IWRITE: DIGITAL MESSAGE MAKING PRACTICES OF YOUNG CHILDREN

by

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Dissertation

Submitted to the Faculty of the

Graduate School of Vanderbilt University

in partial fulfillment of the requirements for

the degree of

DOCTOR OF PHILOSOPHY

in

Learning, Teaching and Diversity

August 2013

Nashville, Tennessee

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DEDICATION

To all of the children who have written with me, especially Anna and Peter.

ACKNOWLEDGEMENTS

It has been said that "It takes a village to raise a child". I would argue that it also takes a village to write a dissertation, and I am indebted to those who have supported this endeavor.

To Debbie Rowe—thank you so much for the support and guidance you have offered me during my time at Vanderbilt both professionally and personally. I have been so fortunate to have the opportunity to learn about research, writing and professional collaboration from the example you have offered. Thank you for always challenging me.

To Vicki Risko—thank you so much for guiding me through the beginning of my journey as a doctoral student. Your insight and guidance has been instrumental to my development as a researcher.

To the other members of my committee—Bridget Dalton and Steve Graham—thank you for the time you invested in my work and for the invaluable insights and feedback you offered.

To Grace and Jane—thank you for opening your classroom to me. I enjoyed getting to know you both better and wish you all the best in your teaching careers.

To my Vanderbilt colleagues—Tara Alvey, Nate Phillips, and members of the New Media & Learning research group—thank you for offering me opportunities to think about the work I do in meaningful ways.

To everyone in the Department of Teaching & Learning office—thank you for helping me scan, format, staple and hole punch my way through this dissertation.

To Andrea—thank you for your support and friendship during this last leg of the dissertation journey. I am so glad to have you across the wall.

To David, Julie, and Michael—thank you for your love and support throughout all of my educational pursuits.

To Sara—thank you for making sure that I didn't lose myself in this process. Thank you for always listening, for caring, and for knowing just what to say.

To Jennifer—thank you for answering the phone whenever I called. Thank you for being the voice of experience, the voice of knowledge, and most importantly the voice of reason. I would not be here without your support and encouragement.

To my parents—thank you for believing in me throughout this long process, and offering every kind of support along the way. Thank you for the meals, the countless hours of babysitting, and everything else you've done to help support on this journey.

To my children—thank you for encouraging and supporting me without knowing it. Thank you for writing with and to me, for always being willing to try out one more app, and for happily having play dates while Mommy was writing.

To Robb—thank you for being my cheerleader and for always knowing that I could do this, even when I wasn't so sure. Your patience and love have supported me throughout this journey. I could not have done it without you. Thank you.

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INTRODUCTION

Literacy As a Digital Practice

Being literate in today's world means more than the ability to read and write printed texts.

It also includes the ability to make meaning both *from* and *with* digital media. Through

technology and interactive tools, literacy is not limited to printed text, but also encompasses a

variety of other modes including images, videos and sound. Due to changing technologies,

children today are interacting regularly with new genres and forms of text as they are avid users

of technology. Children age 8 and younger spend over 2 hours (on average) with screen media a

day (Common Sense Media, 2011). Sometimes referred to as "digital natives" (Prensky, 2001),

these children are entering school with a vast knowledge of digital literacies based on their out of

school experiences with multimedia texts through print, television and computer (Berson &

Berson, 2010; Buckleitner, 2009; Calvert, Rideout, Woolard, Barr & Strouse, 2005; Chiong &

Shuler, 2010; Couse & Chen, 2010; Kerawalla & Crook, 2002; Lisenbee, 2009; National Early

Literacy Panel, 2008; Rideout, Lauricella & Wartella, 2011). This research examines the digital

practices of a group of preschool digital natives with iPads. By introducing iPads within the

purposeful, message-making context of email, I have been able to consider both the process

engaged in and the products created by 4 year old children. Before moving into the specifics of

the study, however, I will first introduce the study through a consideration of digital literacy's

role within the larger field of literacy, the current digital practices of young children, and the

specific digital message making practice of email. In the following chapter, I will review the literature focused on young children composing digitally.

Literacy is not simply paper and pencil practices involving the alphabet. Rather it is more general practices or "literacy events" (Heath, 1983) associated with making meaning. Literacy is not limited to cognitive practices such as reading accuracy or spelling ability, but rather includes social practices such as making messages for others. Defining literacy as a social practice (Gee, 1991; Street, 1984) broadens the definition to include everyday practices used for communication. In today's world, literacy social practices include digital literacies such as emailing, researching online and creating videos. When considering literacy, the incorporation of more diverse texts and technologies impacts the skills that children need as they become literate in today's society (Flewitt, 2011; New London Group, 1996). For example, instead of only understanding print based conventions (i.e. letter formations, directionality, how to turn pages), young children are beginning to also understand how to be literate with digital technologies (i.e. keyboarding, visual image interpretation, hypertext navigation). The term digital literacies refers to children's reading and writing practices that occur through technology. In other words, when children engage with digital technologies they may participate in literacy events such as reading or creating messages. For the purposes of this study, the definition of *digital literacies* is borrowed from Levy (2009), who defines digital literacies as practices surrounding digital text production, involving any screen-based verbal or written text. For example, a child may read text on the computer screen through her interaction with an electronic book or a child may type on her parent's iPhone. In addition, the term *digital technology* refers to all electronic tools with screens (including televisions, computers, cell phones, tablets, gaming systems and so on). Finally, *digital texts* is used to describe the message that is being read on the screen (i.e. text

messages, emails, icons, videos). As children are exposed to various forms of digital

technologies and media, they are creating new ways to explore and experience literacy.

It is important to consider the definition for a digital text and how it significantly differs

from traditional print text (Labbo, Reinking, & McKenna, 1998; McKenna, Labbo & Reinking,

2006; Reinking, 1992, 2008). Typically located on a screen, hyperlinks, images, video and

sound are common characteristics of digital texts as opposed to print texts which rely mainly on

the printed word and static images. Speech and writing are no longer the dominant modes of

communication in digital texts (Kress, Jewitt, Ogborn, & Tsatasarelis 2001; Jewitt, 2002). Also,

while print text is fixed, digital texts may be more malleable, allowing for manipulation. While

fonts may be personalized through the use of color and font choice, digital text eliminates the

personal touch possible through handwriting with pen and paper (Mavers, 2009). Through the

use of fonts, digital texts can be standardized, making texts accessible to all readers. Third,

digital text often has interactive potential. Digital text can interact with the reader, responding to

the touch on a screen or the click of a mouse. Although many print storybooks incorporate

interactive elements such as a peek-a-boo flap or tactile pictures (i.e. a furry kitten), they do not

offer links to other stories or web pages as digital texts often do. Often, there is also the

possibility of interaction with other people. Unlike storybook reading between parent and child,

digital texts can connect children to people who are in other locations. Web 2.0 technologies

encourage social participation, whether it is through something as simple as an email exchange

or as complex as online interactive gaming. Fourth, both digital and printed text often

incorporate pictorial symbols or icons. Visual images such as icons and photographs are often

embedded in web pages, email signatures and video game screens. While this is similar to

images in printed texts, the difference is that with digital texts there is often the option of animation with the images or images can change to text (or vice versa) when tapped.

