5-2019

EXAMINING THE NATURE, QUALITY, AND REPRESENTATIONS OF GENDER IN POPULAR CHILDREN'S DIGITAL PICTURE BOOK APPS

Marie Patricia Bliss
University of Tennessee, mbliss3@vols.utk.edu

To the Graduate Council:

I am submitting herewith a thesis written by Marie Patricia Bliss entitled "EXAMINING THE NATURE, QUALITY, AND REPRESENTATIONS OF GENDER IN POPULAR CHILDREN'S DIGITAL PICTURE BOOK APPS." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Child and Family Studies.

Margaret Quinn, Major Professor

We have read this thesis and recommend its acceptance:

Hillary Fouts, Megan Haselschwerdt

Accepted for the Council:
Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

EXAMINING THE NATURE, QUALITY, AND REPRESENTATIONS OF GENDER IN POPULAR CHILDREN'S DIGITAL PICTURE BOOK APPS

A Thesis Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Marie Patricia Bliss
May 2019

ACKNOWLEDGEMENTS

Thank you to the thesis faculty committee, Dr. Margaret Quinn, Dr. Megan Haselschwerdt, and Dr. Hillary Fouts, for their encouragement, support, and guidance throughout the time of this project.

ABSTRACT

In recent years, use of digital technology among young children has increased. As a result, digital apps are continuously produced and are often designed to support children's learning. While research has progressively focused on the use of multimedia apps, little is known about their nature and quality, specifically that of picture book apps. Further, among the body of research examining gender in children's literature, knowledge of representation and depiction of gender in digital picture book apps is scarce. Therefore, the purpose of this study was to critically examine popular picture book apps for children on a particular popular platform (iOS) in order to understand their nature, quality, and the ways and the degree to which they represent gender. After examining apps based upon inclusion/exclusion criteria, a final sample of 75 apps were used for analysis. Apps were analyzed for genre, the inclusion of transmedial features and the degree of user interactivity of those features, and components of gender. Findings indicate that despite the prevalence of apps that included most of the transmedial features, these apps were generally average in engaging interactivity and limited in genre categorization. Gender disparity was also found across apps, such as the tendency for masculine characters to be the central character and feminine characters to be portrayed with stereotypicaly feminine physical features. This study has implications for users and developers and suggests a general lack of diverse gender representation and the need for high quality, interactive, and engaging picture book apps for the benefit of young children.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

Children's literature plays an important role in culture and acts as an agent of transmission of cultural norms, expectations, ideals, values, and attitudes to young children (Cherland, 2006). One of the most favored mediums of storytelling among children and parents is picture books (Scholastic Corporation, 2016); however, the nature of reading has changed alongside digital technological advancement. Consequently, the concept of digital literacy has been established in literacy research. Digital literacy is "the use of digital tools to create meaning and communicate effectively with others" (Neumann, Finger, & Neumann, 2017). With the emergence of digital literacy, the proliferation of educational digital applications has resulted, and among these, children's picture book apps have risen in popularity. Similar to print-based books, picture book apps have the capacity to transfer society-based values and perceptions through representation, or underrepresentation, of characters. Culture-based representations of gender are one of these transmittable elements, and previous literature has shown that content of children's books has the ability to perpetuate gender biased ideas. A result of lack of representation can contribute to long term effects such as a diminished sense of self value and limited perceptions of ability, aspirations, and scope of acceptable roles and behaviors (Adams, Walker, & O'Connell, 2011; McCabe, Fairchild, Grauerholz, Pescosolido, & Tope, 2011; Santora, 2013). Furthermore, representation of gender has not been investigated in the context of picture book apps, thus this study will examine and evaluate quality (inclusion of transmedial features, interactivity, and intuitiveness)

and the nature of picture books (i.e. genre) and the ways in which and the degree to

which gender is represented in a sample of popular children's picture book apps.

CHAPTER TWO

LITERATURE REVIEW

Children's literature has been considered to be a "celebration, reaffirmation, and dominant blueprint" of cultural values and ideas (McCabe et al., 2011, p. 199). In order for these ideas to be transmitted to, understood, and retained by young children, storytelling must include three essential elements: the story, the storyteller, and the audience (Colwell, 1980; Aarseth, 1997). Namely, the story is the narrative content that is intended to be told and is made up of visual, verbal, and audio signs. Traditionally, the storyteller is the physical means through which the narrative content is presented, for example, by a human individual or a printed text. Lastly, the audience is the recipient and interpreter of the narrative content transmitted by the storyteller. When these elements are aggregated, an engaging and profound storytelling experience emerges.

Picture books have been recognized as a literary form distinct from other variations of literature (Cianciolo, 1997). Due to their employment of mentally and visually stimulating illustrations with complementary text, picture books have the ability to enrich and subsequently extend and expand readers' "background of experiences, their literary and aesthetic interests, tastes, and preferences" (Cianciolo, 1997, p. 1; Sipe, 1998). Further, many picture books have also been designed to include pop-up artwork, pull tabs to show transitioning images, and differing textures (e.g., fur, sandpaper, cotton) to encourage reader interest and interactivity. Printed picture books continue to be favored by children and parents (Scholastic Corporation, 2016); however, the nature of reading has changed alongside digital technological advancement.

Digital Literacy

The nature of children's literature is important to understand, and research has continued to explore this subject. That being said, reading has evolved. With the expansion of digital technology (including the mediums of mobile phones, tablets, and laptop and desktop computers), children's access and awareness of the technology has been, and will continue to be, increasing (Dezuanni, Dooley, Gattenhof, & Knight, 2015). Accordingly, modes of technology are regularly used homes and in classrooms (NAEYC & Fred Roger Center, 2012). The National Center for Education Statistics (2015) states that 39% of three to four year old children used the Internet from home, as well as 54% of five to ten year olds. In addition, a recent study of children in the United Kingdom found that 52% of eight to eleven year olds have their own tablets, followed by 35% of five to seven year olds and 21% of three to four year olds (Ofcom, 2017). Due to the growing popularity and demand of obtaining technology for the home, a small body of research has investigated the use of digital software to support emerging reading skills (Ciampa, 2012; Flewitt, Messer, & Kucirkova, 2015). This research has contributed to the expansion of the definition of literacy by including an individual's ability to learn, comprehend, and interact with technology when engaging in tasks such as reading and writing (de Jong & Bus, 2002; Neumann et al., 2017).

While the updated conceptualization of literacy includes the ability of an individual to engage with and understand technology, an area of research has focused on the idea of digital literacy as its own branch of literacy. Digital literacy includes the general foundations of non-digital literacy while including aspects that are unique to the

digital experience. Specifically, digital literacy is "the use of digital tools to create meaning and communicate effectively with others", and this can be done by utilizing visual representations, integrating a variety of digital texts, navigating non-linear digital texts, and evaluating digital information (Neumann et al., 2017, p. 1). In order to achieve digital literacy competence, one must gain the skills, knowledge, and attitudes necessary to be proficient in this branch of literacy (Neumann et al., 2017). These developmental precursors that lead to digital literacy differ between children and adults. For young children, observed skills include, but are not limited to, icon recognition, digital navigation, key identification on a digital keyboard, operation of technological devices, digital terminology knowledge, user control abilities (e.g. swipe, tap, scroll), and hyperlink use (Beschorner & Hutchison, 2013; Krcmar & Cingel, 2014; Marsh, 2006; Merchant, 2005; Walsh, 2006; Winch, Johnston, March, Ljungdahl, & Holliday, 2010).

Literacy development can be promoted through children's interactions with digital texts, although the strength of the developmental benefits is dependent on the quality of the app (Ihmeideh, 2014; Neumann et al., 2017). The overall quality of the app is dependent on the inclusion of multiple interactive, transmedial, and navigational elements that stimulate visual, auditory, kinaesthetic, and tactile senses (Neumann et al., 2017). Book publishers and independent application (app) developers have created digital apps that include features that encourage the use and development of digital literacy skills in a storytelling context. One of the most popularly developed digital app varieties that include digital literacy skill-based components is picture book apps.

Picture Book Apps

Digital technology has the means to offer multimedia features to reading audiences in ways that traditional literacy tools cannot. Thus, publishers and app developers have contributed to the digital literacy experience by creating picture book apps for children. A picture book app is a software application that is made up of a picture book narrative in a digital form with the addition of content, features, and navigational choices that are not suitable for to print-based books (Serafini, Kachorsky, & Aguilera, 2015; Serafini, Kachorsky, & Aguilera, 2016). The products are available for download from digital app stores such as the iTunes App store or Google Play or publisher websites and can be accessed on tablets, computers, and smartphones. Picture book apps are considered one of the first entertaining and educating items that most young children have access to in homes and schools (Zheng, 2016). Similar to print-based books, picture book apps have text and illustrations that are digitally displayed; however, picture book apps provide a literacy experience that widely differs from and is not possible with a print-based book (Wooten & McCuiston, 2015).

