Designing for interactive eBooks: an evaluation of effective interaction elements in children’s eBooks

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‘Designing for interactive eBooks: An evaluation of effective interaction elements in children’s eBooks’
by
Karen Marie Doty

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

MASTER OF FINE ARTS

Major: Graphic Design
Program of Study Committee:
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Iowa State University
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DEDICATION

I dedicate my thesis to my loving husband, Chad. Thank you for your endless support over the past many years. You are my inspiration and creative drive. I would not have made it this far without your help. I would also like to give a special thank you to my parents who never faltered to point me in the direction of my dreams. In addition, I would like to credit my grandmother, whose natural artistic talent taught me that true beauty spurs from practice and patience. Finally, I would like to praise my nephew Caleb, who inspired the basis for this study in the first place. Keep on reading and learning, your Aunt Karen is proud of you.
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ABSTRACT

We live in a world where technology is woven into nearly every aspect of our lives. From the moment we wake, we are surrounded by technology. Technology is present in our homes, careers and schools, incorporating itself in our daily routines, entertainment and education. Due to the speed at which technology has evolved, little research has been completed regarding reading on interactive enhanced eBooks. For children learning to read in the modern world, eBooks provided on tablets are becoming a common occurrence.

With this increase of eBook availability, it is of utmost importance that a better understanding is gained over eBooks for young readers. Currently, a categorization of the types of interactive enhanced eBooks does not exist, nor a thorough understanding of the interactions within them. This thesis suggests the necessity of categorizing the nature of children’s eBooks, and better understanding the varied interactive experiences within them. This research is imperative for graphic designers to have the proper knowledge to create eBooks that create a positive, engaging experience for readers.

Never in history have educators; graphic designers and scholars had the opportunity to work together to create an enhanced learning experience. This thesis examines existing eBooks for early readers through a field survey and an observational case study of current eBook interactions.
CHAPTER 1 OVERVIEW

1.1 INTRODUCTION

During the past ten years, sales for eBooks have skyrocketed with thousands of eBooks (electronic books) sold daily at record numbers. While initially meant for adults, more and more eBooks are finding their way into the minds of children through digital picture books, interactive enhanced eBooks, and educational apps.

In an ever-evolving world, eBooks are opening doors to new ways of interacting, learning and experiencing information and stories. As is common with new technology, the regular use of eBooks fosters new research questions. What are the current types of eBooks available to children? How are children responding to interactive elements in current eBooks? Finally, how can graphic designers (those typically in charge of creating the interaction, design, and overall use of the eBooks), design a product that creates successful interactions with results based on a foundation of understanding the different kind of interaction and typical responses that increases effective interaction?
1.2 PURPOSE OF RESEARCH

The purpose of this study is to understand how interaction in children’s interactive enhanced eBooks are currently perceived. Additionally, this study proposes categorization of current eBooks based on interactive elements. Through this categorization and with a better understanding of current interactions, eBooks and their purpose can be portrayed to users to best fit the user’s needs.

Through research and analysis, a field study of current user experience with interactive enhanced eBooks has created an inventory of interactions in current eBooks. In addition, the field study has completed a proposed categorization of current eBook focus in order to best portray current eBooks in the most purposeful manner.

To conclude, a case study using observational techniques has tested user experience with a current popular interactive enhanced eBook to better understand how young readers are interacting with current interactive elements on an emotional, comprehensive and purposeful level. Knowledge gained from this study will establish a groundwork for best practices for eBook design to be established in the future. With these guidelines, graphic designers will have the ability to create eBooks that contain effective interactivity based on the categorization of the proposed eBook.
1.3 DEFINING KEY TERMS

● EBook Terminology
  ○ Digital Publishing – the use of digital technology to take printed work and format it so it can be accessed by computer technology. Examples include eBooks, emagazines and other digital periodicals.
  ○ E-reader- a publication that is primarily text. For example, e-readers can be described as novels that contain a large amount of text with little imagery. Thus, e-readers can be created using any digital format and can be used for a wide range of devices.
  ○ Interactive Enhanced EBooks - refers to eBooks that contain interactive features within a media-rich book. For this study, interactive enhanced eBooks represent eBooks that include touch screen features, sound, and interactivity.

● User Experience & Literacy Understanding
  ○ Literacy- refers to the linguistic meaning intertwined with other modes of meaning such as visual, audio, gestural and tactile within an interface.
  ○ User Experience Design – user experience design describes the creation and synchronization of the elements that affect one’s experience with a particular device, company or product. These elements are examined with the intent of influencing one’s perception and behavior.
  ○ New Literacies- Included but not limited to skills, strategies, dispositions and social practices that are required by new technologies for information and communication.
○ **Transmedia** - the ability to follow the flow of stories and information across multiple modalities within the context of new media literacies. Modalities may include television, music, cinema, printed books, eBooks and games.

○ **Multimodal** - linguistic meanings are intertwined with other modes of meaning such as visual, audio, gestural and tactile within an interface.

- **Graphic Design Terminology**

  ○ **Literacy** - as explained throughout this thesis pertains to visual literacy from a design perspective to understand how word, image and interaction together form a message and experience.

  ○ **Enhanced EBook Design Practices** - For this study, this references the proposed design practices required for successful enhanced eBook design.

  ○ **Visceral Design** – a type of design described by the aesthetic and visual impact it has on the viewer. Visceral design is the way humans perceive the world and measure beauty.

  ○ **Behavioral Design** - a type of design described by the useful value and purpose of the product/device. This design type focuses on the usability and performance. Behavioral design does not reflect the appearance of a design.

  ○ **Reflective Design** - a type of design described by the message and meaning of a product or its use. With this type of design, there is focus on the emotional impact of design.
1.4 Defining Research Questions

Due to the relative recentness of eBook technology and eBook usage, many research questions have risen on the topic. For the purpose of this study, this thesis will focus on the following research questions:

- **What are the different types of eBooks available to children?**
  - This question relates directly to the surge of eBook productivity increase in recent years. Since eBook distribution has spread rapidly, there is need to increase education in how to design the eBook interface. With interactive enhanced eBooks, graphic designers need to consider more than the visual aspect of design, and in addition consider the experience one has when reading an interactive enhanced eBook. With the availability of eBooks rising, the creators of eBooks must clearly understand their varied intent and the different roles/purposes they can serve for a reader.

- **How are children responding to interactive elements in current eBooks?**
  - How does the user respond to the experience of an eBook? In addition, what kinds of interactions are garnering the most attention and thus are possibly more effective? The case study conducted for this thesis will present new data on the topic.

- **How can graphic designers create a product that successfully increases effective interaction?**
  - While this question is a difficult one to find a concrete answer to, this study hopes to shine new perspectives over how young children respond to
interactive eBooks. Through the information gained with this study, groundwork for proposed design guidelines may be established.

1.5 Outline of Thesis

This thesis will be outlined in the following manner: First, it will give a brief background of the history of eBooks and how eBooks are making their way into elementary classrooms. Next, this thesis will include a literature review that will discuss the concept of digital literacy and what it means for those who are experiencing interactive enhanced eBooks. The theory of new literacy usage in educational settings will be a cornerstone for this section. In addition, the literature review will explain user experience for eBooks as well as an understanding of the interactive experience as a whole with reference to researcher and designer, Donald Norman’s guidelines for emotional design.

Next, this thesis includes a field study that analyzes current popular enhanced eBooks. The field study will address the topic of user experience further and will explain current interactive elements of eBooks discovered on the market. Guided by Ben Shneiderman’s Eight Golden Rules of Interface Design, this section will categorize current eBooks based on interactivity and eBook purpose.

In the final chapters of this thesis, a case study has been completed to best understand how early readers are interacting with a chosen enhanced eBook. In addition, quantitative data has been obtained through research found in the case study conducted using the screen-capture app, Airplay to record time spent while interacting with an existing interactive enhanced eBook.
CHAPTER 2 INTRODUCTION TO EBOOKS

2.1 Introduction to Digital Publication and eBooks

Mass book production began in the Middle Ages due in most to the invention of moveable type and the technologic advances of the printing press by Johannes Gutenburg in 1450. Print technology spurred a communication revolution that eventually led to increased creativity, social interaction and a spread of knowledge. “There have been many significant technological advances since then but until the advent of the Internet and electronic commerce, the book industry remained relatively unchanged” (Hawkins 2000).

According to researcher and historian, Donald Hawkins, author of the article, Electronic Books, a Major Publishing Revolution, “Books have endured because they are remarkably well engineered. They are easy to use, generally portable, relatively cost-effective, and they require no instructions or manuals for their use” (Hawkins 2000). In short, books are user-friendly which creates an enjoyable experience for the users involved. However, even with all of the positive outcomes enjoyed when reading printed books, there are still drawbacks. “They can be extremely costly to produce, store, ship and sell. Because they are a static medium, revisions typically take a significant amount of time and effort to produce” (Hawkins 2000). EBooks on the other hand can be distributed electronically, thus increasing the potential for updates, cost-effective publishing and overall dispersion of information.

Interactive enhanced eBooks are digital books that in addition to text; may include animation, games, and sound. It is important to note that interactive enhanced eBooks are possible to enjoy on a variety of devices including but not limited to: Kindles, smart
phones, and most recently; touch screen laptops such as the Microsoft Surface. In addition to the available devices, there are different ways of purchasing eBooks. Amazon, iBooks and Nook are some of the more well known companies, however countless reading apps also dominate the eBook reading market and digital libraries. Please see Figure 1 for a representation of the history of the eBook and tablet evolution from 1971 to 2014.
Figure 1 eBook History
2.2 EBooks in the Classroom

In recent years, eBooks have become a common site to see in both homes and educational settings. Teachers are seeing an increase in interest of eBooks. According to a survey taken in January 2015, from Lightsail Education, a K-12 Literacy platform, “Classroom materials will dramatically transition from thesis to digital books in the next two years, educators predict.” In addition, “Among those polled, 84 percent expect that eBooks will increase in their schools and districts, with 52 percent predicting that eBooks will surge to account for more than 40 percent of all books in their school or district.”

An increased interest in eBooks spurs an increased need for graphic designers to understand how to design and plan for eBooks in different digital platforms. Also, increased distribution of eBooks suggests new literacy uses and future possibilities for eBook technology.