These structural differences are available in part due to advances in software and touch screen technology which allow children the ability to interact independently with digital technology. In addition, icons often support children's navigation of programs and websites. For example, a menu bar in an open-ended composing app, Sketches2, boasts numerous icons including a pencil icon to access the drawing tool, a 'T' button to open the pop-up keyboard, and and an arrow pointing to the left to undo actions. This reliance on symbols, rather than alphabetic text, is especially important to consider for young children because, in some ways, this allows children to access and create digital literacies independently.

While most educators think of digital literacy as on-screen practices such as typing an email, playing a video game or interacting with an electronic storybook, even some printed texts reflect the digital nature of our culture. As seen in this discussion, a specific delineation between print and digital texts no longer exists, as the former rigid line between product and process has become blurred (Walsh, 2008). Today's literacy is a hybrid literacy, composed of genres and forms with print and digital literacies comingling. It is not the advent of a "new" medium. Rather it is the idea that print is no longer the sole purveyor of meaning (Kress, 2003). In fact, print literacies may be just as useful when dealing with new media. For example, a child may read the book *Curious George*, and then watch the animated television show of the same name. Finally, the child may then interact with the Curious George picture dictionary app on an iPad or with the Curious George activities on pbskids.org on a computer. Throughout all of these activities, the child can use her knowledge of the Curious George book to help guide her understanding of the show and the website activities. For example, at the Curious George

website, the Man with the Yellow Hat narrates the games and plays the role of knowledgeable grown up on the website just as he does in the Curious George books. If a child needs guidance, she can click on the yellow hat icon in order to get a verbal tip from the Man with the Yellow Hat. Similarly, even when they are not actually using a screen-based program, students are greatly impacted by digital technologies and tend to incorporate them into their "offline" literacy practices. For example, a child may label a row of black dots as her "password" when working at a writing table. Even though she was not prompted to write about passwords, she applied her digital literacy knowledge to traditional pen and paper writing. Similarly, other children may draw pictures of cell phones or make pretend iPods out of pen and paper to use in dramatic play (Wohlwend, 2009).

Children are being exposed to these new and old technologies simultaneously; thus theorizing about children's literacy practices must take this into consideration. This is not an argument that print is becoming obsolete, but rather an argument that digital literacies surround us and need to be acknowledged to better understand the literate beings that children are today. It is not, as some argue, enough plan a curriculum to prepare children for technologically-intense futures. Instead we must acknowledge children to be the active participants in digital practices that they are here and now (Carrington, 2005a, National Association for the Education of Young Children, 2011). Additionally, it is essential to look at the screens these young children are using. As Moje (2009) encourages, it is important to consider medium as well as literacy practices associated with such tools. For example, investigating how young children compose email messages on iPads could highlight children's digital literacy practices when using touchscreen and interactive technology.

Taking into consideration the digital landscape of today's society, it is essential that research consider issues surrounding the digital literacy practices of young children. In order to do this, I have defined the terms digital literacy, digital technology, digital texts to create a common language (see Table 1).

Table 1
Definitions of Commonly Used Digital Terms

Digital literacies	Reading and writing practices that occur through technology
Digital technology	Electronic tools with screens
Digital texts	Messages read on screens

My discussion of the hybridity of literacy allows for a fuller understanding of the importance of digital literacy when discussing young children's literacy abilities. Moving forward, to consider what today's child knows and can do, I will look closely at children's digital literacy practices at home and in school,. This investigation into what constitutes the "fullness of literate practice" (Moje, 2009, p. 352) will give insight not only into children's understandings of literacy, but also the possibilities that accompany this. Before discussing the specifics and potentials of children's digital message making practices, however, it is important to consider the current digital practices of young children at home and school.

Current Digital Practices

Children's Digital Technology Use at Home

Young children today are growing up in a world immersed in digital media. "More than half the world's population now owns a cell phone and children under 12 constitute one of the fastest growing segments of technology users in the U.S." (Shuler, 2009, p. 4). Children see cell phones being used to communicate, digital cameras to record events, e-readers to read electronic books, game systems to play video games and computers to research. There has even been an increase in electronic baby and toddler toys ensuring that children are exposed to technology

from the earliest age (Levin & Rosenquest, 2001; Shuler, 2011). For example, kid tablets aimed at 4 to 9 year olds, released in June 2011, were a huge success during the 2011 holiday season, selling out frequently (McManus, 2011). Digital media is dominating young children's media involvement. In most environments, exposure to screen media is occurring alongside exposure to print media (Wartella & Richert, 2009). Children have been raised with these artifacts in their lives, such that it is not a new set of objects but rather a part of their textual landscape (Carrington, 2005a; Ching, Wang, Shih, & Kedem, 2006).

Young children spend time at home engaging in digital experiences through, and across, their interactions with television, computers, gaming systems, and smart phones. For example, a preschool aged child may watch a video clip of a construction site on YouTube on a parent's smartphone or play an Elmo A-to-Zoo Adventure on the family's wii gaming system. While these activities are fun (and often informative), children can also be exposed to digital experiences with more personalized literacy purposes such as video chatting with a grandparent or asking Dad to send Mommy a text message requesting popsicles from the grocery store. Through these home experiences, many young children are learning first hand about literacy. This literacy is multi-faceted, with elements existing in various forms and genres. It is children's involvement with these screens, both at home and at school that will guide this discussion regarding the importance of studying young children's digital practices.