First, the manner in which picture books are digitally modified varies from scanning print-based picture books into a computer software and making available for download as a static document (e.g. no inclusion of interactive and animated components, simply text on a screen) to creating multimedia software apps that include interactive elements (e.g., game-like activities) that produce additional content and options for the reading audience (Serafini et al., 2015). Many picture book apps do not all have print-

based counterparts; a number of independent app developers have designed original app narratives for digital platforms that can only be downloaded from app stores.

Additionally, available digital picture books range across levels of interactivity and complexity (Turrión, 2014). Serafini and colleagues (2015) established a framework focusing on transmedial features that can be included picture book apps that encourage reader participation. Transmedia storytelling is defined as process in which aggregated elements of fiction are distributed across many channels in order to create a connected and concerted entertainment experience (Jenkins, Ford, & Green, 2013). Therefore, transmedial features are the elements of fiction that provide opportunity for an engaging and entertaining occurrence with the content.

There are many types of transmedial features. Firstly, visual images are the key feature of picture book apps. Visual images can be depicted through digitized paintings and ink drawings and photographs, and the pictures themselves may remain static during reading or they may be animated (e.g. a photograph of a butterfly may flutter its wings). Secondly, sound effect, musical, and vocal elements may also be included in the app. Sound effects may include, but are not limited to, the sound of pages being turned and background noise (e.g. rain, chirping birds). Musical components may be incorporated in the app in the form of background music and are typically optional in nature. In consideration of the vocal elements, apps may have an optional or not-optional "read-to-me" function in which pre-recorded narration of the text "reads" to the user automatically. Similar to print-based books, textual elements such as font, typeface, and text orientation will be included in picture book apps. Unlike print-based books, picture

book apps may include animation of the textual elements; for example, the text orientation may move across the page in a way that is relevant to the context of the text (e.g. text positioned on top of an illustration of waves may move in a swaying motion). Additionally, paratextual elements included in the book app may be hyperlinks within the text that may direct readers to websites with additional information relative to the story. The purpose of paratextual elements is to draw readers outside of the story text and make connections between the narrative content and the world of the reader (McCracken, 2013; Serafini et al., 2015).

There are navigational elements beyond page turning may be included in the apps' features. Examples of navigational elements may include directional icons such as arrows may appear to indicate navigation to following or past pages. Transitions, defined as the act of page turning itself, are necessary for the presentation and perception of the story as presented in the app (Serafini et al., 2015). By including many, if not all, of the transmedial elements previously discussed, picture book apps can make meaning through interaction and engagement that can lead to broadened understanding of the narrative content that may not be possible in an experience with a print-based book or a digital picture book document (Serafini et al., 2015). Thus, it is imperative to assess the degree of interactivity and the nature of inclusion of transmedial features and navigational components in apps in order to determine overall quality of picture book apps.

Picture book apps, similarly to print-based picture books, vary by genre. Galda, Sipe, Liang, and Cullinan (2014) describe popular genres in children's literature, and among them include fantasy, contemporary realistic fiction, science fiction, historical

fiction, nonfiction, and poetry and rhyming. Fantasy, which is made up of narratives that include strange or otherworldly settings or characters, is initially the most popular genre of literature among children (Galda et al., 2014). On a similar note, the genre of contemporary realistic fiction is made up of stories that are based in reality but include fictionalized characters. Within the realm of fiction, science fiction includes elements of science and technology as a foundation for conflict or as the setting for the story. Compared to fiction, nonfiction is a narrative about real people and events that is presented imaginatively, meaning there is a novel-like structure to the description of the events. Lastly is poetry and rhyming which is rhythmic storytelling with imagery that may stimulate emotion in the reader. Research on genre in children's literature is very limited, and so far no research has investigated genre presence in children's digital books. It is meaningful to explore genre in children's digital literature as connections may be made as to the production of picture book apps and the value of certain genres over others. We can ask, with the change in the nature of reading, is change also happening with production of picture book apps across a variety of genres?

Despite the fact that research on picture book apps is a relatively new direction in children's literature research, as well as that that is studied in the field of digital technology advancement, few studies have shown positive outcomes for children who digital picture books over print-based books (Ciampa, 2012; Broemmel, Moran, & Wooten, 2015). Motivation to read and active engagement in children increased when utilizing picture book computer software over a print-based text (Ciampa, 2012). Additionally, a study investigating resultant vocabulary development and computer

picture books found that more vocabulary was gained after students read the interactive

computer books compared to non-interactive computer books (Smeets & Bus, 2014).

Other research has found the development of skills such as reading comprehension and

resourcefulness to be related to practice with interactive computer picture books. While

the objective of the current paper is not that of evaluating children's literacy outcomes, if

the research suggests that digital picture books are effective in developing literacy skills

in young children, it is important to study and evaluate picture book apps more deeply

across a variety of transmedial factors that may possibly contribute to individual's

motivation and further literacy development.

   With the growing availability of picture book apps, there is the suggestion of

change in storytelling mechanisms, specifically the relation between the app and the

reader. Digital literacy is understood as the ability to understand and utilize information

received from interactions with digital media (Glister, 1997). When an individual

engages in digital literacy activity, interaction with information, such as text, images,

sounds, and navigational elements, contributes to the individual's meaning making of the

content. Apps encourage more engagement between the reader, the tablet, and the

narrative content itself through their features more so than any other platforms of

storytelling would (Zheng, 2016). It is understood that digital information, otherwise

known in the current study as transmedial features, aids in the interpretation of content.

Not only should a good book involve the reader, aid in bringing the reader into the

narrative, and broaden their imaginations, but a high quality picture book app should as

well (Wooten & McCuiston, 2015). Therefore, in the current study, transmedial features

were evaluated in frequency and the degree to which the features contributed to meaning making of the app content through their level of engagement. Furthermore, an additional way that books bring readers into the story is by being relative, and one of the ways in which this can be possible is by including content that represents and connects to the reader.

Representation

Childhood is a period of one's life in which the development of gender identity and schemas is central (McCabe et al., 2011). The development of these constructs as well as the understandings of the expectations related to such will pervade through childhood and well into adolescence (Bem, 1983; McCabe et al., 2011). In fact, children's literature plays an important role in young children's social learning and identity development (Ruterana, 2012). The values and lessons taken from literature make a mark in children's earliest and long-standing attitudes and beliefs of gender, race, and socioeconomic status (Frawley, 2008).

Books, like other forms of media, project values and attitudes of the societal environment, and any biases that are reinforced by society and transmitted to children can become a part of children's thinking (Santora, 2013). Historically, children's literature has been considered as highly impressionable by social forces (Pescosolido, Grauerholz, & Milkie, 1997). Literature is a piece of socialization and the process of identity formation during young children's lives (McCabe et al., 2011). The messages that are depicted in books shape individuals' interpretations of people.

One variety of representation that has been extensively researched in children's literature is that of gender. The cumulative presence of characters on its own in a children's book makes impressions of importance on children; for example, Weitzman, Eifler, Hokada, and Ross (1972) found that feelings of unimportance of female characters were found on children who were exposed to stories with no inclusion of female characters. In another study examining gender in twentieth-century children's books, male characters were represented more frequently in titles and as central characters than female characters were (McCabe et al., 2011). In general, male characters were included in significantly more books than female characters. A concern among researchers is that children are bound to receive the idea that girls are not important because no one seems to write about them in books (Filipovic, 2018). Evidence even suggests that male characters are preferred by boys as well as girls, further conserving the idea that girls are believed to be less interesting than boys (McCabe et al., 2011).

According to Diekman and Murnen (2004), negative representation of gender in literature is manifested in many ways. It has been found that perceptions of gender and gender stereotypes are influenced by children's books (Huntington, 2013). One way publishers attempt to avoid the issue of gender representation and publish more books that are balanced in gender representation is by using animal instead of human characters (Filipovic, 2018; McCabe et al., 2011). And yet, most animal characters are assigned sexes, and disparity is greater in gender representation with the inclusion of animals more so than the inclusion of humans (Filipovic, 2018). Even when animals are gender neutral and lack feminine markers (e.g. long eyelashes, ponytails), children are more likely to

understand those characters to be male, not female (Marie, 2007). Consequently, in order for female animal characters to be recognized as female, they must have stereotypical female human features (e.g. female body shape). Thus, this encourages the idea that the male form is given and the default figure in contrast to the female form having to be created through use of stereotypical features (Filipovic, 2018). The inclination that readers have to perceive gender neutral animal characters as male emphasizes the habit of female underrepresentation (McCabe et al., 2011). Furthermore, animal characters can be considered powerful, yet seemingly unlikely, channels for gendered messages (McCabe et al., 2011).

