that include a range of difficulty levels could also be beneficial for longterm vocabulary development. This should increase the longevity in usage of individual e-books and keep children engaged with pre-programmed questions. Randomizing through a series of different questions in a similar format to Smeets, Van Dijken, and Bus (2012) could help avoid reductions in engagement when reading the same story over time. This would help to make each reading experience different and unexpected for the reader; which can help avoid passive reading.

Some limitations not mentioned in the researched studies were found. For starters, researchers utilized a variety of different e-books in their experiments. Troseth et al. (2020), for example, had gone to the original publisher in order to enhance the *Peg + Cat's The Big Dog Problem* e-book to include Ramone. While in the De Jong and Bus (2004) study it appeared that the e-books went unedited. Unedited enhanced e-books used in studies would be more accurate to e-books in the current market. Each book picked by the various researchers may vary in quality based on personal opinion. This can be seen with how parents in both the control and enhanced e-book groups viewed *Peg + Cat's The Big Dog Problem* in a positive light; regardless if they interacted with Ramone or not (Troseth et al., 2020).

The durations of the studies, for the most part, do not show long term results or follow ups with previous participants. It is unknown if parents from the Troseth et al. (2020) study have continued to use or research dialogic reading for at-home use. Similarly with DeLoache et al. (2010), it is unknown if parents started to interact with their children more or continued to use DVDs as an interaction replacement after the study concluded. Other studies did conduct two separate experiments, but with completely different participatory groups (Smeets, Van Dijken, & Bus, 2012; Parish-Morris et al., 2013). None of the current research conducted a second study to check on their participants to see if their behaviors towards e-books have changed in any way. For studies that used e-books to see if educationally focused enhanced features could be beneficial (Smeets, Van Dijken, & Bus, 2012; Troseth et al., 2020; Verhallen & Bus., 2009) this would have given insight for long term usage of said enhanced features.

Another aspect that should be noted is that none of the research studies discussed the ages and cultural backgrounds of the parents. For studies that recorded the ages of the parents, it showed that many of them were born during the 1960's-1980's (Korat & Or, 2010; Troseth et al., 2020). E-books were not available during this time period, therefore these parents grew up reading printed books. This would explain how parents reported feeling frustrated or unsure in trying to interact with enhanced e-books (Bus et al., 2015). Having children was probably the only reason why they interacted with this type of electronic media in the first place (Korat & Or, 2010). Parents reporting feeling more comfortable with printed books or basic e-books most likely comes from a place of familiarity from their own childhoods. That was how they were taught, and they are unaware of how to implement what they knew with more advanced new technology. This is how enhanced e-book features with a primary focus on educational usage are important for the future of e-book design. Programs like Ramone would help make enhanced



e-books more accessible and adaptable for children's language development, and promote parent/child interactions during shared reading time (Troseth et al., .

More research is needed to investigate long term impacts of enhanced e-books, considering most of these studies were short term. However, the current research suggests that enhanced features can be beneficial to both parents and their children when they are designed to be educational and story-relevant. While enhanced features can be used to help facilitate vocabulary development, not all children react to them the same way. Children with SLIs may find themselves getting overstimulated and distracted by background music when reading (Smeets, Van Dijken, & Bus, 2012). Enhanced features in e-book should be customizable, or at least optional, in order to meet the educational needs of the individual child. Education is not a one-size-fits-all matter. Publishers should also consider creating e-books or programs that focus on teaching parents how to interact with their children using enhanced e-book features; such as the programmed reader Ramone (Troseth et al., 2020). Figuring out how to design and utilize enhanced features in e-books to support vocabulary development and parent-child interactions is critical for future use of this technology in education.

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