We are still in the early days for eBooks. “There is a clear present need to understand more deeply eBook user behavior and the phenomenon of the ‘power user’, the user who has adapted to eBooks, prefers them as an information source, manifests exploratory behavior and converts titles browsed to titles read” (Ahmad & Brogan 2012). In the coming chapters of this thesis, a discussion over user experience for eBooks, in specific interactive eBooks will shed light on the development of current eBooks. Through research and study, a better understanding over the concepts of interactive learning and designing for the eBook user will be discussed.
CHAPTER 3 REVIEW OF LITERATURE

3.1 Understanding Literacy and New Literacies

Literacy in today’s world means much more than understanding how to read and write. Instead, becoming literate today encompasses navigating through the use of technology, understanding how to best incorporate technology into daily use and being able to be a productive user of technology. In the textbook, *Sociology, Fourth Edition*, written by authors; Margaret Anderson and Howard Taylor, “Education in a society is concerned with the systematic transmission of the society’s knowledge. This includes teaching formal knowledge such as the “three R’s”—reading, writing and arithmetic—as well as the conveyance of morals, values, and ethics” (p. 424).

While, in the past, that may have been true, today even the simplest of tasks may incorporate the operation of technology. According to Elizabeth Baker, editor of *The New Literacies, Multiple Perspectives on Research and Practice*, “If our schools continues to limit the literacy curriculum to reading and writing traditional, alphabetic, printed texts, then our children will be well prepared for 1950 but ill prepared for 2050” (p. 2).

The concept of literacy itself could be an entire thesis in its own; however, for the purpose of this research, the focus is primarily on understanding how to be literate for interactive enhanced eBooks. The importance of these ideas are highlighted in an article published in the Journal of Interactive Online Learning. The article, titled *A Typology for Observing Children’s Engagement with eBooks at Preschool*, focuses on the multisensory behaviors observed of children when reading eBooks. According to this article, “In a changing world, where eBooks may soon rival hard-bound storybooks, how children engage with them is important not only for understanding how eBooks might
supplement the early literacy experience, but also how they might improve the learn-to-read process” (p. 47).

For graphic designers who are creating the eBooks children are learning and reading, it is of utmost importance to have a better understanding of the relationship readers have with eBook technology. Graphic designers may in fact play a role in shaping the minds of readers both now and in the future.
3.2. Theoretical Perspectives of New Literacies

In order to understand the possibilities of interactive enhanced eBooks, a reader must first understand how to use the device of which the eBook is displayed. In addition to understanding how to use the technology of eBooks, readers of interactive enhanced eBooks must also consider the multimodal possibilities of engaging with eBooks. This concept brings us to the question of literacy and what literacy means for those digitally reading today. Understanding the role literacy—specifically new literacy—plays in comprehension and cognitive development may determine what graphic designers must consider when addressing new technology such as interactive enhanced eBooks.

Defining the term new literacy is difficult as there are many perspectives as to what the concept new literacy actually contains. In the position statement of *New Literacies and 21st-Century Technology*, from the International Reading Association, there are four elements that can be applied to current perspectives of new literacies. The following four elements below can be described as concepts of new literacy.

- Internet and other information and communication technology require new social practices, skills, strategies, and dispositions for their effective use
- New literacies are central to full civic, economic, and personal participation in a global community
- New literacies rapidly change as defining technologies change
- New literacies are multiple, multimodal, and multifaceted

These four elements help define what may be considered as areas for new literacy development, however it is the usage of technology that brings much deeper perspectives and definitions. Currently researched perspectives include: behavioral, neurological,
linguistic, psycholinguistic, semiotic, cognitive, sociocultural, feminist, and critical.

Through the guidance of these perspectives and the consideration of the previous four elements, one can begin to gain an understanding regarding what new literacy entails and more specifically, how to best understand the effects of new literacy. This thesis specifically focuses on examining three of the fore mentioned perspectives: behavioral, sociocultural and cognitive. These perspectives were chosen based on their relationship between a user and their experience reading an interactive enhanced eBook.

To begin, let's look at the sociocultural perspective. This perspective can best be described with the following definition; “Those who consider literacy to be an artifact of the culture argue that the nature of literacy is changing” (Baker 2010). As an example, this idea refers to the fact that what was considered guidelines for literacy in previous years may change as the culture changes. For instance, a few hundred years ago, people were considered literate if they could read and write their entire name. Today, as recently stated, being literate requires more skills. New literacy requires much more than being able to use technology. It also includes the ability to utilize and communicate both a cognitive and technical ability through technology. Literacy today means more than the ability to view text on a device such as an interactive enhanced eBook. Instead one must know how to fully use the device to its potential to be considered digitally literate.

Next I will discuss the concept of the behavioral perspective in new literacy research. Researchers Diane Tracey, Alex Storer and Sohrob Kazerounian, who authored *Cognitive Processing Perspectives on the New Literacies*, also believe the abridgement of the traditional definition of thesis-and-pencil literacy is needed. “Expansion of our
literacy schema is required due to the new texts that individuals must navigate to function in the modern world” (Baker 2010).

Due to the expansion of new types of texts, for example; social networks, Internet-based media such as blogs and email, and yes, interactive enhanced eBooks, users must thus develop a familiar understanding of how to use and comprehend through new texts. “With new texts come the new skills that are needed to negotiate them” (Castek, Bevans-Mangelson, & Goldstone, 2006) (Baker 2010).

For instance, lets take the example of learning to read. According to Baker, learning to read is a matter of cracking a code. Thus, learning to read is a type of behaviorism. This theory is explained in the following statement; “Studies that examine literacy as a visual perception process share this basic tenet: children simply need to learn the code. When a child can make the correct sounds represented in a written word, then he can hear the word and make a match between the written and oral word”(p. 9).

To summarize, once the child has mastered the visual stimulus to an auditory response, then it is possible for a child to make sense of phrases, sentences, paragraphs, and stories. Interestingly, research found by Ted S. Hasselbring, author of Reading Proficiency, the Struggling Reader, and the Role of Technology, discusses a similar concept of decoding, “In reading, students first learn the alphabetic principle and use this to decode words, often very laboriously. Through repeated trials, the student will develop a “neural model” of the word and no longer relies on the use of the alphabetic principle” (Baker 2010). Thus, practice could in turn make a better reader. In regards to new literacies and the use of interactive enhanced eBooks, the key is using interactive enhanced eBooks in the most appropriate way. “Rapidly advancing technology offers a
powerful way to scale up instruction and deliberate practice for large numbers of struggling readers” (Baker 2010). Thus, through the use of technology, a perspective of learning can be used to understand how technology can benefit literacy. Let’s consider this concept of using technology to learn to read with the assistance of an interactive enhanced eBook. If, based on Hasselbring’s notions, practice makes a reader more efficient; then how does an interactive enhanced eBook possibly affect enhance reading skills? To answer this question, one should consider the types of interaction providing different levels of engagement-associated with an interactive eBook. If the eBook has the ability to allow a reader to practice their reading in multiple types of ways, one could argue that interactive eBooks could possibly suggest better reading skills.

The final literacy perspective addressed in this thesis is the cognitive perspective. The cognitive perspective according to Baker, suggests, “new literacies require new cognitive and metacognitive abilities not currently considered in literacy education” (Baker 2010). According to this theory, an example such as an eBook, a new literacy, requires users to expand an understanding of elements by considering new ways of comprehending the thought process of learning. For instance, when one is reading an eBook, they may be required to begin reading by making a choice. How would they like to read the eBook? Would they like to have the eBook read to them, would they like to read the eBook to themselves quietly or would they like to record themselves reading the eBook aloud. The choice they make may change the way they interact with the eBook from that point on, thus requiring an understanding of how to comprehend and read the text in different ways. While reading the text is still very important, so are other elements of navigating the eBook such as learning from collaboration with the eBook, expanding
one’s knowledge through visual and audio elements and resulting with the conclusion of understanding the process as a whole.

3.3 New Literacies and Transmedia Learning

While understanding visually how to master the code that is reading with technology, becoming digitally literate encompasses a huge array of other skills as well. According to Baker, “Meaning is made in ways that are increasingly multimodal, in which linguistic modes of meaning interface with other modes of meaning such as visual, audio, gestural, tactile and spatial patterns of meaning” (New London Group, 1996, 2000).

In regards to interactive enhanced eBooks, multimodality represents the ability to gain meaning through the different ways of experiencing the eBook. Many interactive enhanced eBooks contain options for gestural, audio and visual response. Some eBooks allow readers to create their own experience through a series of choices and patterns. In order for the reader to understand how to gain knowledge and truly experience the interactive enhanced eBook, they must become digitally literate in the platforms the eBook contains.

In the article, *T is for Transmedia: Learning through Transmedia Play*, authors Becky Herr-Stephenson, Meryl Alper and Erin Reilly, investigate the evolving role of learning through multimodality. According to their research, multimodality can also be described as transmedia learning. “Within the context of a media saturated, hyper-connected, and rapidly changing world, the concept of “transmedia” has come into the spotlight among those creating and using media and technology for and with children. Transmedia, by itself, means “across media” and describes any combination of
relationships that might exist between the various texts (analog or digital) that constitute a contemporary entertainment media experience” (p. 1).

EBooks represent a perfect example of how important it is to be a digitally literate learner in society. Through the guidance of new literacy perspectives, in specific, behavioral, sociocultural and cognitive; graphic designers can gain a better understanding over how one interacts and reads on an eBook. Consequentially, transmedia and multimodality represent ways readers of eBooks can make connections to additional modes of digital learning and more importantly, connect broader implications and considerations necessary for designers to consider and understand.
3.4 User Experience and Interactive EBooks

User experience is concerned with designing products that are not only easy to use, but also purposeful. There are many ways to define user experience. According to Russ Unger and Carolyn Chandler, authors of *A Project Guide to UX Design: For User Experience Designer in the Field or in the Making*, “User experience design is the creation and synchronization of the elements that affect users’ experience with a particular company, with the intent of influencing their perceptions and behavior” (Unger & Chandler 2012).

Researchers who focus on user experience are concerned with the whole package. They are concerned with the senses of the experience of a product. User experience also includes difficult to measure concepts such as emotion, psychology and overall response. “For interactive enhanced eBooks, user experience is not only concerned with the ease of interaction and emotional response, but also comprehension. The following questions are examples that could be asked to understand user experiences with eBooks: “

Do the animations in an eBook create a memorable experience? Are touch screen indicators easy to understand? Can the users reflect the process of using the product that the designer had in mind? These are all questions successful designers of user experience take into consideration.

Recently, an article published in *Publishing Research Quarterly*, addressed the importance of user experience when engaging with eBooks. The article, titled, *The Engaged Reader*, by Angus MacWilliam discusses the importance of user experience in interactive enhanced eBook design. “The experience must be harmonious between book and cover, and the reading experience will be heightened if both device and contents can
engage the reader on a functional, material, and emotional level as well as a cognitive or experiential level.” Cognitive, functional, experiential, emotional; all of those things create quite a list of things to consider with user experience. However, all of these things are important to create a successful balanced experience. In *A Project Guide to UX Design*, Unger and Chandler discuss the balance in further detail, “To create truly memorable and satisfying experiences, a UX designer needs to understand how to create a logical and viable structure for the experience and needs to understand the elements that are important to creating an emotional connection with the product’s users” (Unger and Chandler 2012).