More recent studies show that even in today's sociopolitical climate, despite equality and diversity becoming more important and present in education, stereotypical representation of gender and underrepresentation of female characters in children's books continues on (Filipovic, 2018). Sociocultural theory posits that society makes an important contribution to an individual's development (Vygotsky, 1978). Signs and symbols as cognitive tools aid children in learning through social exchange and constructing their own meaning. With this, diversity of characters in books is important for children; they need to see characters like themselves represented in all forms of media (Crisp, Knezek, Quinn, Bingham, Girardeau, & Starks, 2016). Long term effects such as a diminished sense of self value and limited perceptions of ability, aspirations, and scope of acceptable roles and behaviors may result from lack of perceived importance in media (Adams et al., 2011; McCabe et al., 2011; Santora, 2013). It is the responsibility of adults - parents, caregivers, and educators - to supply children with high-quality learning

materials (Santora, 2013). In order for adults to achieve this, they must become aware of issues and concerns regarding lack of gender representation and critically understand children's book content and messages (Filipovic, 2018).

As previously mentioned, representation of gender in children's literature has been widely investigated. However, gender representation in children's picture book apps has not been explored. According to Green and Brock (2000), effects of transmission of stereotypes from literature on children are mediated by the "degree of transportation or immersion that the reader experiences." In other words, the efficiency of which the stereotype information reaches the child and the extent to which the child is engaged with the material determines the effect of information on the individual. This, along with the complete lack of research in this area, is impetus for investigating the ways in which, and to what degree, interactive and transmedial picture book apps represent gender. In this study, the signs and symbols used to transmit gender dependent societal expectations include illustrations of the physical nature of characters and the roles and behaviors they exhibit in the stories.

Similarly, gender schema theory (Bem, 1981) postulates that children learn about male and female roles from the culture in which they live. Further, children adjust their behavior to line up with the gender norms of their culture, even early on in their development. Additionally, through cultural transmission, information is processed and contributes to the formation of attitudes and beliefs of "gender-appropriate" behavior (Bem, 1981). Therefore, gender components in each app were reviewed in order to

determine the kind of normative cultural messages that could be interpreted by audiences through the presented signs and symbols.

Thus, the purpose of this study is to examine and evaluate children's picture book apps for quality (inclusion of transmedial features, interactivity, and intuitiveness), representation of gender, and genre and address the following questions:

1. What is the nature and quality of these apps in various factors including visual images, sound effects, music, and voice, textual elements, paratextual elements, navigational elements, and transitions, and genre?

2. In what ways and to what degree is gender represented in the content of the picture book apps?

3. What are the relations among genres, quality, and gender representation in picture book apps?

CHAPTER THREE

METHODS

Search Terms

Apps were downloaded from the U.S. Apple App Store on an iPad (iOS 12.0.1)

and resulted from various search terms in order to account for differences in terminology.

The search terms included *interactive story* ($n = 20$), *interactive book* ($n = 20$), *storybook*

($n = 20$), *story app* ($n = 20$), *book app* ($n = 20$), and *interactive picture book* ($n = 20$).

Evidence suggests that the iPad is the most popular tablet in the current marketplace

(Dezuanni et al., 2015). Therefore, for the present study, an iPad was used to complete

app searches, download apps, and collect data from the apps themselves. The terms were

chosen based off previous literature (Zheng, 2016; Neumann et al., 2017). The 10 most

popular apps for each search were used in data analysis. To ensure the app search

returned results relevant to the framework, the filter for "category" in the search options

was set to "books." Next, in order to analyze the most popular apps for each search term,

the filter for "sort by" in the search options was set to "popularity." Additionally, the

research questions focus on young children's picture book apps, therefore, the filter for

"ages" in the search options was set to 5 and under, and following that search, the same

search term was used with the age filter for 6-8.

Inclusion/exclusion criteria

Apps produced by searches were deemed relevant to the study based on their

nature as a picture book app (narratives including words and illustrations). If the apps met

this criterion, they were purchased, downloaded, and coded; apps that do not meet this criterion were excluded as they focused on content other than reading, e.g., activities not related to reading (e.g., worksheets, coloring pages, gaming) and foreign language learning. Apps were also not included in the dataset if they are book library apps that require a subscription or have more than one book in the app. These apps were not coded due to their nature of being picture book library apps, not apps featuring singular picture books. In addition, picture book apps that did not include written text were excluded.

Coding

Quality

The coding system for quality drew heavily on previous research that established frameworks for evaluating apps (literacy apps - Israelson, 2015; picture book apps - Serafini et al., 2015). The coding categories included components of transmedia, specifically visual images, sound effects, music, and voice, textual elements, paratextual elements, activities, navigational elements, and transitions, and interactivity (intuitiveness for navigational elements and transitions) for each of these components. Inclusion of each transmedial component was coded on a two point scale (not present and present), and degrees of interactivity and intuitiveness were coded on a four point scale (interactivity - distracting, mostly entertainment/gaming, mostly engaging, engaging; intuitiveness – confusing, not readily obvious, generally intuitive, and intuitive) . App features were coded based on the presence of these nine components, degrees of interactivity, and

intuitiveness were established following coding of the presence of each of the transmedial

components.

Representation of gender

Coding categories for representation of gender were established based on past

research that analyzed sexism and gender representation in children's print-based

literature (Crisp et al., 2016; Filipovic, 2018; McCabe et al., 2011). Coding categories

included *title* (the inclusion of a character's name or pronoun in the title of the app),

central character (determined by the frequency of the character's presence throughout

the app), *human, animal, or other* (whether the coded character is human, an animal, or

another creature or animated object), *face* (the presence of stereotypically feminine or

masculine facial features), *form* (the presence of stereotypically feminine or masculine

body shapes), *clothes* (the use of stereotypically feminine or masculine apparel),

pronouns (the use of feminine, masculine, or gender neutral pronouns), and *roles* (the

inclusion of stereotypically feminine or masculine roles such as domestic and leisure

roles and occupation). Due to the absence of conceptualization of gender neutral or

gender ambiguous physical features and clothing, a gender code titled "unclear" was

created as an option that signified the inclusion of features that were other than those of

stereotypical feminine or masculine definition. Details of the coding criteria for gender

can be found in Table 1. The 4 focal characters of individual apps, as determined by the

frequency of their presence throughout the story, were analyzed for each of the gender

coding categories. Collection of data for more than one character per app was determined

in order to provide a better understanding of gender representation across apps and, presumably, across the picture book app market itself.

Genre

The genre of each picture book app was coded. The chosen categories of genre were based on previous research examining children's print-based literature in early childhood education settings (Crisp et al., 2016). Genre categories included contemporary realistic fiction, fantasy, science fiction, nonfiction, and poetry/rhyming.

A random subsample of 10% of the included apps were independently coded by the author and a graduate research assistant. When comparing individual codes across randomly selected apps, raters agreed on 96% of codes. Disagreements were discussed and resolved, and the remaining apps in the sample were coded along the lines of the established revisions.

Sample

In total, 120 apps across the searches were returned that met the conceptualization of children's picture book apps. Apps that were not included for coding were excluded for a variety of reasons (e.g., apps in languages other than English, no text included in the narrative content, picture book library app or subscription necessary, game focus, and not a picture book app). Several apps emerged in multiple searches. These apps were coded once and did not inflate the final app sample size, leaving a final sample of 75 apps.

CHAPTER FOUR

RESULTS

Transmedial Features and Interactivity

Descriptive statistics were run in order to address the research question regarding the nature and quality of apps with respect to transmedial features. A total of 75 apps were coded for inclusion and user interactivity of transmedial features. In terms of presence of visual images, a majority of apps included interactive images (65.3%, $n =$ 49). In these apps, users can touch digital pictures in order to activate animation such as movement (e.g., *The Monster at the End...* (Sesame Street, 2018). In contrast, a smaller proportion of apps (24.0%, $n = 18$) were made up of static images with no animated style (e.g., *Grandma* (Sneaky Media LLC, n.d.). Only eight apps (10.7%) included animated images that did not warrant user touch to activate the feature (e.g., *The Alice App* (Emmanuel Paletz Corp., 2017).

When evaluating the degree of user interactivity with visual images, most apps were determined mostly engaging (30.7%, $n = 23$) and engaging (32.0%, $n = 24$). Apps with visual images that were mostly engaging provided an interactive experience for the user without distraction from the story content (e.g., *My Friend Barlow* (Oddbot Inc., 2016). Apps that were engaging presented animated visual images that, through user touch, added to the story within the app. For example, in *Locke Saves the Town* (Hullabalu, 2018), the user aids the main character in the construction of his invention by dragging parts across the tablet screen to the character, resulting in an animation of the

main character assembling a product. A smaller number of apps (4.0%, $n = 3$) included visual images that had the potential to distract the user from the story content. These apps tended to include many interactive images, but engagement would result in animations that provide opportunity for entertainment separate from the story. To illustrate, *Is the Witch in Love?* (SlimCricket, 2016) includes images of objects scattered around the main character's house. While these objects belong to character in the story, the images and the animations that result from user interaction do not provide context to the story and encourage diversion of attention from the narrative.