Media reports abound, claiming that young children are immersed in digital media. In light of this perceived high level of engagement with technology, children in this digital age are seen as "capable, curious and interactive" (Dresang & McClelland, 1999, p.162), and any parent will tell you about the power of the screen. However, it is important to examine the actual prevalence of digital media among young children in order to understand the types of tools and

experiences with which young children are engaged. Data supports society's notion that children are heavy technology users. In fact, 90% of 4-6 year old children engage in at least one form of screen media on a typical day (Rideout & Hamel, 2006). While this heavy use does not mean that children naturally know how to use technology, it does mean that many children have enough exposure through personal use and adult models that they are capable of interacting successfully with digital tools.

Young children spend the most screen time at home watching television, typically a non-interactive screen. A telephone survey of over one thousand families reported that 78% of 4-6 year olds watch television on a typical day, with the average amount of time spent watching equal to just over 1 hour (Rideout & Hamel, 2006). In 2006 it was reported that 92% of 4-6 years old watch television several times a week (or more) (Rideout & Hamel, 2006). It is obvious from these numbers, that even young children are heavily engaged with television in their homes. While television is not the screen of interest for this research, television shows are often springboards for other digital media such as video games and websites, and continues to be the biggest digital influence on young children (Gutnick, Robb, Takeuchi, & Kotler, 2010), so being aware of children's exposure to television is important. For example, a child may watch Sesame Street on PBS, hear about the website, psbkids.org, and log on to play games. When watching television, children are typically fairly passive, tending to sit and watch a show. In comparison, other forms of media, such as video games and computers offer more active opportunities for children. Labeled as interactive technology these opportunities are "designed to facilitate active and creative use by young children and to encourage social engagement with other children and adults" (NAEYC, 2012, p. 1). It is this, interactive, type of technology that is of interest for this paper.

Next to the television, computers are the second most popular digital technology used by young children. According to 2011 survey data of 800 parents, 85% of children between the ages of 2 and 8 years have used a household computer (Takeuchi, 2011). Focusing on 4 to 6 year olds, while 13% are reported to use a computer daily, 43% use a computer several times a week (or more) (Takeuchi, 2011). A 2005 survey of almost 2000 parents of preschool children also reported that young children are immersed in digital technology (Marsh Brooks, Hughes, Ritchie, Roberts & Wright, 2005). Marsh et al. (2005) report that 81% of these families have one or more computer and that on a typical day, 53% of preschool children use computers in the home. It is important to note that when using the computer (unlike when watching television), children may engage in different activities including: computer games, drawing, and visiting child-friendly websites (Zevenbergen & Logan, 2008). With technological advances, children also now have the opportunity to watch videos on computers.

Video games (both console-based and handheld) are also used by young children at home. The average age of a child's first video game use is reported to be 3 years and 11 months (Common Sense Media, 2011). As they grow older, this exposure only increases. Eighty-one percent of 5 to 8 year olds have played a console based video games (Common Sense Media, 2011). It is reported that 24% of children under the age of 6 play console video games regularly, and 14% play handheld video games at least several times a week (Rideout & Hamel, 2006). Video games are another staple of many children's digital diet.

Most recently, it is reported that many young children are using mobile technology including cell phones. Out of a group of 2000 children that had universal access to cell phones, parents reported that 14% of preschool aged children had used cell phones to make phone calls with help (Marsh et al., 2005). Considering that more than half the world's population now

owns a cell phone, young children's exposure to cell phones will only increase (Shuler, 2009). Specifically, 93% of 6 to 9 year olds in the United States live in a home with a cell phone (Sesame Workshop, 2007). It would appear that preschool children are aware of the role and nature of cell phones, often pretending to use old cell phones during dramatic play. Parents also reported children having an understanding of texting, as 18% had pretended to send texts and other parents reported children requesting that parents send a text on their behalf (Marsh et al., 2005). With the advent of smart phones, which do more than just make phone calls, children are being allowed access more frequently to these previously "adult only" tools. It is estimated by the Pew Research Center that approximately 45% of American adults own a smartphone (Brenner, 2012).

The advancement of technology has created newer devices including touchscreen devices (i.e. iPods) and tablets or e-book readers (i.e. iPads and Kindle Fires). As of January 2012, adult ownership of tablet computers and e-book readers is up to 29%, an increase of 11% from 2011 (Brenner, 2012). Since much of this technology is new, and has only recently become widespread across adults, there are few studies that consider children's use. A 2011 study of 1384 surveyed parents revealed that 52% of 0-8 year olds live in a house with a smartphone, a video iPod or iPad (Common Sense Media, 2011). Survey respondents reported that 39% of the 2-4 year olds and 52% of 5-8 year olds have used these mobile devices. Considering that the availability of these tools is increasing drastically, these numbers appear to be only the beginning of an increasing trend as parents are willing to share mobile devices. Now that mobile devices often have games, parents pass their devices to a child to keep them occupied when becoming bored, prompting the term "pass-back effect" (Chiong & Shuler, 2010). In addition, in a 2012 study of iPad owners, the majority (72.5%) reported co-reading e-books with their 2 to 6 year old

children (Takeuchi, 2012). While very little research has been conducted on children's use of these devices, educators and industry experts currently suggest developing ways to harness the potential power that mobile technology has to offer children of all ages (NAEYC, 2011; Shuler, 2009).

Interestingly, research has suggested that the presence of tools in the home does not necessarily dictate that a child is a competent digital user. For example, Bearne, Clark, Johnson, Manford, Motteram, & Wolstencroft (2007) report that "very young children show expertise in on-screen reading, even where homes have no computers" (p. 11). In addition, in a survey of over 300 families regarding children's use of digital technology, it was found that an increase of technological items did not relate to the amount of use of said technology by children (Plowman, McPake, & Stephen, 2010). The amount of time spent on digital tools is presented in the research, but it is also important to consider the *types of activities* that children choose to engage, or how these screens are being used. Large-scale studies have not investigated how children are interacting with these tablet and smartphone tools, but rather the time spent or the ownership of categories of technology. With the advent of technologies, children can now play games, write a story, send an email, surf the internet, watch a video and take a picture all with one device. No longer is the type of device indicative of the actual activities being done. For example, a child may report television, computer, smart phone and tablet use, and could be doing different things on each. However, he could simply be watching videos on all four screens as well. Many surveys only ask about what tools a child has access to, or how much time they spend on a specific tool. For example, most surveys prior to 2010 simply asked for the time spent on a specific type of technology (i.e. computer or handheld video games). One large scale study in 2011 focused questions on the types of activities children engage in in conjunction with the

technology being used (Takeuchi, 2011). This research shows that parents of 3 to 10 year olds, report that their children regularly "play games on the computer or internet" (44%), "surf the internet or visit websites"(36%), and "create art or other items on computer" (28%) (Takeuchi, 2011). Moving beyond the time spent on specific tools allows us to consider if, and how, children are interacting with technology (Christakis & Garrison, 2009; Tandon, Zhou, Lozana, & Cristakis, 2011). This distinction is important in order to understand more fully the ways that children are taking up and interacting with various activities offered through digital technologies. This study has looked closely at children's engagement in specific digital message making opportunities in an effort to understand children's involvement and understandings of these digital literacies.