For example, in the print book, *The Tale of Peter Rabbit* by Beatrix Potter, the graphic designer who created the layout for the book made sure to design it in a way where the imagery supported the text in a balanced and harmonious manner. This same book was recently printed as an enhanced interactive eBook. In the eBook, the graphic designers who created the eBook took into account similar ideas of balance by placing the imagery adjacent to the text. In this way, imagery and text remain separate but equal. In addition, the graphic designers of this eBook considered how to emotionally relate the interactive opportunities provided in an eBook in order to create an overall experience different than the original print book. The designers chose to allow readers the option of interacting with the original imagery by altering the imagery so readers can move the characters. In addition, interactive elements such as leaves falling and animal sound effects support the storyline of the story in the eBook. This eBook along with many others will be discussed further in the upcoming chapter containing the field study for this project. For an visual example of this eBook, please see Figure 2.
ONCE upon a time there were four little Rabbits, and their names were—

Flopsy,

Mopsy,

Cotton-tail,

and Peter.

They lived with their Mother in a sand-bank, underneath the root of a very big fir-tree.
3.5 User Experience & Graphic Design

So far, this thesis has discussed how technology is changing what it means to be literate in today’s world; in addition, a discussion over new literacy and understanding how to attribute new literacy perspectives to current interactive enhanced eBooks has been covered. All of these things have much to do with creating a successful experience for an interactive enhanced eBook. However, the question over how graphic designers fit into the mix is yet to be determined. In this next section, a discussion between user experience theories and their possibilities with interactive enhanced eBooks will be explored. To properly explore this concept, a discussion covering design considerations will be addressed. In the book, Emotional Design: Why We Love (Or Hate) Everyday Things, written by design educator and researcher, Donald Norman, research over why users respond to certain types of design is explained. According to Norman, there are three levels of design: Visceral, Behavioral, and Reflective. In the next section, each of these levels will be explained in further detail.
3.6 Visceral, Behavioral, Reflective Experience

To begin, let's discuss the concept of **visceral design**. Visceral design, according to Norman, can be described as how design is perceived visually. For example, “When we perceive something as “pretty,” that judgment comes directly from the visceral level,” (p. 66). Visceral design is especially important when designing for interactive enhanced eBooks.

For instance, to capture and keep the attention of a reader, a designer may consider creating a design that enhances a positive reaction toward the content of the eBook. Norman argues that attractive and beautiful design has an effect on how a user interacts with the product. According to Norman, “Attractive things make people feel good, which in turn makes them think more creatively” (p. 19).

Thus, visceral design should be considered in the creation of eBooks in order to appeal to the reader initially while also creating a lasting impact on the reader post-interaction. Through the inclusion of visceral design at the aesthetic level, the physical features such as the look, feel and sound of the eBook overall create an interactive experience. Good visceral design creates a positive affect and engagement with the eBook. Norman continues, “Positive affect arouses curiosity, engages creativity, and makes the brain into an effective learning organism” (p. 25).

To continue, **behavioral design**, according to Norman is, “all about use” (p. 69). He continues to explain that appearance doesn’t really matter with behavioral design, but instead performance is the focal point. Norman says that the first behavioral test for a product must be to pass whether it fulfills needs. For those whom are reading an interactive enhanced eBook, a function that must be considered is whether or not the
eBook portrays information in a clear and understandable manner. In short, readers need to be able to crack the code of reading on an interactive enhanced eBook much like they would decode the ability to read from a visual perception for behaviorism. In addition to understanding how to use a product, behavioral design is also important for product feedback. In the example of an interactive enhanced eBook, one must be able to understand the usability of the eBook. Does the reader know how to navigate the eBook? Does the eBook provide proper guidelines and signals when experiencing the eBook? These are all things that must be considered when designing with good behavioral design in mind. If these are ignored, the process of creating a positive engagement could be compromised. “Confuse or frustrate the person who is using the product and negative emotions result. But if the product does what is needed, if it is fun to use and easy to satisfy goals with it, then the result is warm, positive affect” (p. 37).

Finally, reflective design is defined as “all about message, culture and the meaning of a product or its use.” According to Norman, it is about the meaning of things, the personal remembrances something evokes. What one person perceives in reference to a product or thing is different from what another person may perceive for the same product or thing based on that person’s personal experiences. “The visceral and behavioral levels are about “now,” your feelings and experiences while actually seeing or using the product. But the reflective level extends much longer—through reflection you remember the past and contemplate the future” (p. 37). Thus, reflective design is about how the eBook is reflected in the mind of the beholder and through self-image. If a person, for example perceives reading an eBook as a privilege and something to be excited about, they would then reflect on the cultural significance of this privilege and
react positively to having the opportunity to engage in an eBook. In a similar circumstance, Norman uses the example of video games and the visceral, behavioral and reflective qualities of designing for video games. Many video games are designed with a focus demographic of young excitable males. However, Norman argues, for video games to become more successful and attractive to a larger audience, the visceral, behavioral and reflective design for current video games must be considered.

The potential ability for current video games is relatively untapped. According to Norman, video games could be “excellent teaching devices” (p. 43). In playing video games, users are often tasked with the challenge of learning a variety of skills and knowledge. Video games have the possibility to reflect meaningful topics and could be designed to appeal to a larger audience.

Norman suggests that viscerally, the physical appearance of video game consoles and controllers should have different designs to reflect a more serious and professional approach in order to appeal to the education market. Behaviorally, the emphasis of playing the game should be on content and not continuously on fast reflexes. Finally, reflectively the concept of video games needs to be advertised as a powerful learning tool and not solely as a device that rewards fast reflexes.

To take this idea and consider it for interactive enhanced eBooks, one should also consider the visceral, behavioral and reflective aspects of the eBook in order to create a successful, purposeful, and positive experience for the user. This concept will be discussed further in the conclusion toward the end of this thesis.
3.7 Comprehending Reactions Toward Enhanced EBooks

Currently, there is much debate over whether interactive enhanced eBooks are a positive addition to the school curriculum. Concerns exist over the possibility interactive elements are distracting to learning comprehension. “The recent flurry of articles about the potential development perils of eBook use by the young, stems from a very natural fear of the unknown,” said Nicole Deming, a spokesperson for the Children’s Book Council, a New York-based trade association for children’s book publishers. “At this stage, there simply aren’t studies we can point to on the effects of this technology” (p. 1).

In recent research found in the article, *Print Books vs. E-Books* from Cynthia Chiong, Jinny Ree, Lori Takeuchi, and Ingrid Erickson (from The Joan Ganz Cooney Center) a study was performed that researched what outcomes co-reading on a print book vs. an enhanced eBook created for a parent and child.

In the study, 32 pairs of parents and their 3-6 year-old children read a print book and an eBook together. The study focused on the recollection of content and story in addition to conversations between the parent and child and overall engagement with the eBook. According to study results, children who read the eBooks and primarily the enhanced eBooks were shown to have a distraction from the storyline of the eBook. “Both types of eBooks, but especially the enhanced eBook, prompted more non-content related actions (e.g., behavior or device focused talk, pushing hands away) from children and parents than the print books.”
In contrast, there is much support for eBooks as well. For some, the question is not whether or not children are learning, but what they are learning. “Some transmedia experiences for children are designed with learning objectives in mind; for others, learning is not an explicit goal. However, even without overt “educational content,” transmedia offers numerous opportunities for learning” (Herr-Stephenson, Alper, Reilly 2013). Please consider the study by Chiong, Ree, Takeuchi, and Erickson. As mentioned previously, this study reflected positive outcomes for eBooks as well as mixed reactions. For example, in reference to the experience of the book, “When measuring child-book engagement (e.g., direct attention, touch), more children showed higher levels of engagement for the eBooks than the print books, though a majority were equally engaged by both book types. Children also physically interacted with the enhanced eBook more than when reading either the print or basic eBook.” In regards to memory recollection and storyline facts, the study produced mixed results. According to Chiong, Ree, Takeuchi, and Erickson, “Children who read enhanced eBooks recalled significantly fewer narrative details than children who read the print version of the same story.” However when it came to recalling storyline elements of the story, “Across all book formats, children performed nearly equally when asked to explain a critical element in the story.” So what does this data mean? Why did children who were asked specific details about a story; not do as well with enhanced eBooks in comparison to low-level enhanced eBooks or print books? The study concluded graphic designers need to follow the following guidelines when designing for eBooks.

“Exercise caution when adding features to enhanced eBooks, especially when those features do not directly relate to the story. EBook enhancements should also be designed
in a way that allows parents to access and control settings to customize the co-reading experience with their children” (Chiong, Ree, Takeuchi, and Erickson 2012).

For designers creating a transmedia environment through interactive enhanced eBooks, it is important to stay focused on what features are necessary. “Transmedia, done well, can contribute to an immersive, responsive, learner-centered learning environment rich with information and linked to children’s existing knowledge and experiences. It can build upon what children already know about playing games, telling stories, and sharing media” (Herr-Stephenson, Alper and Reilly 2013).
3.8 The Eight Golden Rules of Interface Design

American computer scientist and professor, Ben Shneiderman, conducted significant research in the area of human-computer interaction. According to Shneiderman, “The old computing was about what computers could do; the new computing is about what users can do” (Shneiderman 2003). In his book, *Designing the User Interface*, he lists eight golden rules of interface design. Those rules are listed in below:

1. **Strive for consistency.**

   Consistent sequences of actions should be required in similar situations; identical terminology should be used in prompts, menus, and help screens; and consistent commands should be employed throughout. As an example, we discussed the concept of visceral design suggested from researcher Donald Norman. With visceral design, a successful product is consistent in the look, feel and overall aesthetic appeal of the product. This same concept works for eBooks. EBooks that create a cohesive aesthetic experience may be more successful than eBooks that do not have consistent qualities throughout.

2. **Enable frequent users to use shortcuts.**

   As the frequency of use increases, so do the user's desires to reduce the number of interactions and to increase the pace of interaction. Abbreviations, function keys, hidden commands, and macro facilities are very helpful to an expert user. In regards to this element, eBook creators need to consider the navigational aspects of the eBook. How does the eBook create a behavioral response toward using the eBook? Is there a shortcut
to getting back to the home page of the eBook, what about additional shortcuts such as the help key, word response and other important eBook characteristics?

3. **Offer informative feedback.**

For every operator action, there should be some system feedback. For frequent and minor actions, the response can be modest, while for infrequent and major actions, the response should be more substantial. This rule works well with rule number 2 in that it helps the user understand the usability of the eBook. Many successful eBooks have found that by creating sound, animation and color response, one can better navigate the eBook. For instance, if a user is confused as to how to turn the page of an eBook, an animated page turn motion would work as an appropriate indicator for this engagement.