Most apps included sound effects (74.6%, $n = 56$), music (66.7%, $n = 50$), and character voices or narration (93.3%, $n = 70$). Of the apps that included sounds, 55.3% ($n = 31$) included sound effects that were interactive. For instance, in *Johnny Tractor and Friends: Growing Season* (Soul and Vibe Interactive Inc., 2016), sound effects (e.g., the honking of a horn) are expressed when the user touches the character image. Similarly, 42.8% ($n = 21$) of apps that included character voices and narration were also interactive regarding these features. For characters in *Little Red Riding Hood by Nosy Crow* (Nosy Crow, 2017), their voices became a part of the story narration when the user touched their image.

Regarding user interactivity, most apps (48.0%, $n = 36$) were determined mostly engaging on the basis that the apps included many engaging sound, music, and voice features; however, they were not as user immersive to result in engaged and direct action from the audience. In particular, *The Thief of Wishes* (Lucyna Markowska, 2019) included sound effects, music, and narration, yet character voice was not present and the

chance for user interaction to prompt any sound effects was non-existent. Only three apps

(4.0%) had components that were distracting from the story content. To illustrate, *Green*

Riding Hood: Read Aloud (Huracan Apps, 2018) incorporated sound effects, music, and

character voice and narration into the story content. At the same time, the sound effects

and voices elicited by user interaction dominated the content of the app and

overshadowed the content of the story, therefore seemingly providing the user with an

entertainment experience separate from the story.

In terms of textual elements, the greater number of apps (46.7%, $n = 35$) include

static, unanimated text that is similarly seen in printed picture books. However, 28.0% ($n = 21$) of apps included animated text, specifically text that moved or words that changed

color (e.g., *Oh, What a Tangle!* (Digital Leaf, 2016). Twelve apps (16.0%) had text that

was interactive, i.e. words that could be touched and read aloud (e.g., *Storytime: Billy*

Goats Gruff (StoryToys Entertainment Limited, 2017). A small number of apps (9.3%, $n = 7$) were determined both animated and interactive. These apps included text that moved

or changed color by user interaction. For example, in *Rom and the Whale of Dreams*

(BelMontis Publishers Pte. Ltd., 2018), some textual elements would move in a way

described in the story content (i.e. the textual content described the wind and when the

text was touched, the words seemingly "blew away").

Addressing the interactivity of the textual elements, 46.7% ($n = 35$) of apps were

deemed not interactive on the basis that they included text that was static, unanimated,

and unchanged by user interaction. In contrast, 17 (22.7%) apps were deemed engaging

as they provided opportunities to enhance the reading experience through user

interaction. For example, some apps provided the opportunity for the repetition of words prompted by user touch (e.g., *Dr. Seuss's ABC – Read & Learn* (Oceanhouse Media, 2018). Additionally, several apps provided labels for objects on the screen after users touched the images (e.g., *The Icky Mr. Fox* (IckyPen Ltd., 2016).

The presence of paratextual elements, such as hyperlinks and advertisements for similar products or apps, was accounted for. It was found that 42.6% ($n = 32$) of the apps in the sample included hyperlinks or advertisements in or throughout the digital content. User interactivity was no evaluated in relation to paratextual elements as this component of quality does not contribute to user engagement with the story content.

In terms of inclusion of activities within the digital content, 22.7% ($n = 17$) of apps included one or more games that provided an interactive and entertaining experience relevant to the story content. An example of an activity can be found in *Mr. Potato Head: School Rush* (PlayDate Digital, 2016). In this app, the main character's falls and his detachable toy body parts separate from his body. The user was encouraged to interact with the app by touching and dragging the pieces back onto the character's body.

When evaluating the degree of user interactivity of the activities, it was determined that 55.4% ($n = 10$) were generally distracting from the story content. Typically, the activities provided an entertainment and gaming experience not relevant to the plot of the story (i.e., catching falling tools and mechanical parts; e.g., *Chuck & Friends: Fort Chuck* (Ruckus Media Group, 2017). Two apps (10.8%; e.g., *Unnamo the Earthworm LITE: interactive tale* (Gediminas Cibulskis, 2017); *Even Monsters Get Sick* (Busy Bee Studios, 2018) were determined engaging due to their nature of incorporating

details of the story's text in activities, therefore encouraging user listening

comprehension.

Regarding navigational features – navigational elements (i.e. directional icons and

scroll bars) and transitions (i.e. paper turning actions) – 78.7% ($n = 59$) of apps included

the former and 37.3% ($n = 28$) the latter. A limited number of apps (18.6%, $n = 11$)

included navigational elements that were clearly displayed with cues for next steps or

examples of how to maneuver through app (e.g., *Elmo's Big Birthday Bash!* (Penguin

Random House LLC NY, 2016). Otherwise, 69.5% ($n = 41$) were generally intuitive with

their incorporation of navigational elements. These apps included directional icons

without provision of examples of the navigational process; however, the presence of the

icons themselves was considered an appropriate cue for navigation. On the other hand,

60.8% ($n = 17$) of apps with transitions were confusing regarding maneuvering through

the application. Specifically, once the user proceeded from the start page to the app

content, it was unclear how to move from the first page to the next. It was assumed that

the user knew to swipe their fingers across the screen in a paper turning motion to

proceed to the follow pages. Three apps (10.7%) provided specific instructions for

navigating through the app with page turning motions (e.g., *The Snow Fox* (AKQA,

2016).

Composite scores were created for the inclusion of transmedial features

(components that support the reading experience in ways that promote sustained actions

and support understanding) and interactivity (the extent to which the features are

distracting or entertainment and engaging). The maximum score for transmedia inclusion

(M= 5.9, SD= 2.63) was 11 and the minimum score was 1. For interactivity (M= 5.22, SD= 2.5), the maximum score was 18 and the minimum score was 1; however, the highest score reached by the sample was 10. The composite scores will be used in relational analyses.

Genre

With nature of genre in the sample of picture book apps, the majority of apps (66.7%, $n = 50$) fell under the category of fantasy followed by contemporary realistic fiction (21.3%, $n=16$), science fiction (1.3%, $n = 1$), and nonfiction (1.3%, $n = 1$). Additionally, seven apps were categorized into two genres; fantasy and poetry/rhyming (6.7%, $n = 5$) and contemporary realistic fiction and poetry/rhyming (2.7%, $n = 2$).

Gender

In beginning to address the ways and the degrees in which gender in represented in app content, it was found that there were more instances of masculine names and pronouns used in titles (30.6%, $n = 23$) compared to feminine names and pronouns (21.3%, $n = 16$). However, a majority of apps did not include feminine or masculine names or pronouns in the titles (46.6%, $n = 35$). Only one app represented a masculine and feminine character in the title (e.g., *Beauty and Beast – Fairytale* (BulBul Inc., 2015). For central characters of the apps, it was found that masculine characters dominated as the central characters in the sample of apps (54.6%, $n = 41$), followed by feminine characters (26.6%, $n = 20$). In thirteen apps (17.3%), it was unclear who the

central characters were, and only one app (1.3%) let the user choose who the main character was (e.g., *The Snow Fox,* 2016).

A total number of 242 characters were analyzed in order to understand the depiction and representation of gender in the sample of apps. Details for the criteria of the following gender coding components can be found in Table 1. Most characters in the sample were animals or insects (40.5%, $n = 98$), followed by humans (35.9%, $n = 87$), and other creatures (i.e., aliens, mythical creatures, and cars; 23.5%, $n = 57$). When considering the faces of the characters in the sample, there were more characters with gender ambiguous facial features (54.9%, $n = 133$), such as no hair, followed by those with stereotypically feminine facial features (e.g., eyelashes, makeup, long hair; 26.8%, $n = 65$), and lastly, those with stereotypically masculine facial features (e.g., facial hair, short hair, no eyelashes; 18.2%, $n = 44$). Similarly, with character's physical forms, 82.6% ($n = 200$) had gender ambiguous forms (i.e. nonhuman form without human form attributes) compared to 10.3% ($n = 25$) of characters who had stereotypically feminine forms (i.e. curvy body shape and pronounced breasts) and 5.3% ($n = 13$) had stereotypically masculine forms, depicted with wide shoulders and muscles or a boxy body shape. For clothing, most characters (37.6%, $n = 91$) were depicted not wearing clothes or gender ambiguous clothing. A proportion of characters wore gender ambiguous clothing (17.3%, $n = 42$), including robes or clothing combinations that included both stereotypically masculine and feminine items. However, more characters were depicted wearing stereotypically masculine clothing (26.4%, $n = 64$), such as collared shirts, pants,

26

and tennis shoes, than stereotypically feminine clothing (17.7%, $n = 43$), which included

dresses, skirts, and high-heeled shoes.

When considering non-physical attributes of characters, character pronoun data

shows that, per character, masculine pronouns (40.8%, $n = 98$) were clearly stated more

than feminine pronouns (24.5%, $n = 59$). Interestingly, non-use of pronouns (33.3%, $n =$

80) occurred more frequently per character than the use of feminine pronouns. As to

gender roles, there were more characters partaking in stereotypically masculine roles,

such as physical labor, office work, and exhibition of confidence and adventurous spirit

(41.6%, $n = 100$) than stereotypically feminine roles (18.7%, $n = 45$), which include

childcare, housework, grooming, shopping, and exhibiting passivity. There were few

characters who had both stereotypically feminine and masculine roles (9.2%, $n = 22$).