Children's Digital Technology Use at School

Young children today are competent users of digital technology at home, and, when offered the opportunity, at school. Children are entering the classroom as users of digital and paper texts and are in the process of acquiring skills to understand even the most complex multimodal texts (Albers, Frederick & Cowan, 2009). At first glance, there appears to be cohesion across home and school settings, as many preschool and kindergarten students have access to computers and internet in their classroom. However, a different landscape emerges when we shift our attention away from the home environment and focus on digital technology practices in school. The 1994 *Elementary and Secondary Education Act* passed by Congress created technology programs to promote experimentation and research on use of technology in schools. Public schools in particular have benefited from this legislation, taking advantage of discounts on computer equipment and telecommunication services (Chaplin & Puma, 2003). In addition, the passage of the *No Child Left Behind Act of 2001* (NCLB, 2002) includes, among

many interests, a desire to improve students' technology use, wanting to ensure that students become digitally literate by 8th grade. This attention and support for technology in classrooms has ensured that many K-12 schools now have computers and internet access. It has been suggested that young children acquire basic technology skills or "technology-handling skills" (National Early Literacy Project, 2008) by the age of 5 (International Society for Technology in Education, 2007), further encouraging technology integration in classrooms. Most recently, with the addition of the Common Core Standards, technology is included in the newest set of standards. While digital literacies are not the focus of the Common Core Standards (2012), print and media literacies are blended throughout the standards. For example, in a kindergarten writing standard, it states that children should "With guidance and support from adults, explore a variety of digital tools to produce and publish writing, including in collaboration with peers" (Common Core Standards, 2012). Children are not just expected to learn to write a story, but also to use digital technology when doing so.

Basic technology has made its way into preschools. Looking at early childhood programs, there is a plethora of technology, especially computers, music players and digital cameras. The National Center for Educational Statistics (NCES) reports that 67% of nursery schools and 80% of kindergarten children have computers in schools, with a combined 55% who have access to the internet (NCES, 2005). A more recent report of almost 2,000 preschool teachers found that 98% of classrooms have at least one computer in their classrooms (Pasnik & Llorente, 2011). Digital cameras are less prevalent, with less than half of preschools reporting their use (Marsh et al., 2005; Pasnik & Llorente, 2011). Interactive whiteboards, document cameras, and tablets are rarely seen in preschool classrooms (Pasnik & Llorente, 2011). While not quite as saturated as in

the home, the majority of schools do appear to have opportunities for children to interact with technology, especially computers.

It is important to remember that the presence of computers does not mean that they are positively influencing instruction or that they are being used by students (Labbo, 1996). Even though schools may appear to be equipped, and have access to digital technology such as computers, printers and the internet, students may not actually be using this equipment during the school day. Current literacy practice in preschool and kindergarten classrooms is based upon traditional print literacies utilizing books, paper and markers (Lynch & Warner, 2004). Whole group lessons tend to be taught using traditional forms of text such as picture books or chart paper as central components, not computers. Looking specifically at young children, it appears that this lack of technology use is "exacerbated in the context of early childhood education, where digital technologies are seen as oppositional to the ideologies that underpin what is seen as quality teaching in the learning settings" (Zevenbergen & Logan, 2008, p. 37). Early childhood classrooms have been slow to incorporate digital technology and the affordances that come with its use because many teachers and administrators do not see a place for technology in the early childhood curriculum.

When computers are found in preschool classrooms, they aren't always used effectively. In their survey of early year practitioners in England, Marsh et al. (2005) report that even though 71% of classrooms reported having computers, only 46% of the teachers had used the computers with children that week. In the same study, 32% teachers report rarely or never planning for computer instruction, and 78% never used the internet with children (Marsh et al., 2005). In a study of P-12 educators, 76% of K-12 teachers report that they use digital media in their classrooms while only 33% of pre-K teachers said the same (Grunwald Associates, 2009).

Touchscreen tablets are becoming more prevalent in society and in education. The tablet market is expeted to grow from "fewer than 20 millions units in 2010 to over 230 million in 2015" (McManis, 2012, p. 3). While there is very little empirical research on the impact iPads may have on learning, school districts are beginning to embrace this technology. For instance, New York City public schools spent $1.3 million on 2,000 iPads in 2011; in 2012 San Diego public schools spent $10 million on 26,000 iPads; and the McAllen, TX school district recently approved $20 million for an iPad rollout program over the next few years (Aimonetti, 2012; Hu, 2011; Kaufman, 2012). As of fall 2012, there were approximately 1.5 million tablets in use by students (Kaufman, 2012). Research is only beginning with regards to the impact of this widespread adoption of touchscreen technology, but the preliminary data (such as that from Auburn, Maine where kindergarten students received iPads this year) are promising, reporting that students who used iPads performed slightly better on literacy tests than those who didn't use the device (Dalrymple, 2012; Schramm, 2012). At this point, it is clear that iPads are being used by school districts across the United States. It is essential that research investigate how children are embracing this type of technology in order to better understand this digital technology.

In many cases, computers tend to play an ancillary role in the classroom, with computers and other technological devices offering practice opportunities, non-curricular game opportunities for children or new methods for publishing existing printed text (Becker, 1993; Carey & Worthington, 1997; Honan, 2008; Reinking, 2008; U.S. Congress, 1995). When used in schools, digital resources appear to be used mainly in an additive manner, and tend to use technology in an effort to support and emphasize "the basics" (Lankshear & Knobel, 2003). For example, children may have opportunities to read an e-book or play a computerized educational game designed to teach rhymes or alphabet knowledge. In other classrooms,

children are encouraged to use computers to create final products based on earlier print work. For example, one classroom created comic books using pen and paper, and then students were asked to transfer their print work onto a computer to create a final digital text through a power point presentation (Honan, 2008). Labeled a "Literacy 1.0" mindset (Wohlwend, 2010), early years teachers are not capitalizing on many of the resources that technology has to offer.