4. **Design dialog to yield closure.**

Sequences of actions should be organized into groups with a beginning, middle, and end. The informative feedback at the completion of a group of actions gives the operators the satisfaction of accomplishment, a sense of relief, the signal to drop contingency plans and options from their minds, and an indication that the way is clear to prepare for the next group of actions. For eBooks that have an initial end to them helps the user understand that the experience is over. For example, something as simple as text that reads “The End.” will help the user understand that the eBook is finished. These qualities, although they may seem to be common sense are very important. Unlike print books, eBooks do not have the feel and weight of a print book that indicates the book is over. Instead, eBooks must rely on the visceral qualities that indicate the finality of the eBook in a digital manner.
5. Offer simple error handling.

As much as possible, design the system so the user cannot make a serious error. If an error is made, the system should be able to detect the error and offer simple, comprehensible mechanisms for handling the error. This rule relates directly to the behavioral and reflective qualities of the eBook. A good example of simple error handling in eBooks is the parental control element found in many eBooks. A lot of eBooks are geared toward young children. In addition, many eBooks are purchased online with a credit card. Successful eBooks are encouraged to consider the possibilities of mistakes, such as deleting the eBook or accidentally buying additional eBooks on a parental credit card. By creating ways to prevent these problems from occurring, for instance, with a parental programmed code or a password, the eBook is thus more successful in this category.

6. Permit easy reversal of actions.

This feature relieves anxiety, since the user knows that errors can be undone; it thus encourages exploration of unfamiliar options. The units of reversibility may be a single action, a data entry, or a complete group of actions. This rule is similar to rule number 5, however it deals with the aftermath if the possibility a mistake is made. Take for example, a reader who accidentally jumped ahead in the eBook due to a mistake in gesture. A successfully designed eBook would allow an option to go back a page, skip to a page, or go back to the beginning. By considering the possibility of users making mistakes while reading an eBook, the designers can create solutions for a problem before the problem begins.
7. **Support internal focus of control.**

Experienced operators strongly desire the sense that they are in charge of the system and that the system responds to their actions. Design the system to make users the initiators of actions rather than the responders. This rule explains the importance of choice. In the section on new literacy perspectives, we discussed the concept of cognitive theory and the example of having the ability to choose how to read the eBook. Choices include reading the eBook quietly and to oneself, having the eBook read to them or recording one’s own voice. By giving the user a choice, Shneiderman’s rule number 7 suggests, the users will have a “sense that they are in charge of the system and that the system responds to their actions” (Shneiderman 2003). This same idea works when allowing users to turn off and on the music and sound in an eBook.

8. **Reduce short-term memory load.**

The limitation of human information processing in short-term memory requires that displays be kept simple, multiple page displays be consolidated, window-motion frequency be reduced, and sufficient training time be allotted for codes, mnemonics, and sequences of actions. This rule refers to the understanding of how to use the eBook from the beginning and throughout the experience. If visceral displays are kept simple and to the point, if behavioral navigation is cohesive and comprehensive and if the overall reflective experience of an eBook is positive and without confusion; an eBook that contains all of these qualities would additionally be labeled a success based on rule number 8. The next chapter will focus on interactive elements found in current enhanced interactive eBooks.
With these rules in mind, designers can work to design effective interface interaction. An interactive enhanced eBook is an interface with many elements of interaction to consider.

### 3.9 Literature Review Summary & Conclusion

In summary, in order to gain a more complete understanding of eBook design, one must have a knowledgeable comprehension of new literacy theories and user experience. With the knowledge gained from these areas of research, one will have a better grasp of the usability and theoretical impact eBooks have on current society. In addition, while current opinions of eBook usage is conflicting, this thesis suggests more research is needed to best understand the future impact of eBooks. Thus, eBooks and graphic design for eBooks is an area of much needed research.
CHAPTER 4 METHODS & PROCEDURES

4.1 Introduction

This section contains research undertaken to begin to better understand the current types of interactive enhanced children’s eBooks available on the market. A field study of existing eBooks, their interactive elements and an observational case study of children reading a current interactive enhanced eBook were methods used. The following sections detail the results and procedures utilized for each.

4.2 Field Study

In the field study, current popular children’s eBooks and their interactive elements of gesture, sound, word recall, reading choice and animation were analyzed. The selected titles were taken from a 2014 list posted on the website, www.bestinteractiveebooks.com. In addition, a few of the eBook titles were cited in the article, 12 wonderful, interactive children's books for iPad and iPhone, posted in www.phonearena.com. In the article, eBooks that are specific to iPad and iPhone are suggested. Each of the eBooks in the field study had the following criteria in common:

- Early reader: ages four to eight
- All eBooks studied included at least three of the following interactive elements: gesture, sound, word recall, reading choice, and/or animation. Each of these elements are defined below:

  - Gesture – gestures are categorized as a usable function. Gestures include the ability to turn pages, zoom in, zoom out, and create functionality when
reading the eBook. For the purpose of this study, gestures are associated with the gesture technology level present in an iPad.

- **Sound** - sound in interactive eBooks can be categorized as effects, music and voice recording.

- **Word Recall** - word recall is an interaction that supports reading comprehension and pronunciation. With this interaction, readers can choose to hear a printed word in the text. In addition, word recall also works as a highlighting option that may help the reader follow along with the reading of text if the eBook is being read to them.

- **Reading Choice** – this interaction allows readers to choose whether they want to have the eBook read to them, if they want to read the eBook quietly or if they would like to record themselves reading the eBook out loud.

- **Animation** – Animations fall into two categories with eBooks. The first category represents animations of which are independent and play automatically without response from the reader. The second category represents animations that respond to the reader’s direction. For example, in an eBook that includes a game, the user may choose to play the animation or ignore and move on to the next interaction.

Figure 3 shows icons created to represent the different interactions associated with this thesis and study. These icons are shown in other figures in this thesis.
4.2.1 Group Categorization

After careful consideration, I separated the eBooks in this field study into three different categories. Based on current research the following categories represent the different groups of eBook interaction:

- Interaction Through Play (Group 1)
- Interaction Through Participation (Group 2)
- Interaction through Comprehension (Group 3).

These categories were created in the following steps. First, I listed the types of interactions contained with each eBook in the field study. Next, I analyzed the specific interaction and how it was utilized when reading the eBook. After the eBook interactions were organized, specific groups began to form. For example, nearly all of the eBooks in the field study include some sort of touch or tap interaction. However, only a few eBooks include touch or tap interactive games for the reader to engage with. The eBooks that contained games were considered to be more directed toward interactive play and entertainment. As an example, consider the eBook, *Cosmo’s Day Off*, by Ayers.
Animation. *Cosmo’s Day Off* contains the following interactive elements: Gesture, Sound, Reading Choice and Animation. More specifically, this eBook contains the interactive gesture of touch, interactive sound that is predominantly dominated by sound effects and interactive reading choice that includes the option to read silently, have it read to the user or record the reader’s voice. Finally, this eBook contains animation that plays automatically without direction from the reader. The games associated with this eBook are touch interactive and do not directly relate to the storyline of the eBook, thus they are considered additional elements with entertainment properties.

In the second category, that of participation, eBooks varied in interactive elements. However, one key element each of these eBooks contained was the concept of breaking the fourth wall. In this concept, a character or the narrator in the eBook talks directly to the reader to encourage them to participate in the eBook. These eBooks contain a storyline that does not divert from the original focus. This is in contrast to the first category; play. In the first category, the storyline of the eBooks divert from the initial direction due to the inclusion of games and automatic animations.

Finally, in the third category, comprehension, all eBooks contained the interactive categories of reading choice, and controlled animation. These eBooks allowed the reader to choose how they preferred to read the eBook. Thus, readers had the ability to interact with the eBook elements at their leisure. In addition, all of the interactive elements associated with the eBooks in the third category supported the storyline of the eBook. For example, in the eBook, *Alice In Wonderland*, by Lewis Carroll, the interactions reflect the text. When Alice shrinks or grows after drinking the bottle in the story, readers have the option to change Alice’s size via an interactive element of touch.
4.2.2 Group 1: Interaction Through Play

This group contains the following criteria;

- Primary purpose is to encourage play, exploration and entertainment.
- Include sounds, animations and visually stimulating movement.
- Interactions do not directly relate to the text of the story.

For some eBooks, the experience is not overtly focused with learning objectives in mind. Instead, some eBooks provide interactions to be a responsive overall experience complete with immersive connections associated with the storyline of the eBook. In interactive experiences such as these, the user is experiencing through interactive play. According to researchers, Becky Herr-Stephenson, Meryl Alper and Erin Reill, authors of the article, *Learning Through Transmedia Play*, “play can support new approaches to reading across media, helping children develop broad literacy skills necessary to navigate a media-saturated society; second, transmedia play can foster co-learning among children, peers, parents, and other adults through joint media engagement (Takeuchi & Stevens 2011); and third, transmedia play can encourage learners to construct understanding and draw complex connections between information, leading to learning that is deeply meaningful” (p. 10).

Thus, interactive play and transmedia play may have an effect on the interactive responses from the reader of an eBook. For example, in the eBook, *Leonard*, created by Ink Robin Bookshelf, readers have the option to play games with Leonard and his cat while they explore the country around them. This eBook contains games and visual animations that encourage the reader to play with the eBook. An example is when Leonard and his cat are lost in the forest. Readers have the option to capture and smash
bugs through the interactive element of touch. Please see Figure 4 for a visual representation of this interaction.

Source: Leonard, by Ink Robin Bookshelf
Figure 4 eBook Example for Play
4.2.3 Group 2: Interaction Through Participation

This group contains the following criteria

- Primary purpose is to encourage participation
- Include multiple types of gestures, audio response & narrative
- Interactions do not directly relate to the text of the story

Much of the interaction through play, as discussed in Group 1, focuses primarily with the reader playing with the eBook. In Group 2: interactive participation, readers must first participate before moving on to the next page of the eBook. An example of this element is found in the eBook, *Sid the Science Kid*: from the Speakaboos story app. In this eBook, Sid the Science Kid is interested in learning how animals communicate. The story follows Sid as he talks to others in his community about animals and their communication abilities. At numerous times in the eBook, Sid looks to the reader and asks the reader what they think about a question. In this example, Sid is breaking the fourth wall so to speak and thus encouraging the reader to become an active part of the story. Please see Figure 5 for a visual representation of this example.
Source: Sid the Science Kid, by Speakaboos Story App

Figure 5 eBook Example for Participation
4.2.4 Group 3: Interaction Through Comprehension

This group contains the following criteria

- Primary purpose is to focus on reading comprehension and understanding of facts.
- Include word recognition with touch and sound response
- Interactions directly relate to the text of the story

All of the groups discussed thus far have encouraged interaction through play or by participating and becoming a part of the story. In Group 3, interaction through comprehension, more focus is directed toward the text of the eBook. In these eBooks, interactive elements exist as part of the story but do not direct the flow of the story or suggest readers to become a part of the story. Instead, readers of eBooks with a comprehension-focused interaction are reading the eBooks much like they would a print book. However, interactive elements exist to encourage further comprehension of the subject matter of the eBook.