Gender data was further split by species (human, animal and insect, and other).

Frequencies were conducted in order to examine physical and non-physical gender

differences among human, animal and insect, and other species characters. Frequencies

can be found outlined in full in Table 2. Noteworthy findings include those of facial

attributes, physical form, and roles. Regarding facial attributes, stereotypically feminine

features were more prominent among humans (42.5%, $n = 37$), animals and insects

(16.3%, $n = 16$), and other creatures (24.6%, $n = 14$) than stereotypically masculine

features (human: 36.8%, $n = 32$; animals and insects: 4.1%, $n = 4$; other: 12.3%, $n = 7$).

Gender ambiguous facial features were more apparent for animals and insects (79.5%, n

$= 78$) and other creatures (63.2%, $n = 36$) than humans (20.7%, $n = 18$). For physical

form, the stereotypical feminine form was depicted the most for human characters

(23.0%, $n = 20$) compared to animals and insects (3.1%, $n = 3$). However, gender ambiguous forms were most the prevalent form among humans (64.4%, $n = 56$), animals and insects (95.9%, $n = 94$), and other creatures (96.5%, $n = 55$). Lastly, for roles, stereotypically masculine roles were greatly exhibited by human (36.8%, $n = 32$), animals and insects (41.8%, $n = 41$), and other characters (50.9%, $n = 29$). Stereotypically feminine roles were performed by human characters (27.6%, $n = 24$) more so than animal and insect (17.3%, $n = 17$) and other characters (7.0%, $n = 4$).

Associations

Transmedial and interactive components of quality were crosswalked with genre to address the relations among genre, quality, and gender representation in picture book apps. Apps that were identified as fantasy included more transmedial features as well as features of higher degrees of interactivity than all other genres. When crosswalking genre and gender components, the greatest disparity between gender can be found among fantasy. Among fantasy apps, there were more characters with stereotypically feminine facial features (25.8%, $n = 47$) than characters with stereotypically masculine facial features (17.0%, $n = 31$) but even more characters with gender ambiguous facial features (57.1%, $n = 104$). Similarly, more characters depicted with gender ambiguous forms were found (87.7%, $n = 158$) than characters with stereotypically feminine physical forms (7.2%, $n = 13$) and stereotypically masculine forms (5.0%, $n = 9$). Characters with stereotypical masculine clothing (25.8%, $n = 47$), identified by masculine pronouns (41.9%, $n = 76$), and participated in masculine roles (45%, $n = 82$) were dominant among the genre of fantasy. The gender gap in physical and non-physical attributes narrowed

among apps that were determined contemporary realistic fiction. There were more characters with stereotypically feminine facial features (29.4%, $n = 10$) and physical forms (26.4%, $n = 9$) than those with stereotypically masculine facial features and physical forms. On the other hand, there were greater frequencies of characters with stereotypically masculine clothing (35.3%, $n = 12$), pronoun usage (38.3%, $n = 13$), and role participation (29.4%, $n = 10$) than those with stereotypically feminine clothing, pronoun usage, and role participation.

CHAPTER FIVE

DISCUSSION

This study serves as a review of popular children's digital picture book apps. With the increasing presence of tablets (Rideout, 2014), and subsequent digital application use, in households and classrooms, access to high quality apps is important now more than ever. Therefore, the current investigation revealed a great number of apps that are produced for children's entertainment and educational engagement. The findings will be discussed in relation to genre, inclusion and degree of interactivity of transmedial features, representation and depiction of gender, and the relationships among variables. Further, future directions in research and app development will be considered.

Overall, the results for genre of popular picture book apps point to homogeneity in publication of digital content for children as most apps in the sample were categorized as fantasy and contemporary realistic fiction. Comparatively, this trend of genre ownership has been found in early elementary classroom library inventories of print books (Crisp et al., 2016). Fantasy also continues to be named as a leading trend in publication of children's literature (Scholastic Corporation, 2018). While there has been push for availability and use of nonfiction in classrooms (Duke & Bennett-Armistead, 2003) and increased popularity of these narratives among readers and publishers (Kantor, 2017), this movement has not reached the picture book app market. The sample included only one nonfiction picture book; however, may be a result of the generic search terms used. The search terms used were selected based upon previous research related to digital picture book apps. The terms may have been more general, as intended, and may have not

been specific enough to yield genre diverse results. General search terms were also partly chosen to reflect what terminology would be used by parents and caregivers to search for picture book apps. Although they did not appear in searches, there is no doubt that there are nonfiction picture book apps available on the digital market.

Most apps included many, if not all, transmedial features that have been identified as markers of quality. All apps included textual elements and visual images, per the inclusion criteria. Additional features, such as sounds, music, voice, paratextual elements, activities, navigational elements, and transitions, were often incorporated throughout the apps. This finding was expected as previous literature highlights the possibility for and affordability of apps to include complex features to support reader engagement and participation (Serafini et al., 2015). The transmedial features that were not frequently present were paratextual elements and transitions (i.e. page turning). Paratextual elements provide the readers the chance to explore material relevant to the app and transitions can serve as a connection between digital reading and traditional book reading with incorporation of the page turning action. Variations of these features found in the sample seem to have little potential to enhance the user's reading experience.

Following examination of inclusion of transmedial features, the components' degree of user interactivity based on part of an assessment framework developed for literacy apps (Israelson, 2015) were evaluated. On average, the degrees of interactivity of transmedial features were determined mostly engaging with some potential for distraction from the literary content. Although research has yet to widely evaluate picture book apps based on the quality of included transmedial features, it can be expected that apps are

31

engaging but also provide opportunity for interruption and diversion from the task of reading due to presence of game-like elements (Bus, Takacs, & Kegel, 2015). For example, for the apps that included activities within the story content, the largest proportion of the activities were determined distracting and as mostly entertainment and gaming. These activities did not provide further context to the story content and were merely positioned in the app as an additional opportunity for users to engage with the touch screen. With activities and other interactive transmedial features, it is important for digital content developers to understand the implications of incorporating heavily animated features with game-like modes into educational apps. The current study encourages inquiries regarding the producers of the apps that were taken from the searches. Who are these individuals, and do they understand child development and literacy learning? It can be assumed, based on the complexities of the apps' features, that the developers are experts in coding and digital design but have limited knowledge about children's digital and traditional literacy.

In this study children's reading engagement and interactions with the sample of apps were not assessed. Nonetheless, evaluation of these apps is imperative in order to understand the trends in transmedial feature inclusion. Further, app assessment can provide insight into areas of improvement in app development, such as consideration of incorporation and complexity of certain transmedial features, that may not have been previously considered in order to provide a more engaging and educational experience for the user.

Generally, for results regarding gender, the frequency of which masculine characters were represented in app titles and as central characters was unsurprising given similar findings in previous research of print books (McCabe et al., 2011). An additional replicated finding was that more masculine characters were identified by their pronouns than feminine characters, therefore highlighting a greater male presence across the sample of apps. Filipovic (2018) and McCabe and colleagues (2011) studied the use of animals in children's books as a means of avoiding "gendering" characters; however, they both found that animals continued to be gendered and would typically be presented in ways that would increase disparity between gender representations by illustrating feminine characters in overly feminized ways. While the current research did find greater frequency of animal and insect characters compared to human characters, it was found that characters' physical attributes were more gendered for humans rather than animals and insects.

Interestingly, the most gendered human characters were those identified as mothers. A significant observation made regarding maternal characters was that their physical forms and faces were frequently exaggerated in stereotypically feminine ways (e.g., pronounced hips and breasts, eyelashes, makeup, and dresses; *Little Red Riding Hood by Nosy Crow* (Nosy Crow, 2017). This finding prompts the question as to why the app developers made the decision to purposefully enhance feminine features in a character that has a stereotypically feminine role and nickname ("mother")? In contrast, in *Roxy and the Ballerina Robot* (Jackrabbit Publishing LLC, 2017), there was a character with stereotypical feminine features that was identified as a mother; however,

this character's role was not that of child caretaker but of one that works outside of the house and handles money, which are typically traits stereotypically associated with masculine or paternal characters. The character with masculine features identified as the father was present throughout the story and was consistently portrayed as the child caretaker, which is not typical in children's picture books (Adams et al., 2011). This app was one of few that included storylines with masculine and feminine featured characters that were not assigned stereotypical roles and traits. In *The ogress* (SARL La souris qui raconte, 2015), the central character was a human with stereotypical feminine features who exhibited physical strength, was loud, and took part in messy behaviors, which are all stereotypically masculine roles. The sole character in *The ABC's of Halloween – A Little Lucy Adventure* (9 Volt Interactive LLC, 2017), who was identified by feminine pronouns and facial features, dressed up in stereotypically feminine and masculine outfits and was illustrated participating in both stereotypically feminine and masculine activities and behaviors. These examples of characters challenging stereotypes may point to a new direction of children's digital narratives, reflecting the current trend of inclusion of strong female characters in children's print picture books (Scholastic Corporation, 2018).