While most educators accept that young children learn through play, this attitude has not been applied to digital technology by many early childhood educators (Lindahl & Folkesson, 2012), and teachers are focused on using digital tools to support basic skills. In preschool classrooms, most time on computers appears to be spent on educational games (2.9 hours) and drill and practice software (3.4 hours) (Carey & Worthington, 1997). In a study of the ECLS-K data, which is a collection of national data regarding children's early childhood experiences including schooling, researchers found that computers in early childhood settings were used for three main purposes: to learn literacy skills (i.e. reading, writing and spelling), to learn math and for fun (West, Denton & Germino-Hausken, 2000). More recent research has echoed these findings, reporting that computer game play in preschools was typically used to enhance literacy and math concepts, through repetitive skill practice, and was independent of other teaching and learning activities (Pasnik & Llorente, 2011; Zevenbergen & Logan, 2008).

There are, however, a few classrooms found in the research that have embraced technology, integrating it into the classroom in a purposeful manner. While not the norm, these classrooms do offer examples of how technology can be used appropriately and effectively with young children, and give insight into children's digital literacy practices. These studies will be focused on in the literature review in the next chapter.

In summary, young children are active users of technology at home. Spending the most time with the television screen, children are also found interacting with computers and video games. While mobile technology is a newer tool, most children live in homes with access to cell phones, and some children are given access to these devices (Sesame Workshop, 2007). Even less popular devices such as tablets have been used by almost one third of preschool children, and half of early elementary children (Common Sense Media, 2011). These numbers are increasing as availability of digital technology is increasing. In general, young children are spending more time interacting with digital media outside of school. Research is just beginning to look closely at the ways in which children are using technology in the home, but it appears that much of the activities are passive (i.e. watching television or videos), while some is more interactive (video gaming, creating art, taking photos). In schools, however, young children do not interact with digital technology in the same manner. First, the amount of technology and the opportunities to interact with said technology is much slimmer than in the home. Second, when children do use technology, it is typically in an isolated manner that reinforces basic skills.

Email as Digital Message Making

It is important to consider how digital literacy can be used in the classroom beyond these basic standard practices. In this section, I will discuss email as an effective digital message making practice. Within the intersection of emergent writing and digital literacies, I have chosen to focus specifically on the composing practices among young children when using digital technology. I am drawn to this area for two main reasons. First, and foremost, I have always been interested in the ways that young children come to understand and engage in writing. Second, the potential power of digital technologies is also of interest to me due to the highly engaging and motivating characteristics of "the screen". Young children are avid users of digital

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media, and this involvement is integral to consider when thinking about young children's literacy practices.

Throughout this paper, the foundation for my investigation into how young children interact with technology is based on concepts grounded in emergent writing research and theory. Specifically, I consider children to be active participants in the writing process as they draw existing social, cultural and cognitive knowledge when they compose. Early writing researchers were the first to position young children as authors, recognizing that children are indeed composers and can create meaning using various modes, even when the products are unconventional in format. I believe that technology has much to offer when children are offered active opportunities to interact and compose on screens. My research on children's meaning-making practices with digital technologies builds on this emergent literacy framework, focusing on the child as composer, along with a multimodal perspective.

Before delving into the details of the study, it is important to look closely at the specific practice of digital message making. While digital message making can include a variety of practices such as texting, Instant Messaging, or video chatting, for the purposes of this study, *digital message making* refers to the practice of emailing. Email was selected due to its widespread use and conventional genre. Since email is used widely to communicate, it was hoped that most parents in this study would have regular access to an email account. Also, at this research location, email was the parents' preferred vehicle for communication, thus ensuring that they would receive participants' emails. Building on the fact that email practice is commonplace, it was hoped that the children in this study would have some understanding of the practice. This does not mean that children would have emailed independently, but rather that they may have been aware of email as a message making practice. In order to fully understand

the characteristics and affordances of email, I will discuss it in comparison to the practice of print message making or writing a message with pen and paper. Both are discussed within the context of the early childhood classroom since that was the location for this study.

Creating messages is common practice in early childhood classrooms. Whether it is to the teacher, a peer or a family member, young children often put pen to paper to share a message. Let us assume, for this example, that both digital email and print message have the same purpose, which is to compose a message for a family member. Specifically, a child would like to ask her Dad whether they can have pizza for dinner that night. Assuming available supplies, this message could be composed with both print and digital tools. First, I will describe the print composition process. Composing using print affords opportunities for children to draw and write with a variety of writing tools such as crayons, markers, and pencils on various types of paper (i.e blank, construction, and notebook). If available, children can also use other tools such as letter stamps, stencils, stickers, scissors and glue to create multimodal compositions. While some completed products may contain only marks on a page, others may be an elaborate construction of stamps, stickers, various papers glued together and marks. For example, a child may print "PZU PEZ" (with a backward Z and an E with 4 horizontal lines) with a red marker on an orange sheet of paper (for her message of "Pizza, please!"). Then she could add a drawing of a pizza as seen in Figure 1. In addition, these products can be physically manipulated, often being folded and put into a paper envelope, something that cannot be done using digital technology. Finally, these products may be taken home to share with family members.

Using technology such as open ended drawing applications with a touchscreen tablet to compose an email offers many of the same tools as print products. Colored lines, images, and a keyboard are available for use during the composing process. Both simple and elaborate

products can be created on the rectangle space on the screen. Children can chose to erase or "undo" markings when working, an option that is not as easily done when working with print materials. Also, photographs can easily be added to a composition by simply pushing a button. In this scenario, a child may snap a digital photo of herself, stamp a picture of a pizza, and then type the conventional letters "PZU PEZ" for her message of "Pizza, please!"