In addition, most of the eBooks in Group 3 contain the interactive element of word recall. As an example, words light up or change color as they are being read to the reader. In the eBook, *Green Eggs and Ham*, by Dr. Seuss, words light up when touched and will be suggested to the reader if they need help understanding the pronunciation of a word when reading to themselves. For a visual representation of this example, please see Figure 6.
Do you like green eggs and ham?

Source: Green Eggs and Ham by Dr. Seuss
Figure 6 eBook Example for Word Recall
4.2.5 Conclusion of Field Study

Through the categorization of eBooks into the groups of play, participation and comprehension, graphic designers can better understand what types of interactive elements can be associated with the purpose of a specific eBook. For the purpose of this field study, eBooks were broken into distinct groups in order to foster a better understanding of the three main intents of eBooks in communicating with their readers. However, it is important to note that subcategories may exist in addition to the three proposed categories. For example, in the first category; play, all eBooks that contained game elements were grouped into one category. However, this category could be broken into subcategories. Examples include interaction through play with learning games, interaction through play with reflex games, and interaction through play with creative games. Subcategories were not described in this field study due to the amount of eBooks analyzed. However, future investigations may include sub-categories that could benefit graphic designers, educators and consumers. With the knowledge gained from this field study graphic designers can understand how to better create a purposeful interactive experience for the reader and client. To view an overview of all eBooks in their group categories and their associated elements, please see Table 1.
Table 1: All Groups

<table>
<thead>
<tr>
<th>eBook Title</th>
<th>Gesture</th>
<th>Sound</th>
<th>Word Recall</th>
<th>Reading Choice</th>
<th>Animation</th>
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<tr>
<td>Cozmo’s Day Off by Ayars Animation</td>
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<td>Leonard by Ink Robin Bookshelf</td>
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<td>Nighty Night by Fox and Sheep</td>
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<td>Monkeys in My Head by Paperplane Co.</td>
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<td>Sid the Science Kid by Speakaboos</td>
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<td>National Geographic Insects by Robin Bernard</td>
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<td>The Monster at the End of This Book by Jon Stone</td>
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<td>On the Night You Were Born by Nancy Tillman</td>
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<tr>
<td>Green Eggs &amp; Ham by Dr. Seuss</td>
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<tr>
<td>The Tale of Peter Rabbit by Beatrix Potter</td>
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<tr>
<td>Green Goo by Terri Rowe, MeeGenius App</td>
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<tr>
<td>Alice in Wonderland Lewis Carroll</td>
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4.3 Introduction to Case Study

This study was conducted to better understand how young readers are interacting with eBooks at the early reading level. Through this study, graphic designers may gain insight into how the interactions they create are experienced for young readers. The primary focus of this study is concerned with interactivity, in specific, the purpose is to gain a more extensive understanding over what types of interactivity children are most engaged with when reading an eBook. According to the article, *A Typology for Observing Children’s Engagement with eBooks at Preschool*, “While existing research provides some descriptive evidence of young children’s engagement behaviors with traditional storybooks that informs early literacy pedagogy (e.g., the design of quality early literacy materials), the body of research on children’s engagement with eBooks is rather thin.” (p. 47).

Thus, this case study provides new insight into how children are truly engaging in interactive enhanced eBooks. Through the analysis of this case study, researchers can begin to gain a better understanding over how young readers are engaging with, responding to and overall taking away from the experience when engaged with enhanced eBooks. The participants in this case study represent a small sample of the youth that may be effected by eBook engagement both now and in the future. This case study provides new knowledge to benefit many. In specific, graphic designers, educators, and parents/guardians can gain specific information over how young readers are beginning to read with modern technology.
4.3.1 Background on Case Study

Nine participants were observed reading the eBook, *The Monster at the End of This Book*, by Jon Stone. All participants were enrolled as full-time kindergarten students. During the study, participants were observed in a comfortable setting familiar to them. Participants were asked to read the eBook in a quiet conference room where the researcher did not interact with subjects to best document natural behavior and emotional response in their reading of the eBook. In addition, participants took part in this study during their reading and language arts time so as to not disrupt from already scheduled studies. Participants were asked to read the eBook on an Apple iPad that was provided for them.

*The Monster at the End of This Book* was chosen for many reasons. First, this eBook was one of the twelve eBooks studied in the field study. This eBook falls into Group 2, focused on participation. Originally a popular print book; this book was published by Golden Books in 1971. At the time of publishing, this book was ahead of the curve in creating an experience for the reader. Throughout the story, the main character, Grover, is continuously interacting with the reader through printed dialogue with anticipated response and participation from the reader. In addition to being a fun and enjoyable experience for the reader, this eBook was chosen for this study due to its transmedia appeal. The main character, Grover, is a well-known character on the children’s television series, *Sesame Street*. *Sesame Street*’s first episode aired in 1969. The television series is known for its transmedia tendencies. “Much has been made of the ways that Sesame Street reinvented children’s television, embracing rather than running away from the properties of its medium, incorporating tricks from advertising, parodies
of popular culture, songs and skits, into something which encouraged the active engagement of its young viewers” (Herr-Stephenson, Alper and Reilly 2013).

Part of what makes this eBook appealing to children is the fact that many children know who Grover is before reading the book. They know his story, his personality and as a whole, can relate to him. Recently, Sesame Street has taken its transmedia ways to the digital age and created the eBook version of *The Monster at The End of This Book*. The eBook is similar to the print book in aesthetic value and storyline. However, the eBook includes additional interactive elements such as animation, interactive play, participation, gesture, page turns and word interaction.

Finally, while this eBook contained appealing elements as described in the field study, this eBook also fits with the usability guidelines proposed by Ben Shneiderman. As stated earlier in this thesis, Shneiderman’s eight golden rules of interface design layout rules for graphic designers to follow in order to create an effective user experience when engaging with a product. This eBooks follows many of the Eight Golden Rules of Interface Design. This concept will be explained further in this thesis. Please see Figure 7 for a visual representation of the eBook.
Figure 7 The Monster at the End of This Book

Source: The Monster at the End of This Book, by Jon Stone
4.3.2 Testing Procedure Set Up

With the permission gained from the elementary school authority, (Appendix D) participants were allowed to participate in the study as volunteers. The participants were provided an informed parental consent form informing them that their participation was voluntary and that they could withdraw from the study at any time. In addition, the parental consent form explained to the participants that their participation would remain anonymous. (Appendix A) Only participants with signed parental consent forms were allowed to participate in the study.

In addition, participants and parents/guardians were provided a cover letter explaining the purpose of the study, the usage of the technology and an explanation of the screen-recording app, AirPlay. Each participant was provided two copies of the parental consent. One copy was for them to keep for their records with an additional copy to be returned to their kindergarten teacher prior to the performance of the study.

During the study, participants engaged with the eBook while the principal investigator documented the interaction between the participant and the eBook. Interactions that were observed included emotional reaction and behavior while reading the eBook.

In addition to observational documentation, a screen-recording app called AirPlay allowed the principal investigator to gain quantitative data covering time spent with the interactions within the eBook screen. Sound was not recorded throughout the study so as to keep anonymity for the participants in addition to allowing the research to focus primarily on interactive time and movement on the screen. These interactions included but were not limited to, gestures and page turns, interactive play, word recognition and touch, and eBook navigation.
4.3.3 Participants

Overall, a total of nine participants participated in this study. In order to have the most accurate results, participants were based on an early reader demographic. Participants were required to be of kindergarten age of who attended kindergarten full-time. Participants volunteered at random and did not have any known prior association with the eBook chosen for the study. In addition, participants needed to have a signed parental consent form in order to participate in the study. Participants were asked to participate during the reading and language hour of their school day so as to not disrupt the regular schedule of their learning environment.

4.3.4 Testing Environment

To ensure an accurate testing environment, participants were tested in their elementary school in a room they were familiar with. In this room, a participant was asked to sit at a table and read the proposed eBook on an iPad tablet provided for them. The room used for the study was a multipurpose room used for small meetings. In addition, the room was within sight of the kindergarten classroom where the participant attended. These classrooms were easily visible due to large windows located on two sides of the testing room. The testing room contained two large windows that looked out into the main hallway where each classroom connected. Participants were observed from the primary investigator from afar so as to not influence the participant or alter the testing environment. Participants had the option to leave the testing room whenever they were finished reading the eBook, at which time they were asked to return to their normal classroom activities. An Apple Macbook Pro laptop was placed within the room in order
to record the iPad screen with the Airplay app. Participants had the option of holding the iPad, putting the iPad on the table or choosing to use the iPad kickstand.

### 4.3.5 Proposed Observations

The eBook chosen for this study fits into Group 2, participation, as stated in the field study. Due to the elements discussed in the field study, it is proposed that participants will respond positively to the participation interactions in this eBook. As previously stated, Group 2, participation, contains the following criteria:

- Primary purpose is to encourage participation
- Include multiple types of gestures, audio response & narrative
- Interactions do not directly relate to the text of the story

In addition, this eBook contains many of the Eight Golden Rules proposed by Ben Shneiderman that suggest good interface design. These rules include:

- **Strive for consistency** - throughout the eBook, consistent style, navigation, prompts and commands are observed.
- **Offer informative feedback** - this eBook offers informative feedback in many ways. For example, if a reader takes more than the normal time to turn a page for navigation, the main character in this eBook reminds the reader where the navigation is located in order to turn the page and continue engaging in the eBook.
- **Offer simple error handling** – this eBook provides the reader with the ability to return to a home page and begin a new page at any time while
reading the eBook. Thus, allowing the ability for the reader to handle an error.

- **Support internal focus of control.** – this eBook allows the reader to interact at their own pace and decide when to continue with the eBook. By allowing the readers a choice in their experience, this eBook suggests good focus and control over the interface.

- **Reduce short-term memory load.** – Finally, this eBook consistently reminds the reader how to read the eBook and continuously engages the reader in the storyline of the eBook. Thus, the reader is not posed to remember details on usability but is able to instead focus on the engagement with the story shown in the eBook.