When looking at the interplay between nature and quality of the sample of apps, a relationship was found between apps that were classified as fantasy and the inclusion and degree of interactivity of transmedial features. It is important to note that there was a great majority of fantasy apps in the sample than any other genre, so it can be assumed that this association between genre and quality components may be dependent on the number of apps identified by genre. As this study was of the first to examine genre and

transmedial features in picture book apps, future research is needed, and a greater sample of genre diverse apps would provide better insight into the relationship between genre and transmedial features.

Other relevant associations with genre, specifically fantasy and contemporary realistic fiction, include those of the differences between the frequencies of stereotypical feminine and masculine characteristics. Notably, stereotypical feminine physical characteristics (i.e., facial features and physical form) were more apparent in these apps than stereotypical masculine physical characteristics. However, there were more characters identified as gender ambiguous in terms of physical characteristics than both stereotypically gendered categories (feminine and masculine). This finding may be explained by the definition of "gender ambiguous". Past research investigating gender differences in children's literature has prominently examined gender as a binary construct, and although this terminology reinforces the idea that gender is a two-part concept, the literature lacks a conceptual definition of gender neutral or gender ambiguous to use to identify illustrated characters. Therefore, there were limitations in the definition of gender ambiguous physical characteristics, so much so that any character that did not exhibit stereotypical feminine or masculine characteristics was considered gender ambiguous. Regarding the findings of greater numbers of stereotypically masculine clothing and roles compared to those of stereotypically feminine characters across the two genres, this result may have emerged due to the fact that the stereotypically masculine clothing included more variation (i.e., t-shirt, pants, shorts, and tennis shoes) than stereotypically feminine clothing (i.e., skirts, dresses, and high heeled

shoes). Similarly, for roles, stereotypical masculine roles include that of adventure and exploration (Diekman & Murnen, 2004). As it has been identified as a trend among children's literature (Scholastic Corporation, 2018), there were many picture book apps that included the themes of exploration and adventure, therefore, the characters that engaged in these activities were coded for stereotypical masculine roles, even if they had stereotypically feminine physical characteristics.

In terms of associations between all three examined components, there was no evidence found for a relationship between genre, inclusion and degree of interactivity of transmedial features, and presence of gender components. To illustrate, two apps, *Oh! What a Tangle* (Digital Leaf, 2016) and *Tess plays at being a princess – Little Girl* (PLURIAD, 2016), have differing levels of transmedia quality, representations of gender, and genre. In *Oh! What a Tangle* (Digital Leaf, 2016), the main character had stereotypically feminine facial features and pronouns but wore both stereotypically feminine and masculine clothing and participated in stereotypically feminine and masculine roles (i.e. exploration and adventure and grooming). This character was determined one of few figures across all apps that was not conformed to the having features of one heavily stereotyped gender. Also included in this app was a maternal character who was coded as stereotypically feminine across all gender components. Additionally, this app included most transmedial features (all except activities, paratextual elements, and transitions) that were coded with moderately high interactivity. In comparison, *Tess plays at being a princess – Little Girl* (PLURIAD, 2016) presents two characters that were coded as stereotypically feminine across all gender components.

The app included most transmedial features (all except activities and transitions) but scored moderately low on degree of feature interactivity. The data from these two apps is an example that there are no existing correlations among genre and the inclusion of particular features of gender and degree of interactivity of transmedial components.

Overall, these findings provide opportunities for further inquiries regarding future directions in research and app development. The primary implications of this work demonstrate the need for further understanding of the role of genre in picture book app content, as well as greater knowledge of the limits, or lack thereof, of interaction with and inclusion of transmedial features. Additionally, this research highlights the necessity of providing demonstrations of attributes, behaviors, and roles that are not gender specific through non-stereotypically defined characters in the digital storytelling market. Future app development could focus on including interactive visual images and sounds that, when touched, add context to the textual elements in the story and not distract the reader with unruly animation. Also, work could be done on the development of more interactive nonfiction picture book apps as these were underrepresented in the sample.

Limitations

This study has several key limitations. First, the searches were limited by time and accessibility to app stores outside of the Apple App Store. It is understood that there are many picture book apps available in other app stores; however, the searches were limited to Apple in particular for the reason of assessing a limited number of apps in a short period of time. Additionally, the nature of the app market regularly changes and developing, therefore, the searches may yield different results if conducted today.

However, with the search terms and filter categories, it is believed that the searches are representative of the body of apps available at large. Another limitation to the study were the search terms. There are several terms synonymous with "picture book app" (Zheng, 2016), and an attempt was made to include as many variations of the term in order to capture an assortment of apps. It is possible that the chosen terms may have left some existing apps out of the dataset. Another limitation previously mentioned was that of the conceptualization of gender ambiguous. Hopefully future research on gender and gender identity can loosen this constraint of definition and provide the opportunity to explore representation in picture books and picture book apps in a more well-rounded manner. Lastly, user interactivity with the apps and their transmedial features with children were not evaluated. Therefore, the measures of quality were based on the perceptions of researchers. In the future, it is our hope to study children's use and experiences with the apps after continued focus on the market itself.

Conclusion

This study examined a sample of apps in hopes of understanding the nature, quality (as determined by frequency and interactivity of chosen transmedial features), and representation and depictions of gender within digital picture book story content. Even with the increasing use of digital technology, such as tablets, by children, there is limited knowledge about the nature of picture book apps designed for young individuals. Analyses showed that most apps included many, if not all, transmedial features, however, degrees of user interactivity were determined as mostly engaging with some opportunity for distraction from the literary content. Findings showed that the most prevalent genre

found among the sample was fantasy, which reflects current children's publishing trends. Results also revealed that masculine characters were identified more often than feminine characters as the central character, and feminine characters were depicted with more stereotypical facial features and physical forms. Additionally, characters were depicted taking part in more stereotypically masculine roles than stereotypically feminine roles. What this research has highlighted is the need for greater understanding of how apps can engage readers with literary content through the use of transmedial features without providing opportunities for distraction. Secondly, it indicated that greater variability in genre in picture book apps is needed, although they may exist and did not emerge from the searches and are not popular. Further, greater understanding of children's publishing trends regarding gender are needed to provide audiences with non-stereotypical and non-limiting ideas of possible selves that children have the capability and opportunity of being.

REFERENCES

Aarseth, E. J. (1997). *Cybertext: Perspectives on ergodic literature*. Baltimore, MD: Johns Hopkins University Press.

Adams, M., Walker, C., & O'Connell, P. (2011). Invisible or involved fathers? A content analysis of representations of parenting in young children's picturebooks in the UK. *Sex Roles*, *65*(3), 259-270.

AKQA. (2016). The Snow Fox (1.0.1) [Mobile application software]. Retrieved from https://itunes.apple.com/us/app/the-snow-fox/id1057962873?mt=8

BelMontis Publishers Pte. Ltd. (2018). Rom and the Whale of Dreams (1.3) [Mobile application software]. Retrieved from https://itunes.apple.com/us/app/rom-and-the-whale-of-dreams/id766584084?mt=8

Bem, S. L. (1983). Gender schema theory and its implications for child development: Raising gender-aschematic children in a gender-schematic society. *Signs: Journal of Women in Culture and Society*, *8*(4), 598-616.

Beschorner, B., & Hutchison, A. (2013). iPads as a literacy teaching tool in early childhood. International Journal of Education in Mathematics, Science and Technology, 1, 16–24.

Broemmel, A. D., Moran, M. J., & Wooten, D. A. (2015). The impact of animated books on the vocabulary and language development of preschool-aged children in two school settings. *Early Childhood Research & Practice, 17*(1), 1-14.

BulBul Inc. (2015). Beauty and Beast – Fairytale (1.1) [Mobile application software]. Retrieved from https://itunes.apple.com/us/app/beauty-and-beast-fairytale/id910883758?mt=8

Bus, A. G., Takacs, Z. K., & Kegel, C. A. (2015). Affordances and limitations of

    electronic storybooks for young children's emergent literacy. *Developmental*

    Review, *35*, 79-97.

Busy Bee Studios. (2018). Even Monsters Get Sick (1.7.1) [Mobile application software].

    Retrieved from https://itunes.apple.com/us/app/even-monsters-get-

    sick/id535303119?mt=8

Cherland, T. (2006). Female representation in children's literature. *Ecclectica*, *25*(4),

    284-290.

Ciampa, K. (2012). Reading in the digital age: Using electronic books as a teaching tool

    for beginning readers. *Canadian Journal of Learning and Technology*, *38*(2), 1-

    28.

Cianciolo, P. J. (1997). *Picture books for children* (4th ed.). Chicago, IL: American

    Library Association.

Colwell, E. H. (1980). *Storytelling*. London, England: Arrow.

Crisp, T., Knezek, S. M., Quinn, M., Bingham, G. E., Girardeau, K., & Starks, F. (2016).