Figure 1. Pizza Please

Figure 1. Pizza Please
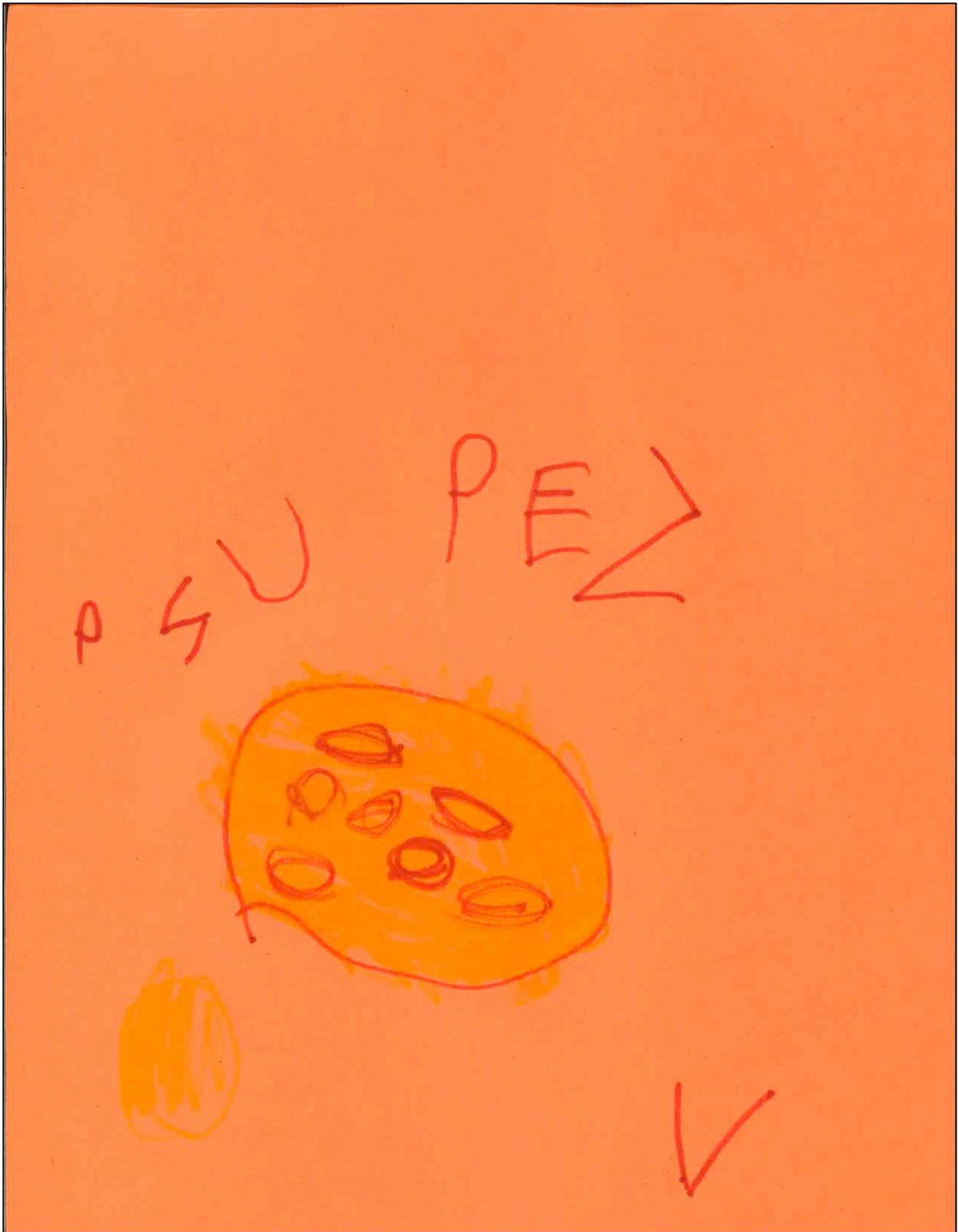
Despite this similarity, the technological tools have potential to offer children opportunities that are typically easier and quicker, thus offering a space within which different types of products may be created (Merchant, 2005). In the digital example, a child uses photographs, stamps and typed letters to create a final product. In contrast, a similar print product could be created using print tools, however the writing center would have to be well stocked to have pizza stickers, photos of the children in the class (or other necessary) images, as well as alphabet stamps, and so on. Practically speaking, the use of technology means that a child can have access to many images, colors, and fonts, along with the capabilities to combine them quickly and easily to create a composition. In addition, for young children, fine motor skills (or lack thereof) may inhibit a child's ability to accurately print letters or cut specific shapes. Digital tools offer resources such as keyboard or the crop tool which can allow children the ability to create compositions on screen that they may not be capable of composing independently at the writing table.

Once a message has been composed, then it must be sent. However, the affordances between sharing print and digital technologies varies, due to the use of different vehicles to deliver the product. When a child has finished composing using print materials, she may put it in her cubby or school bag to take home and deliver to family members. Before placing it in her cubby, she may fold the work or place it in an envelope if desired. Often the name of the recipient is written on the outside of the folded product or the envelope. This can be done using a variety of marks, including scribbles, inventive spelling and conventional spelling. The location of the text in the child's cubby will signify to the family member that it is meant to go home. The fact that the product is folded or in an envelope may further signify that it is a letter. Parents may see the product that afternoon during pick up, or later when cleaning out the child's

bag. There may be a discussion around this product, but parents rarely, if ever, write back. Sending digital texts via email, however is a different process. When the child is ready to send the product, a button is pushed, and an email message appears. Then, the child must type in the name of the intended recipient in order to effectively send the email message. Unlike print letters, email addresses must be spelled conventionally and correctly in order to be sent successfully. If used before, email addresses may pop up automatically as a child begins to type. Parents can receive and respond to an email before coming to pick up the child at school. Returning to our pizza example, a parent could receive this dinner request and respond before pick up, allowing the child's message to have been heard and responded to in a timely manner.

Even though the purpose is the same, the distinction between writing a message and sending an email may be greater than it first appears. These are different types of compositions and therefore each genre "embodies different potentials and makes different demands on writers" (Wollman-Bonilla, 2003). Ultimately, they differ in format and delivery. Digital technology offers the ability to create compositions even if children cannot form letters or have access to writing center supplies. In addition, there is the opportunity for a parent to respond in a real time manner. Because of the power of digital technology, it is essential to consider adding research on digital writing opportunities in the early childhood classroom. While digital tools should not replace pen and paper, they can be used in addition to existing writing instruction in specific and purposeful ways.

Literacy is not limited to printed text, but through the advent of technology, it also encompasses a variety of other modes including images, animations and sound. Young children spend time outside of school engaging in digital experiences through their interactions with television, computers, gaming systems, and smart phones. In addition, at home they are

surrounded by others using digital technology in varied and purposeful ways. Children bring this understanding of literacy as a hybrid mix of print and digital components when they enter school. At many schools, while there may be the opportunity to engage with technology, there is little connection to the content of the classroom instruction. Digital experiences tend to be game-like, skills based, and with animations geared towards engaging and motivating children. Typically these experiences are located on a computer or hand-held screen in an isolated area of the classroom.