Conclusively, this eBook also contains elements suggested from researcher Donald Norman as guidelines for good emotional design. The eBook is designed in an aesthetically pleasing manner and thus would fit with visceral design qualities. In addition, this eBook is designed to be used in a simple and effective manner as shown with its high consideration of the Eight Golden Rules of Interface Design, thus creating a behavioral design success. Finally, this eBook is designed to culturally connect with the reader through it’s inclusion of transmedia qualities thus suggesting reflective design qualities were considered in the creation of this eBook. With all of these characteristics considered, it is proposed that the readers will respond emotionally positively to the engagement of this eBook, in addition, participants will spend more time on interactive pages that contain the most interactive elements.
4.3.6 Case Study Observation Analysis

During the case study, participants were observed while engaging in the eBook. Observations focused on the emotional and behavioral reactions to interacting with the eBook. In addition, the principle investigator observed how participants reacted to the interaction categories of gesture, word recall and animation. Finally, additional observations focused on the participant’s ability in understanding how to operate the interactive elements associated with the eBook. The main elements observed for this case study include the following list:

1.) **Response** – the main character of this eBook asks the readers to respond verbally at many times during the text. Response, while not a physical interaction is listed due to the cognitive impact suggested with this interaction.

2.) **Sound** – for this eBook, sound represents the music, effects and narration showcased in the eBook.

3.) **Animation** – this eBook does not include animation that can be altered by the participant, however animation is shown as a result of the participant interacting with the eBook to further the story.

This list provided a guideline for the principal investigator while observing the participants, however additional observations were also noted. This will be discussed further in this thesis.

To begin, the first observation noted by the principal investigator focused on the initial reaction to using the eBook. Overall, 77.8% of participants reacted positively to the eBook with little to no confusion as to how to navigate all interactive elements associated with the eBook. The remaining 22.2% of participants responded with initial confusion.
over how to use basic eBook techniques such as gestures and touch interaction. However, 100% of participants quickly learned through trial and error within a few minutes of interaction with the eBook. For more detailed information, please see Figure 8.

Additionally, emotional reactions toward the engagement with the eBook were also observed. Among those reactions include the following:

1.) Was there a positive or negative reaction when engaging with the eBook? For example, did the participant appear emotionally happy, sad or indifferent when engaging with the eBook?

2.) Was the participant overall responsive and engaged with the interactive experience?
3.) Were the participants willing to respond to the interactions suggested by the eBook?

Overall, 100% of participants reacted with a positive reaction to interacting with the eBook. Observations include giggling, smiling and laughing while engaging with the eBook. The principal investigator observed that participants who initially appeared shy and reserved continued to react to the eBook in an emotionally positive manner. It is noted that 44% of the participants asked if they could read the eBook again, thus suggesting a strong enjoyment toward the time spent engaging with the eBook. For further explanation of this observation, please see Figure 9.

### Observation Sampling

- Happy laughs, smiles
- Giggles and touches pages, says “funny!”
- Eagerly waits for the next page
- Laughs at scenes with interaction
- Grins when sound effects happen
- Lots of smiling
- Laughs at Grover Character
- Sits back and enjoys
- Enjoys playing with the interactive pages
- Asked “Can I read it again?”

Figure 9 Emotional Reaction Observation
Finally, the principle investigator observed the reactions of the participants in regards to response to participation with character interaction. 77.8% of participants reacted to the conversation interaction suggested by the eBook’s main character in the story. All participants who interacted responded by vocally commenting, answering questions or repeating what the main character said. Since this eBook fits into the category of Group 2, participation, it is suggested that the goal of the eBook is to encourage participation and interaction between the eBook and the reader. Thus, this data proves that the eBook was successful in this interactive element. For a more detailed explanation of participation responses, please see Figure 10.

**Observation Sampling**

- “This is a funny part.”
- He (Grover) said, “mommy” “This is a funny book.”
- “No, I told you.” – to Grover
- “He (Grover) is a scaredy cat”
- “Now I can do it!”
- Laughs at knots “What’s next?”
- Vocally says, “No he didn’t”
- Vocally says, “I swept the bricks”
- Reads out loud, “Loading”
- “That always works.”
  (in response to interactive pages)

Figure 10 Reaction to Participant Interaction
4.3.7 Observational Case Study Conclusions

Ultimately, the principle investigator observed many qualities of the study that may be possible to research in the future. These observations include a response to share the interaction with others, the usability of gesture in regards to navigation of the eBook and the variation in response toward the iPad of which the eBook was read. Additionally, many participants responded to the sound and animation elements with vocal response and outloud reading.

To begin, the principle investigator observed many of the participants looking for an outside response when they succeeded in an interaction with the eBook. For example, when a participant completed the task of touch interaction on a heavily interactive page, many participants would delight in their success and would look up to see if they could share what they completed with someone not associated with the eBook. This observation suggests that further research could be covered regarding how eBooks may open communication between a reader and other individuals—potentially fostering a positive peer-to-peer learning environment with technology. The observation made by the principle investigator challenges the assumption that eBooks are a deterrent from the reading relationship between a parent/guardian and child. Instead, this observation suggests properly designed eBooks could support reading relationships between parent/guardian and a child. Please see Figure 11 for written observation examples for this observation.
Additionally, the principle investigator noted that participants varied in how they interacted with the iPad device when reading the eBook. While some participants preferred to hold the iPad in their hands like a traditional book, others decided to use the iPad kickstand and watch the eBook with the iPad perched on the table. At times, the iPad kickstand appeared to be a distraction for the participants who chose to hold the iPad to read the eBook. This suggests further research to be completed over how young readers are responding to the overall experience of reading on a tablet device.
For additional examples documenting this observation, please see Figure 12.

**Observations**

- Puts down iPad flat
- Holds up hand to touch iPad
- Chooses to hold iPad in two hands
- Places iPad on table and watches the screen
- Holds iPad very close to their face

Figure 12 Additional Observation: iPad Handling

Further, it was observed that nearly all of the participants chose to gesture with a slide technique instead of touch when navigating the eBook pages. This did not deter from the navigational abilities of the eBook as the slide gesture also works with the navigation. It is noted, however, the eBook was designed to navigate through a touch gesture. This observation poses the question for how and why young readers prefer certain types of gesture for navigation as opposed to others. Figure 13 shows this observation in addition to other navigational and gesture observations.
Observations

- Ready to touch screen
- Continues to slide instead of touch
- Touches Grover first
- Slides page corner
- Touches the other corner until Grover tells him to touch the correct corner
- Knew immediately what place to touch
- Already turning pages before told because the participant is excited
- Tries to turn page sometimes before it is time
- Accidentally brings up keyboard but knows how to put it back
- Touches Grover and then figures out what to do.
- Not sure how to turn pages initially
- Tickles Grover with 2 hands
- Touches knots immediately on interactive pages
- Touches words to hear them again
- Continues to slide for more pages
- Understands page turn
- Doesn't really get the recall
- Does not want to turn the pages (at first)
- Taps at wall
- Tries to touch other parts of the page, nails and tools
- Tries to turn page sometimes before it is time
- Touches “Please” 3 times, Touches “Monster”
- Confused at first for brick wall but quickly learns
- Already touching nails before it is put together.
- Uses one hand to gesture
Finally, many participants responded with a vocal response toward the animation and sound created from the highest interactive pages. Examples include the vocal responses toward the sound and animation such as an increased level of laughter, physical pointing toward the eBook animation and an overall sense of delight shown in the facial expressions of the participant. It is important to note that the principle investigator observed that this reaction was unanimous amongst all participants in the study.

One participant did not understand the language portrayed in the eBook as English was not their first language, however even for this participant, the interactions of sound and animation were enough for them to understand the eBook and respond in a proper manner. Examples include this participant’s positive emotional response toward the eBook and the ability for this participant to successfully navigate the eBook even though they did not speak English well. This observation suggests further research over how eBooks could affect reading across language barriers.

Conclusively, the qualitative data observed from the principle investigator provided solid groundwork to consider additional studies in the future. When considering the overall variety of observations, the amount of data acquired from the observation is successful in providing insight into how interactions in an eBook are being perceived from participants. Figures 14 displays a list that shows many of the response vocalizations from the participant toward the eBook.
Observations

- Says the words out loud “Me”
- Participant is talkative
- Laughs a lot, like scenes with interaction and sound
- Responds to Grover “talking” to them
- “What if he makes it out of iron next?”
- “He is a scaredy cat”
- (laughs) “It’s him!” (to end of eBook)
- Likes to vocalize what Grover is doing
- Is not interested at first but the enjoys it. “Now I can do it!”
- Exclaims, “I made a mess!”
- Sits back and enjoys
- Laughs at knots “What’s next?”
- Responds to Grover telling them what to do
- Vocally says, “No he didn’t”
- Vocally says, “I swept the bricks” (in reference to brick interaction page)
- Watches very intently
- “This is a funny part.”
- Reads out loud, “Loading”
- Looks back and forth at eBook
- “No, I told you.” – to Grover
- “It’s not me, It’s someone else,” – to Grover

Figure 14 Additional Observation: Vocal Response
4.4 Screen Recording Data

Quantitative data for the study was obtained through the use of the app, Airplay. Airplay is an app created for use on both Mac and PC platforms. Created in 2010 through the launch of the Apple TV, Airplay allows the user to mirror what is happening on one device to another device. In addition, Airplay has the option to allow screen recording for both movement and sound. For this study, only movement was recorded in order to further contain the anonymity of those participating in the study.

Airplay, uses the concept of AirServer to stream a screen of one device to another. For example, one could stream the use of an app on a smartphone to a laptop screen so that a designer can see how the user is interacting with the app.

In this case study, Airplay was used to record the screen of the iPad while the participants engaged in the eBook. Through the collection of the screen recordings, data was obtained that directly related to how the participants were interacting with the eBook on a page by page basis, in addition the data obtained showed how long the participant engaged in specific interactions.
4.4.1 Evaluation Measures and Statistical Variables

Quantitative data was obtained and standardized measures were developed to evaluate the time spent per page while engaging in the eBook. In addition, data was obtained showing the time spent with the specific interactions of gesture (navigation), touch and word recall. These three interactions were chosen based on the field study results for the eBook used in the pilot study. The field study results stated that the eBook used in the pilot study had four out of the five analyzed interactions. The interactions included, gesture (touch), sound effects, word recall and auto animation. Statistical variables were used to compare and evaluate the quantitative output of the engagement with the eBook in measurable data.

4.4.2 Mean & Standard Deviation

A mean was calculated for the following categories:

• Overall time spent on a page
• Time spent with the interaction, gesture and navigation
• Time spent with the interaction, touch

In addition, the standard deviation was calculated for the following category:

• Overall time spent on a page

Finally, a percentage was calculated based on the amount of participants who responded to and used the interaction, word recall.