    What's on our bookshelves? The diversity of children's literature in early

    childhood classroom libraries. *Journal of Children's Literature*, *42*(2), 29-42.

De Jong, M. T., & Bus, A. G. (2002). Quality of book-reading matters for emergent

    readers: An experiment with the same book in a regular or electronic format.

    Journal of Educational Psychology, *94*(1), 145-155.

Dezuanni, M., Dooley, K., Gattenhof, S., & Knight, L. (2015). *iPads in the early years:*

    Developing literacy and creativity. New York, NY: Routledge.

Diekman, A. B., & Murnen, S. K. (2004). Learning to be little women and little men: The inequitable gender equality of nonsexist children's literature. *Sex Roles*, *50*(5-6), 373-385.

Digital Leaf. (2016). Oh, What a Tangle! (1.1.1) [Mobile application software]. Retrieved from https://itunes.apple.com/fi/app/oh-what-a-tangle-kids-bedtime-story-best-ebook/id573508067?l=fi&mt=8

Duke, N. K., Bennett-Armistead, S.V. (2003). Filling the great void: Why we should bring nonfiction into the early-grade classroom. *Literacy Faculty Scholarship*, *1*, 1-7.

Emmanuel Paletz Corp. (2017). The Alice App (1.5) [Mobile application software]. Retrieved from https://itunes.apple.com/us/app/the-alice-app-childrens-fairy-tale-stories/id849718336?mt=8

Filipović, K. (2018). Gender representation in children's books: Case of an early childhood setting. *Journal of Research in Childhood Education*, 1-16.

Flewitt, R., Messer, D., & Kucirkova, N. (2015). New directions for early literacy in a digital age: The iPad. *Journal of Early Childhood Literacy*, *15*(3), 289-310. doi: 10.1177/1468798414533560

Frawley, T. J. (2008). Gender schema and prejudicial recall: How children misremember, fabricate, and distort gendered picture book information. *Journal of Research in Childhood Education*, *22*(3), 291-303.

Galda, L., Sipe, L. R., Liang, L. A., & Cullinan, B. E. (2014). *Literature and the child* (8th ed.). Belmont, CA: Wadsworth Publishing.

Gediminas Cibulskis. (2017). Unnamo the Earthworm LITE: interactive tale (1.0)

   [Mobile application software]. Retrieved from

   https://itunes.apple.com/us/app/unnamo-the- earthworm-lite-interactive-

   tale/id1227215126?mt=8

Gilster, P. (1997). *Digital literacy*. New York, NY: Wiley Computer Publishing.

Hullabalu. (2018). Locke Saves the Town (1.0.3) [Mobile application software].

   Retrieved from https://itunes.apple.com/us/app/locke-saves-the-

   town/id1175819214?mt=8

Huntington, A. R. (2013). Breaking gender barriers in early childhood education: An

   exploration of the Reggio Emilia and Montessori approaches. *The Loyola*

   University Chicago Journal of Early Education Law and Policy, 2013, 1-14.

   Retrieved from

   http://www.luc.edu/media/lucedu/centers/childlaw/earlyeducation/2013studentpap

   ers/huntington.pdf

Huracan Apps. (2018). Green Riding Hood: Read Aloud (2.0.3) [Mobile application

   software]. Retrieved from https://itunes.apple.com/us/app/green-riding-hood-read-

   aloud/id977242839?mt=8

Ihmeideh, F. M. (2014). The effect of electronic books on enhancing emergent literacy

   skills of pre-school children. *Computers & Education*, *79*, 40-48.

IckyPen Ltd. (2016). The Icky Mr. Fox (6.0) [Mobile application software]. Retrieved

   from https://itunes.apple.com/us/app/the-icky-mr-fox/id543046969?mt=8

Israelson, M. H. (2015). The app map. *The Reading Teacher*, *69*(3), 339-349.

Jackrabbit Publishing LLC. (2017). Roxy and the Ballerina Robot (1.2.0) [Mobile

    application software]. Retrieved from https://itunes.apple.com/us/app/roxy-and-

    the-ballerina-robot/id1062690612?mt=8

Jenkins, H., Ford, S., & Green, J. (2013). *Spreadable media: Creating value and meaning*

    in a networked culture. New York, NY: NYU Press.

Kantor, E. (2017, December 7). Global kids connect 2017: Sales, stats, and hot topics.

    Publishers Weekly. Retrieved from https://www.publishersweekly.com/pw/by-

    topic/childrens/childrens-industry-news/article/75555-global-kids-connect-2017-

    sales-stats-and-hot-topics.html

Krcmar, M., & Cingel, D. P. (2014). Parent–child joint reading in traditional and

    electronic formats. *Media Psychology*, *17*, 262–281. doi:

    10.1080/15213269.2013.840243

Lucyna Markowska. (2019). The Thief of Wishes (1.4.0) [Mobile application software].

    Retrieved from https://itunes.apple.com/us/app/the-thief-of-

    wishes/id1341712700?mt=8

Marie, M. (2007). A thematic feminist analysis of best-selling children's picture books

    (Master's thesis). Oregon State University. Retrieved from http://goo.gl/NsBMQs

Marsh, J. (2006). Emergent media literacy: Digital animation in early childhood.

    Language and Education, 20, 493–506. doi: 10.2167/le660.0.

McCabe, J., Fairchild, E., Grauerholz, L., Pescosolido, B. A., & Tope, D. (2011). Gender

    in twentieth-century children's books: Patterns of disparity in titles and central

    characters. *Gender & Society*, *25*(2), 197-226.

McCracken, E. (2013). Expanding Genette's epitext/peritext model for transitional

electronic literature: Centrifugal and centripetal vectors on kindles and iPads.

Narrative, *21*(1), 105-124.

Merchant, G. (2005). Barbie meets Bob the Builder at the workstation. In M. Marsh

(Ed.), *Popular culture, new media and digital literacy in early childhood* (pp.

183–200). New York, NY: Routledge Falmer.

NAEYC & Fred Rogers Center. (2012). Technology and interactive media as tools in

early childhood programs serving children birth through age 8. Washington, DC:

National Association for the Education of Young Children. Retrieved from

https://www.naeyc.org/sites/default/files/globally-

shared/downloads/PDFs/resources/topics/PS_technology_WEB.pdf

National Center for Education Statistics. (2015). Children's access to and use of the

internet. *The Condition of Education 2018.* Retrieved from

https://nces.ed.gov/programs/coe/pdf/coe_cch.pdf

Neumann, M. M., Finger, G., & Neumann, D. L. (2017). A conceptual framework for

emergent digital literacy. *Early Childhood Education Journal*, *45*(4), 471-479.

9 Volt Interactive LLC. (2017). The ABC's of Halloween – A Little Lucy Adventure

(1.3) [Mobile application software]. Retrieved from

https://itunes.apple.com/us/app/the-abcs-of-halloween-a-little-lucy-

adventure/id1158574900?mt=8

Nosy Crow. (2017). Little Red Riding Hood by Nosy Crow (1.2) [Mobile application software]. Retrieved from https://itunes.apple.com/us/app/little-red-riding-hood-by-nosy-crow/id626696483?mt=8

Oceanhouse Media. (2018). Dr. Seuss's ABC – Read & Learn (4.0.12) [Mobile application software]. Retrieved from https://itunes.apple.com/us/app/dr-seusss-abc-read-learn/id1011479119?mt=8

Oddbot Inc. (2016). My Friend Barlow (1.1) [Mobile application software]. Retrieved from https://itunes.apple.com/us/app/my-friend-barlow/id752660033?mt=8

Ofcom. (2017). Children and parents: Media use and attitudes report. Retrieved from https://www.ofcom.org.uk/__data/assets/pdf_file/0020/108182/children-parents-media- use-attitudes-2017.pdf

Penguin Random House LLC NY. (2016). Elmo's Big Birthday Bash! (1.5) [Mobile application software]. Retrieved from https://itunes.apple.com/us/app/elmos-big-birthday-bash- sesame-street-step-into-reading/id510754841?mt=8

Pescosolido, B. A., Grauerholz, E., & Milkie, M. A. (1997). Culture and conflict: The portrayal of blacks in US children's picture books through the mid-and late-twentieth century. American Sociological Review, 443-464.

PlayDate Digital. (2016). Mr. Potato Head: School Rush (1.0) [Mobile application software]. Retrieved from https://itunes.apple.com/us/app/mr-potato-head-school-rush/id1065623382?mt=8

PLURIAD. (2016). Tess plays at being a princess – Little Girl (1.4) [Mobile application software]. Retrieved from https://itunes.apple.com/om/app/tess-plays-at-being-a-princess-little-girl/id714161967?mt=8

Puentedura, R. (2014). Learning, technology, and the SAMR model: Goals, processes, and practice. Ruben R. Puentedura's Weblog.

Rideout, V. (2014). Learning at home: Families' educational media use in America. *Joan Ganz Cooney Center*. 1-50.