Clearly, there is a gap between children's home and school experiences with regards to digital literacies. Because technology use in classrooms is typically isolated from other instruction or opportunities to use technology in purposeful ways, children do not see digital media being used in the same purposeful, authentic manner that often happens out of school. This gap is slowly beginning to be addressed by both educators (NAEYC, 2012) and researchers (Couse & Chen, 2010; Pelletier, Halewood & Reeve, 2006). As the following literature review will show, there have been successful examples of technology integration in classrooms, but few offer opportunities for children to interact with digital tools while making messages for family members. Building on this work, this study has been crafted to address the lack of research on authentic classroom based touchscreen opportunities.

Assumptions Guiding the Design of this Study

Research on digital literacies among young children must take into consideration all forms of literacies, occurring both in and out of school. To consider the many ways in which young children engage with digital literacies, I designed a study that integrates digital technology with existing literacy practices in school, while also investigating home digital literacy practices. In addition to drawing on existing research, there are also guiding assumptions drawn from

emergent literacy, multimodality and digital literacy perspectives that have impacted the design features of this study.

Focusing on the emergent literacy perspective, I assume that children are active composers, which has led me to craft opportunities for children to compose and receive emails at school using iPads and software programs (Sketches2 and Mail). I focused data collectionon observing children as they composed, sent and received digital messages. By doing this I could focus on the child's active composing process as well as the final product. Secondly, I assume that children are communicating, even when not producing conventional products. Therefore the goal of this study is to describe children's behaviors, regardless of conventionality. Third, I assume that children use all forms of products, both conventional and unconventional, for real purposes. In turn, I designed authentic iWrite activities that had the real communication purpose of emailing parents about classroom activities for the children involved in this study.

Drawing from the multimodality perspective, I assume that children weave together a variety of modalities when composing. In order to allow for an investigation of this, I selected an open-ended composing app, Sketches2, that allowed children access to a variety of visual modes including drawing, typing, stamping and the use of photographs.   In addition, when analyzing data, I looked across modes as I described children's use of stamps, photos and typing in relation to their behavior and the final products.

Drawing from the digital literacies perspective, I assume that children begin to explore digital literacies early in life through interactions with parents and other technology users. Therefore, I collected home data including home visits and parent interviews to understand children's home digital literacy experiences better. In addition, I assume that technology is an active tool that young children can engage with some adult support. Because of this, I chose to

use child friendly touchscreen iPads as the vehicle for composing so that children could compose as independently as possible. Research has shown that children are comfortable with various forms of technology, so regardless of children's previous exposure to touchscreen technology, using an iPad was expected to be manageable.

The purposes for this study were to examine both children's digital message making practices and products in a preschool classroom, and then digital practices outside of school. This study moves beyond research reporting what types of technology children interact with, to look at how children compose digital messages. This study used a qualitative approach to examine children's digital message making process, specifically looking at the ways that children responded when offered specific types of emailing opportunities. The research questions that guided this study are listed below. An in-depth review of the digital message making literature will be discussed as it relates to each research question in next chapter.

1. What do children understand about email?

2. How do adults interact with children to support the joint construction of email messages?

3. How do young children interact with iPads during the digital composing process?

4. What kinds of digital products do young children create on iPads when using Sketches2 and Mail?

CHAPTER 2

REVIEW OF THE LITERATURE

Theoretical Underpinnings: Meaning Making Practices of Young Children

Understanding how young children interact with technology is still in its beginning stages. As often happens with new forms of media, existing literacy theory has been applied to investigations into young children's digital literacy practices. Specifically, a great deal of current research can be traced to concepts grounded in emergent writing research and theory. Reflecting upon emergent writing research (Dyson, 1985; Harste, Woodward & Burke, 1984) it is important to remember that children are active participants in the writing process. That is, children use existing social, cultural and cognitive knowledge when they compose. Early writing researchers were the first to position young children as authors, recognizing that children are indeed composers and can create meaning using various modes, even when the products are unconventional in format. My research on children's meaning-making practices with digital technologies builds on this emergent literacy framework, focusing on the child as composer, along with a multimodal perspective. This section will discuss both the emergent writing and multimodal framework before continuing into a review of the literature.

Emergent Writing

Within the field of emergent literacy, a smaller field known as emergent writing arose. Clay (1969), Graves (1978), Goodman (1976), Harste et al. (1984), and Read (1975) made great strides in breaking away from the traditional (and problematic) mold of simply looking at printed texts, and instead began observing children's actions as they participated in literacy events

(Gillen & Hall, 2003). This methodological shift has greatly shaped the current understanding of young children's writing development. By focusing analyses on the children's behaviors as well as the texts produced instead of only on the finished product, researchers began to understand the path that children take as they learn to read and write. The shift away from the idea that children only learn literacy through school instruction led to a new perspective that gave children more power and autonomy. As researchers conceded that children played an active role in their own understanding of literacy, it was also noted that this learning could take place well before formal schooling began.

Researchers labeled young children as authors. This was an important step because once researchers granted children the status of authors, more attention was given to their behaviors. Clay (1971, 1975) specifically looked at children and their literacy processes, drawing upon a developmental psychology framework as she observed children's processes during various literacy events. Anchoring her research among young children, Clay focused on the processes that children undertook on their journey in becoming proficient readers and writers. She observed children exploring the print world as they made initial personal connections to print and slowly began to verbally assign meaning to their marks (Clay, 1975). She labeled children as authors once they demonstrated an understanding that the text they had created had potential for meaning, as shown when a child asks an adult, "What did I write?" (Clay, 1975). Through this type of research, the emergent literacy movement shifted the focus from conventional writing to intentional writing, focusing on the meaning a child assigned to her marks.

There is agreement that children develop as meaning makers through a non-linear process of sorts. While children do not move smoothly from one stage to the next, there are specific behaviors exhibited as they try out hypotheses about print and develop their writing abilities.

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Clay describes the development of young children's writing through a list of writing principles that represent different writing types that children may produce along the way (1975). For example, the recurring principle refers to the repetition of the same letters (or strings of letters) and the inventory principle refers to the lists of words created by the child. These principles are witnessed throughout a child's writing development and do not necessarily occur in successive order. Rather, this research suggests that children create a variety of products using different forms based on variables such as context, setting, materials and so on. In addition, research has focused on the importance that a child's name plays in her writing development (Bloodgood, 1999; Ferreiro & Teberosky, 1982; Levin & Aram, 2004; Martens, 1999; Treiman & Broderick, 1998) as it is one of the first set of marks that has meaning for her.