The mean was calculated by adding all of the total amount values divided by the n. Thus, the mean total \( X = \frac{\sum}{n} \) where \( \sum \) equals the sum of the total values and \( n \) equals the amount of data obtained by category. Standard deviation is used to compare the data obtained
from each screen recording to measure the total consistency or variability of all recordings. Standard deviation is measured by the root mean square of the values from their means

\[ S = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \mu)^2}{n-1}} \]. Where \( \sum \) equals the sum of the total values for each recording, \( x \) equals the single recorded data, \( \mu \) equals the mean, and \( n \) equals the total number of participants. Standard deviation is a comparable value. For example, a low value for the standard deviation means a high level of consistency in the evaluation values. A high value for the standard deviation means a low level of consistency in the evaluation values.

### 4.4.3 Screen Recording Data: Type of Interactions

Through the help of the Airplay app, screen recordings were able to determine what types of interactions children engaged with the eBook. These interactions are listed below.

- **Gesture** – use of any hand motion to engage in the interaction with the eBook. For this study, navigation is the specific gesture identified.
- **Touch** – ability to tap or touch the screen to create a resulting interaction. Examples include tapping the brick wall to break it down in order to view the following animation.
- **Word Recall** – use of touch and tap to highlight and thus hear a written word read in the eBook text.
4.4.4 Screen Recording Data Collection & Analysis

The screen recording showed how long each participant spent with a specific interaction element. To begin, Figure 15 shows the time spent between beginning the eBook and turning the first page, thus signifying comprehension of the gesture and page – turn navigation.

Figure 15 Gesture/Navigation Page 1
In Figure 15, one can see that the participants ranged in time. While one participant took only 2 seconds to understand how to move to the next page of the eBook, another participant took 48 seconds for the same task. This suggests the understanding of digital literacy in operating an eBook may vary by participant.

Next, the principal investigator took into consideration the concept of touch as an interaction. For the eBook in this case study, touch was most associated with the highly interactive pages of 5, 7 and 9 -10. Participants engaging in this eBook were asked to “break down” ropes, nailed walls and brick walls in order to continue with the storyline. Each participant did so by touching the iPad screen at the suggested locations. One interactive page suggested the participant break down a brick wall with their touch interaction. This page allowed the participant to touch the brick wall at any location with the result showing an animation of falling bricks with a hole in the wall. Figure 16 shows the time spent for each of the interactive pages showcasing touch. In all there are three main pages that include this interaction. Overall, the time each participant spent interacting with the touch elements of these pages did not vary in high amounts from interactive page to interactive page. This suggests participants as a whole understood the touch interaction and responded to these pages in a similar manner.
Word recall is an interactive element associated with this eBook on a limited basis. For example, some eBooks allow readers to interact with word recall for every word in the text. In this specific eBook, readers are able to interact for certain call-out words shown in the text. All of these words are shown in a different color and font type so as to draw attention to them. Only 33.3% of participants interacted with the word recall interactive element. Figure 17 shows the percentage of participants interacting with this element in the eBook. In addition, 100% of those who did interact with word recall did so on page 11 where multiple text showcased this interactive element. This suggests that when interactive elements are present at a higher amount, the odds of an interaction are of a higher possibility.
Finally, Airplay was able to help the principal investigator understand the length of time spent on each page. This information may shine light on the ability for interactive elements to hold a participant’s attention when engaging with an eBook. Figure 18 shows time spent for each page by percentage. Please note that the data proves that pages 5, 7 and 9 (pages with most interaction) show the longest length of time spent engaging in the eBook. Figure 19 shows the standard deviation for the same data.
Figure 18 Page by Page Time in Seconds
Figure 19 Page by Page Standard Deviation

Please note that the highest standard deviation is with the first page of the eBook. This further proves the theory that many participants react with different digital literacy toward the usability of the eBook at first. However, as they begin to read the eBook, this confusion becomes less as they read the eBook, thus lowering the standard deviation. The standard deviation rises again in the end of the eBook perhaps due to the fact that many of the participants lingered on the last few pages of the eBook looking for additional pages to read.
4.4.5 Results & Limitations

4.4.5.1 Results

The results of the case study proved that participants responded to the engagement with the eBook in an emotionally positive manner. In addition, nearly half of the participants requested to read the eBook again. The immense positive reaction to the eBook engagement suggests theoretically that literacy in eBooks is important. In order to successfully experience the eBook and gain the proposed emotional reaction towards the eBook one may consider welcome new ideas of reading when designed appropriately. Thus, considering a sociocultural perspective in new literacy, reading is indeed evolving (and enjoyed as proven by the participants wishing to continue to read the eBook after it was finished). According to this study, properly designed eBooks could therefore create positive emotional reactions toward the changing world of eBooks.

In addition, participants were most engaged by the most interactive pages of the eBook. It was on these pages many of the participants expressed their emotions vocally, often exclaiming praise for their ability to interact and become part of the story with the interaction. As observed in qualitative data, participants who were initially confused over how to navigate the eBook quickly learned through guidance from the eBook. Thus the participants learned how to digitally interact with the eBook technology. This concept supports the new literacy theory, behavioural perspective. As stated earlier, the behavioural perspective suggests consumers gain an understanding of how to use and comprehend using digital devices. This theory is put to test with this case study. Through the understanding of the eBook technology, participants were able to gain the experience of engaging with the eBook.
In the additional observations, it was noted how a vast majority of participants looked for approval after responding successfully toward the interactive pages in the eBook. This concept suggests a strong reflective design of this eBook to be especially important in supporting reading relationships between parents/guardians and young readers. Since the participants looked to enjoy the eBook collaboratively even though they were not required to, the reflective design of this eBook is quite successful.

When considering the cognitive perspective in new literacy theory, this eBook additionally suggests that new ways of learning, either through interactive elements or participation, to both be elements of importance when understanding the reactions created through the use of new medial literacy and in specific enhanced interactive eBooks.

Finally, quantitative data was obtained from the screen-recording app, Airplay, proved that participants spend more time on highly interactive pages of the eBook. Participants did not skip over interactions and in contrast chose to remain more focused toward the eBook In addition, the quantitative data proved that usability and navigation understanding of the eBook varies by participant, thus suggesting a varying degree of digital literacy among participants. Finally, quantitative data proved that participants are more likely to interact with an interactive element if that element is present in a higher quantity thus including more choices for the reader.
4.4.5.2 Limitations

This study had a few limitations that need to be addressed. First, the sample number of nine participants for this study was relatively low. In fact, the principal investigator had hoped to have twice as many participants in the study, however due to time constraints with the elementary school and schedule conflicts, a smaller sample size was available.

Additionally, this study was conducted to gain an overall understanding of how young readers are engaging in interactive elements of a popular eBook, however, this study did not ask participants their technological knowledge or reading level proficiency prior to participating in the study. Due to this fact, variation in response may be in part to a participant’s prior technology comprehension (or lack there of), in addition to a participant’s reading-level proficiency.

Finally, this study did not have a control group, nor did it compare how a reader interacts with the same book in print form. Thus, this study does not work well as evidence supporting eBooks over print platforms. Instead, this study focuses primarily on the existing interactions of current eBooks.
CHAPTER 5 DESIGN PRACTICES

5.1 Proposed Design Practices and Conclusion

In this thesis, the concept of user experience, new literacy and digital literacy were addressed. All of these areas of expertise are necessary to shape the future proposed design practices for interactive enhanced eBooks.

Throughout the field study and the case study, current main interactions experienced while reading on an interactive enhanced eBook were analyzed. The results from this study conclude that readers, in specific young readers, are attracted to interactive enhanced eBooks at the emotional and cognitive level. In addition, interactive enhanced eBooks with highly interactive pages have proven to keep the interest of young readers. Additionally, the field study highlighted interactions existing in current interactive enhanced eBooks and categorized them based on their area of focus. The case study used an eBook from the interaction group focused on participation to test for current user response when engaging with an eBook.

Thus, to finalize this portion of the thesis, I would like to suggest the following design practices as interaction guidelines based on current research to date. With additional research, it may be possible to specify these guidelines further to suggest best design practices for interactive enhanced eBooks.

- **Interaction with a Purpose.** Design interaction that drives the storyline
  - For example, in the eBook, *The Monster at The End of This Book*, by Jon Stone, highly interactive pages allow the reader to become a part of the story thus immersing them in the reading and engaging in the interactions.
• **Interaction with a Choice.** Design interactions that create a choice for the reader.
  
  o For example, in the eBook, *Green Eggs & Ham*, by Dr. Seuss, the reader has the option to choose how the eBook is read to them. This concept gives the eBook multiple opportunities for encouraging interactive reading.

• **Understand How Interaction is Being Used.** How is the eBook being advertised? Is it an eBook that would fall into the category of Play, Participation or Comprehension? By understanding this element, graphic designers can consider how their interactions are being used thus, encouraging them to create interactions that best drive readership if that is the purpose of the eBook.

• **Consider Visceral, Behavioral and Reflective Elements in Interactive Design.** Donald Norman suggests designers to consider each of these areas prior to designing a project. These same concepts must be considered in order for interactive design to be successful.

• **Understand the Usability of the Interaction.** The readers need to understand how to use the eBook and thus need interactions that are simple and easy to follow. Interactions need to be designed so as to limit user error and create an overall positive experience.
CHAPTER 6 FUTURE DEVELOPMENTS

6.1 Future Studies

This study provides a solid base and stepping point for future studies in eBook interactive elements. The field study suggests more research is needed to define the different types of engagement. This study began a discussion in digital literacy, user experience and design practices for interactive eBooks. This study did not propose a direct conclusion for these areas due to the fact that much more research is needed in all three areas of interest. In the future, more studies may be executed in order to gain a more defined understanding of interactive elements in eBooks.

One area of future development includes the concept of understanding digital literacy in specific to eBook usage among early readers. This study touched base with this idea by providing data showcasing comprehension of the interactive elements of touch and gesture when engaging with the eBook. However, in the future, this topic may be explored to a more defined test. Additionally, this study provided an overview of current engagement in all interactive elements associated with the eBook. In the future, studies may be performed over a specific interactive element. For example, each interactive element could propose a study to best understand how a participant is reacting to one specific interaction when engaging with an interactive eBook. Ultimately, this study provided a basis for proposed design practices to be associated with interactive eBook graphic design. This study did not, however, propose a direct conclusion for these design practices to be taken into design education. In the future, each proposed design practice may suggest further research to prove its impact on interaction eBook design. I have plans to continue this research in the future as part of my continuing education and
research at the Ph.D. level in the discipline of Human Computer Interaction. Through the knowledge provided by the groundwork provided by this thesis, future research will have the ability to focus on specified elements with hopes to continue to gain further findings on interactive enhanced eBooks.
REFERENCES


[www.bestinteractiveebooks.com](http://www.bestinteractiveebooks.com).
APPENDIX A
[PARENTAL INFORMED CONSENT DOCUMENT]

PARENTAL CONSENT FORM FOR: DESIGNING FOR INTERACTIVE ENHANCED EBOOKS, A STUDY PROPOSING PRACTICES IN GRAPHIC DESIGN

This form describes a research project. It has information to help you decide whether or not to allow your child to participate. Research studies include only people who choose to take part—your child’s participation is completely voluntary. Please discuss any questions you have about the study or about this form with the project staff before deciding whether to grant consent for your child to participate.