Ruckus Media Group. (2017). Chuck & Friends: Fort Chuck (1.2) [Mobile application software]. Retrieved from https://itunes.apple.com/us/app/chuck-friends-fort-chuck/id820076764?mt=8

Ruterana, P. C. (2012). Children's reflections on gender equality in fairy tales: A Rwanda case study. *Journal of Pan African Studies*, *4*(9), 85-101.

Santora, L. A. (2013). *Assessing children's book collections using anti-bias lens.* New York, NY: New York Anti-Defamation League.

SARL La souris qui raconte. (2015). The ogre (1.1.0) [Mobile application software]. Retrieved from https://itunes.apple.com/us/app/the-ogress/id547161636?mt=8

Scholastic Corporation. (2018, January 26). 5 top trends in children's books for 2018. *Scholastic Parents*. Retrieved from https://www.scholastic.com/parents/books-and-reading/raise-a-reader-blog/5-top-trends-childrens-book-2018.html

Scholastic Corporation. (2016). *Kids and family reading report.* Scholastic. Retrieved from http://www.scholastic.com/readingreport/key-findings.htm#top-nav-scroll

Serafini, F., Kachorsky, D., & Aguilera, E. (2015). Picturebooks 2.0: Transmedial
features across narrative platforms. *Journal of Children's Literature*, *41*(2), 16-24.

Serafini, F., Kachorsky, D., & Aguilera, E. (2016). Picture books in the digital age. *The Reading Teacher*, *69*(5), 509-512.

Sesame Street. (2018). The Monster at the End… (5.1.8) [Mobile application software].
Retrieved from https://itunes.apple.com/us/app/the-monster-at-the-end/id409467802?mt=8

Sipe, L. R. (1998). How picture books work: A semiotically framed theory of text-picture
relationships. *Children's Literature in Education*, *29*(2), 97-108.

SlimCricket. (2016). Is the Witch in Love? (4.0.2) [Mobile application software].
Retrieved from https://itunes.apple.com/us/app/is-the-witch-in-love/id924850478?mt=8

Smeets, D. J., & Bus, A. G. (2015). The interactive animated e-book as a word learning
device for kindergartners. *Applied Psycholinguistics*, *36*(4), 899-920.

Sneaky Media LLC. (n.d.). Grandma (1.0) [Mobile application software]. Retrieved from
https://itunes.apple.com/bn/app/grandma/id912132504?mt=8

Soul and Vibe Interactive Inc. (2016). Johnny Tractor and Friends: Growing Season (1.0)
[Mobile application software]. Retrieved from
https://itunes.apple.com/be/app/johnny-tractor-and-friends-growing-season/id1085818091

StoryToys Entertainment Limited. (2017). Storytime: Billy Goats Gruff (1.0.1) [Mobile

    application software]. Retrieved from https://itunes.apple.com/us/app/storytime-

    billy-goats-gruff/id1266228635?mt=8

Turrión, C. (2014). Multimedia book apps in a contemporary culture: commerce and

    innovation, continuity and rupture. *Nordic Journal of ChildLit Aesthetics, 5*(1), 1-

    7.

Vygotsky, L. (1978). Interaction between learning and development. *Readings on the

    Development of Children, 23*(3), 34-41.

Walsh, M. (2006). The 'textual shift': Examining the reading process with print, visual,

    and multimodal texts. *Australian Journal of Language and Literacy, 29*, 24–37.

Weitzman, L. J., Eifler, D., Hokada, E., & Ross, C. (1972). Sex-role socialization in

    picture books for preschool children. *American journal of Sociology*, *77*(6), 1125-

    1150.

Winch, G., Johnston, R. R., March, P., Ljungdahl, L., & Holliday, M. (2010). *Literacy

    reading, writing and children's literature* (4th ed.). South Melbourne, Vic: Oxford

    University Press.

Wooten, D. A., & McCuiston, K. F. (2015). Children's literature book apps: Exploring

    new paths for books and literacy development. *Journal of Children's Literature*,

    41(2), 26-30.

Zheng, Y. (2016). Anything new here in story apps? A reflection on the storytelling

    mechanism across media. *Libri & Liberi*, *5*(1), 55-76.

APPENDIX

Table 1

Coding criteria gender components

Component	Conceptualization
Title	Inclusion of name and/or pronoun of feminine or masculine character
Feminine	Feminine pronouns (she/her/hers) or feminine name
Masculine	Masculine pronouns (he, him, his) or masculine name
Both	Two pronouns/names; feminine and masculine
Not applicable (NA)	No pronouns/names
Central character	Name in title, frequency of character's presence in the story (McCabe et al., 2011)
Feminine character	Name or pronouns clarify character is feminine
Masculine character	Name or pronouns clarify character is masculine
Choice	App provides user choice of main character
Unclear	Characters are equally presented in the app, no names or pronouns included in title
Species	Characters presented as human, animal and insect, or other creature (Diekman & Murnen, 2004)
Other	Animated object, mythical creature, alien, etc.
Human	Human
Animal/insect	Animal/insect
Face	Includes hair, eyes (e.g. eyelashes, eye makeup), and facial hair (Filipovic, 2018)
Feminine	Stereotypical feminine features – long eyelashes, eye makeup, long hair, pigtails, and hair accessories
Masculine	Stereotypical masculine features – facial hair, no/short eyelashes, and short hair

Table 1 (continued)

Component	Conceptualization
Unclear	Gender ambiguous; no hair or distinctive features
Form	Physical form (body shape) (Filipovic, 2018)
Feminine	Stereotypical feminine features – hourglass body shape, and pronounced breasts
Masculine	Stereotypical masculine features – broader shoulders and build and pronounced muscles
Unclear	Gender ambiguous form; nonhuman form without human form attributes
Clothes	Stereotypically gendered clothing items (Filipovic, 2018)
Feminine	Stereotypical feminine items – dresses, skirts, high-heeled shoes
Masculine	Stereotypical masculine items – pants, tennis shoes, collared shirts, t-shirts, neck ties
Unclear	Robes or clothing combinations that included both stereotypically masculine and feminine items
No clothes	Absence of clothing items
Pronouns	Use of feminine, masculine, or gender non-conforming pronouns (McCabe et al., 2011)
Feminine	She, her, hers
Masculine	He, him, his
Neutral	It, its, they, theirs
None used	Absence of pronoun use
Roles	Domestic, occupational, and leisure roles based on stereotypical feminine and masculine behaviors and practices (adapted from Diekman & Murnen, 2004)

Table 1 (continued)

Component	Conceptualization
Feminine	Childcare, housework, homemaker, grooming, shopping, cooking, passive and quiet, reading
Masculine	Yardwork, paying bills, handling money, office work, hard labor, physical strength, confidence, messy and noisy, sports, adventure, exploration
Both	Character participates in both stereotypically feminine and masculine roles/tasks
Not applicable (NA)	No roles exhibited

Table 2

Frequencies of gender components based on character species

Species	Component	Gender	Frequency	Percent
Other	Face	Feminine	14	24.6
		Masculine	7	12.3
		Unclear	36	63.2
Human	Face	Feminine	37	42.5
		Masculine	32	36.8
		Unclear	18	20.7
Animal/insect	Face	Feminine	16	16.3
		Masculine	4	4.1
		Unclear	78	79.5
Other	Form	Feminine	1	1.8
		Masculine	1	1.8
		Unclear	55	96.5
Human	Form	Feminine	20	23.0
		Masculine	11	12.6
		Unclear	56	64.4
Animal/insect	Form	Feminine	3	3.1
		Masculine	1	1.0
		Unclear	94	95.9
Other	Clothes	Feminine	6	10.5
		Masculine	3	5.3
		Neutral	9	15.8
		None used	39	68.4
Human	Clothes	Feminine	30	34.5
		Masculine	41	47.1
		Neutral	16	18.4

Table 2 (continued)

Species	Component	Gender	Frequency	Percent
Animal/insect	Clothes	Feminine	8	8.2
		Masculine	20	20.4
		Neutral	15	15.3
		None used	55	56.1
Other	Pronouns	Feminine	9	15.8
		Masculine	17	29.8
		Neutral	2	3.5
		None used	29	50.9
Human	Pronouns	Feminine	31	35.6
		Masculine	32	36.8
		None used	24	27.6
Animal/insect	Pronouns	Feminine	19	19.4
		Masculine	51	52.0
		Neutral	1	1.0
		None used	27	27.6
Other	Roles	Feminine	4	7.0
		Masculine	29	50.9
		Both	4	7.0
		Not applicable	20	35.1
Human	Roles	Feminine	24	27.6
		Masculine	32	36.8
		Both	12	13.8
		Not applicable	19	21.8
Animal/insect	Roles	Feminine	17	17.3
		Masculine	41	41.8
		Both	6	6.1
		Not applicable	34	34.7

VITA

Marie Patricia Bliss was born on March 3, 1996. She graduated from Royal Holloway, University of London in 2017 with a Bachelor of Science degree in Psychology. She is currently attending the University of Tennessee, Knoxville and is pursuing a Master of Science of degree in Child and Family Studies. She will graduate from the University of Tennessee, Knoxville in May 2019.