Who is conducting this study?
This study is being conducted by Iowa State University: Graduate Student, Karen Doty

Why am I invited to participate in this study?
Your child is being asked to take part in this study because he or she is attending Kindergarten. It is not required for the child to participate.

What is the purpose of this study?
The purpose of this study is to better understand how to design for interactive digital children’s books. This study hopes to gain knowledge over how children interact with digital ebooks in order to design better learning experiences for children in the future.

What will my child be asked to do?
If you allow your child to participate, he or she will be asked to read and interact with the eBook, “The Monster at the End of This Book.” By Jon Stone. Your child will have the option to choose to stop reading the book at any time. They will have the opportunity to read and engage with the interactive qualities of the eBook. During this time, their reaction to the eBook will be observed. In addition, a screen capture app called Airplay will show the researcher what sort of interactions the child spends the most time with. The screen capture app only record the screen and will not record the child visually or record any audio.

Your child’s reaction to the eBook and observational experience will remain anonymous and will not be connected to your child in any way. The study is solely interested in learning general knowledge over how a child interacts with the experience of an eBook.

Your child’s participation will last for no more than 15 to 20 minutes. The child will participate during scheduled reading time during the class day.

What are the possible risks or discomforts and benefits of my child’s participation?
Risks or Discomforts—The foreseeable risks or discomforts related to your child’s participation in this research include the possibility of shyness toward the visitor. In
addition, your child may be unwilling to participate, at which time they will be given the option to not participate.

Benefits—You and/or your child may not receive any direct benefit from taking part in this study. We hope that this research will benefit society by shining new knowledge over how children interact with digital ebooks. Through this knowledge, designers of ebooks can create future ebooks to benefit a child’s educational experience.

**How will the information my child provides be used?**
The information your child provides will be used for the following purposes:

- Observational knowledge gained will provide an overall knowledge over the interaction between the participant and eBook
  - This will provide graphic designers with a better understanding over how a participant reacts to interactivity in ebooks, thus creating a better understanding over how to design for interactivity within ebooks.

- Screen recorded data will be used to aid graphic designers in creating well-designed ebooks for future educational purposes. This data will inform graphic designers the duration of interactivity between the reader and the eBook.

**What measures will be taken to ensure the confidentiality of the data or to protect my child’s privacy?**
Records identifying you or your child will be kept confidential to the extent allowed by applicable laws and regulations. Records will not be made publicly available. However, federal government regulatory agencies, auditing departments of Iowa State University, and the ISU Institutional Review Board (a committee that reviews and approves research studies with human subjects) may inspect and/or copy study records for quality assurance and analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken: All data collected will be retained in a password-protected computer with thesis documents locked in a filing cabinet.

All data will be collected anonymously so there will not be any data that will be associated with the child participant at any time. The investigator will not be asking the child their name except to check that they have a signed permission slip by their parent/guardian. Once this has been established, there will not be a record linking the child participant to the data. Data will be collected anonymously.

**Will my child or I incur any costs from participating or will my child or I be compensated?**
You or your child will not have any costs from participating in this study. Your child will not be compensated for participating in this study.

**What are my child’s rights as a human research participant?**
Your child’s participation in this study is completely voluntary. You can choose not to give consent or you can withdraw consent at any time without any penalties or negative consequences. Your child may also choose not to participate or withdraw from the study at any time without any penalties or negative consequences.

If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, (515) 294-3115, Office for Responsible Research, 1138 Pearson Hall, Iowa State University, Ames, Iowa 50011.

Whom can I call if my child or I have questions about the study?
You and your child are encouraged to ask questions at any time during this study.

- For further information about the study, contact Karen Doty at 515-313-6229 or email: karensch@iastate.edu
- Assistant Professor of Graphic Design, Andrea Quam at 515-294-5763 or email: aquam@iastate.edu

Consent and Authorization Provisions
Your signature indicates that you voluntarily agree to allow your child to participate in this study, that the study has been explained to you, that you have been given the time to read the document, and that your questions have been satisfactorily answered. You will receive a copy of the written informed consent prior to your child’s participation in the study.

Child’s Name (printed) ________________________________________________________________

Printed Name of Parent/Guardian or Legally Authorized Representative

_________________________________________________________ ______________________

Signature of Parent/Guardian or Legally Authorized Representative Date
Dear Parent or Guardian,

I am writing to request permission for your son/daughter to participate in an observational interactive ebook study. The study will give your child a chance to experience reading on an interactive ebook on an iPad.

The book, titled “The Monster at the End of This Book” by Jon Stone, will be the book used for this study. In the study, students will be allowed to read from an iPad during Reading and Language Arts time during class.

As a guest, I will be observing the children and their interactions with the interactive book. The study is being performed so as to gain knowledge on how to best design for interactive children’s books.

In addition to observing the students, a screen recording of the iPad screen will be viewed post-study to better understand how children are using the interactive elements of the book. Please note: screen recordings will remain anonymous and will not be associated with your child in any way. Also, the screen will only record the screen of the iPad and will not record audio or visual of the participant.

I am sending home with your child two copies of the parental consent form. One is for you to keep with your records, the other, please complete and send it back to school with your child to be given to your child’s summer school teacher. Please note, this study is voluntary and your child does not have to participate if they choose not to. If you have any questions, please feel free to call me at (515) -313- 6229.

Thank you very much for your time and consideration.

Best,

Karen Doty
Iowa State University
Graphic Design Graduate Student
APPENDIX C
[RESEARCH PROJECT PROPOSAL]

Application
Research Project Proposals

Title of Research Project: Designing for Interactivity: A study on graphic design practices for ebooks.

Your name: Karen Doty

Phone number: 515-313-6229

Email: karensch@iastate.edu

Date submitted to District: May 6th, 2015

Date proposed for conducting research: May 21st

Iowa State University

Name of college, university or other institutions associated with study:

Subjects of the research (parents, students, teachers, principals, records or other data, etc.) including as much specific information as possible without including the names of the subjects:

Subjects include kindergarten students who have received permission from their parent/guardian to participate in the study. I have attached a parental consent form for them to sign.

Purpose of research: The purpose of this research is to gain knowledge pertaining to how children interact and read on interactive ebooks. The study will provide insight into duration of interactivity in addition to participant response to reading on an ebook. Research will help graphic designers create ebooks.

Methodology: In this study, I will be observing the participants from afar while they read the ebook. Observations I will note will be the following: emotional interaction, comprehension of interaction, interest in interaction. A screen recording app will allow measurement of duration with interaction. See attachment

Describe any district involvement required: Permission to visit Robin Kuhlman's kindergarten class during Language Arts & Reading hour and provide the ebook to be read by students who have permission.

Intended outcomes of research: Research will provide graphic designers information over how participants are reacting to ebook design and interaction. With this knowledge, graphic designers can create more focused interactive ebooks.

Signature of applicant: 05-06-2015

Date

Please attach this application and submit with the formal research proposal you have prepared for your university or college.
### APPENDIX D
[SCHOOL AUTHORITY APPROVAL]

Johnston School's Research Study Approval Checklist

<table>
<thead>
<tr>
<th>Requirement Description</th>
<th>Compliant</th>
<th>Non-compliant</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Necessary paperwork is attached.</td>
<td>/ /</td>
<td></td>
<td></td>
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<tr>
<td>Participation is voluntary.</td>
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<tr>
<td>The premise of the research is ethical and academically sound.</td>
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<tr>
<td>There is no expense to the Johnston Schools.</td>
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<tr>
<td>Time required of teachers and students is very limited and does interfere with teaching or learning.</td>
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<tr>
<td>Data are used ethically and legally.</td>
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<tr>
<td>The research project will not discriminate against teachers or students in any way.</td>
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<tr>
<td>Parent permission will be acquired for all student surveys asking to any type of personal information or perspective.</td>
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<tr>
<td>All surveys, parent permission slips, and other pertinent paperwork are attached with the proposal.</td>
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<tr>
<td>The proposal states the research findings will be shared with the district. Please forward findings when completed.</td>
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</tbody>
</table>

Based on the information provided by the applicant wanting to conduct research in the Johnston Schools, permission has been:

a. Granted for summer school Key groups Timber Ridge

b. Not granted because:

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Signature of Director of Teaching and Learning  
5/14/15  Date

Signature of [Redacted]  
5/18/15  Date
APPENDIX E
[IRB APPROVAL]

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Date: 5/8/2015
To: Karen Doty
CC: Dr. Andrea Quam
5940 Cottage Dr., Des Moines, IA 50311
158 College of Design

From: Office for Responsible Research

Title: Designing for Interactivity: A study on graphic design practices for interactive enhanced ebooks.

IRB ID: 15-230

Approval Date: 5/7/2015  Date for Continuing Review: 5/8/2017

Submission Type: New  Review Type: Expedited

The project referenced above has received approval from the Institutional Review Board (IRB) at Iowa State University according to the dates shown above. Please refer to the IRB ID number shown above in all correspondence regarding this study.

To ensure compliance with federal regulations (45 CFR 46 & 21 CFR 50), please be sure to:

- Use only the approved study materials in your research, including the recruitment materials and informed consent documents that have the IRB approval stamp.

- Retain signed informed consent documents for 3 years after the close of the study, when documented consent is required.

- Obtain IRB approval prior to implementing any changes to the study by submitting a Modification Form for Non-Exempt Research or Amendment for Personnel Changes form, as necessary.

- Immediately inform the IRB of (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.

- Stop all research activity if IRB approval lapses, unless continuation is necessary to prevent harm to research participants. Research activity can resume once IRB approval is reestablished.

- Complete a new continuing review form at least three to four weeks prior to the date for continuing review as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.

Please be aware that IRB approval means that you have met the requirements of federal regulations and ISU policies governing human subjects research. Approval from other entities may also be needed. For example, access to data from private records (e.g., student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), Investigators must obtain permission from the institution(s) as required by their policies. IRB approval in no way implies or guarantees that permission from these other entities will be granted.

Upon completion of the project, please submit a Project Closure Form to the Office for Responsible Research, 1138 Pearson Hall, to officially close the project.

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.