Focusing on children's processes pushed emergent writing researchers to also consider the impact of the environment on children's writing. While learning to write includes knowledge of conventions, letters and alphabetic principles, it also includes social and cultural factors. Looking at the social context, including the roles of adults, classroom practice and out-of-school culture, emergent literacy researchers considered a variety of social factors. Specifically, it has been reported that children's understandings of writing are impacted by the writing they see others involved in (Dyson, 1985; Harste et al. 1984; Heath, 1983; Vygotsky, 1978). As children interact with adults, the roles that adults take during literacy events impact what children understand about literacy (Rowe, 1994, 2008a, 2008b). This has been seen both at home and in school (Bissex, 1980; Ferreiro, 1986; Ferreiro & Teberosky, 1982; Heath, 1983; Teale & Sulzby, 1986). In addition, children's home exposures to literacy practices, including writing, greatly impact the ways that they communicate (Cazden, 1988; Heath, 1983).

Multimodal Composing

When emergent literacy expanded to include the analysis of text production, multimodality became a central tenet. Young children have always created multimodal texts, incorporating more than just marks in their compositions. This integration of modes such as images, color, gestures and voice, shows an openness to broadly defining writing, with lines blurred between writing and other sign systems (Kress, 1998). For example, a child may draw a circle, make the letter S, point at the circle and then say, "This is me."

Originally rooted in social semiotics, multimodality offers insight into representation and communication through different modes. While Suhor (1984) applied the concept of social semiotics to the general field of English education, these theories were first applied to emergent writers by Harste et al. (1984). Building on the notions of social semiotics and sign systems, Harste et al. (1984) concluded that writing is not just the transmission of a message, but a complex response process in which readers and writers cooperate to create meaning through the use of various sign systems including writing, drawing speaking and gesturing. With the advent of digital literacies that are also multimodal in nature, multimodality has been used in an attempt to begin to understand the advent and use of multimodal digital literacies across all ages (Jewitt, 2002, 2008; Kress, 1998, 2000; Kress & van Leeuwen, 1996; New London Group, 1996).

While many scholars utilize multimodality as a frame of reference for their work, there is not one commonly accepted definition of the term multimodal. Building on Jewitt's (2009) theoretical work, my concept of multimodal theory is based on the following three theoretical assumptions.

- Language is another mode, not *the* central mode. Remembering that a mode is a set of resources drawn from when composing, language is only one of many options including

gestures, speech, and symbols. Language should placed on equal footing with other

representational modes (Siegel, 2006).

- The message potentials of different modes vary. In other words, different forms of

    meaning making can afford different types of communicative work. Message makers

    draw on these resources as children select, adapt and use meanings through their own

    interpretation of existing signs. An affordance refers to the inherent properties and

    meaning making purposes available through a specific mode. Print, images, speech, and

    music can be used for different reasons, some lending themselves to conveying certain

    types of messages better than others (Eisner, 2004).

- Children make meaning through an integration of the various modes. Writing is not just

    about deciding which words to write or which images to use, but how the text will be

    orchestrated across sign systems. It is important to consider how these various modes are

    used together to create meaning (Kress, 1997, 2010). For young children, it is the

    intersection of these sign systems that children are developing control over as they

    exhibit their literacy abilities and understandings (Dyson, 1985,1989, 2003).

Summary: Young Children as Print Composers

Young children are viewed as authors, intentionally making marks (that are different

from drawing) and applying meaning before developing an understanding of the alphabetic

principle. Children hypothesize about print, trying out and learning what does and does not work

when creating messages as they progress towards more conventional writing. In the research on

young children, the writing process has been described as more than just marks on paper, for it

also incorporates print, speech and gestures as children work and share their products. Children

build on their out of school experiences, incorporating personal knowledge based on cultural

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literacy practices in their understandings of literacy. Using what they have seen in authentic situations, children grasp what it means to be a writer. While there is agreement that young children tend to follow a developmental path as they try out hypotheses about print and develop in their writing abilities, this path to conventional writing is not fixed. For young children, writing is more than a pen and paper activity, but it is talking, interacting, designing and producing. Currently, young children are viewed as capable of making meaning with print through a variety of sign systems, their use of which is greatly impacted by social and cultural factors. Building on this research base, I will draw from emergent literacy work that acknowledges children as authors who create multimodal products as I look towards research on the digital composing practices of young children.

Research on the Digital Composing Practices of Young Children

As digital literacies have become more prevalent in our homes and schools, attention has turned to the digital composing practices of young children. It is important to look beyond studies that merely report on digital usage by young children and instead consider children's behaviors during these events. It is this research that digs deeper to understand how children interact with digital technologies. In order to situate this study in the literature, I will first discuss research findings in an attempt to answer the question: What do young digital composers look and act like? Second, I will discuss methodologies used in these studies and how this understanding can be applied to future work. While the bulk of this research focuses on children's digital composing at school, there are some studies that spotlight out of school practices.

One challenge of reviewing the literature on young children's digital composing practices is the scarcity of research on this topic. While there has been an increase in research on digital

literacies among adolescents, very little research has focused on young children and digital technologies (Lieberman, Fisk & Biely, 2009). Current reviews of technology use among young children have typically reported on children in a wide-age range, i.e from birth to age 18 (Common Sense Media, 2011; Rideout & Hamel, 2006; Rideout et al., 2004), thus combining children with different abilities. While the participants in the current study are 4 year old children, it is not realistic to only consider the slim body of research focused on the digital composing practices of 4 year olds. Instead, examining research on young children through the age of 8 can provide initial understandings of the field. Although, literacy abilities of 8 year olds are typically more advanced than 4 year olds, the focus for this review is on digital composing practices, not reading or writing ability. Even though children's literacy abilities vary between the focal group and older children, research has shown that children's digital habits share similarities between ages 4 and 8, when children's digital habits change drastically (Gutnick et al., 2010). As discussed, writing development is an ongoing process, beginning in young children. Thus, including 5-8 year olds in this literature review allows consideration of emerging behaviors that younger children may be beginning to exhibit when composing digitally. Therefore, research on young children between the ages of 4 and 8 are included in this review of digital composing practices.

Young Digital Composers Today

Research that describes young children's digital composing practices is based on assumptions similar to those that underlie the emergent writing print research discussed earlier. Children are viewed as authors who combine a variety of modes to create meaningful messages. There are four main characteristics of children that stand out in this research. First, young children have a high level of interest in using technology. Second, children are able to use

digital tools with little instruction. Third, children mix and match, pulling from various modes

and resources to create multimodal messages. Finally, children build on existing social

structures during digital composing. Each of these child characteristics will be discussed in the

sections that follow.

      Interest and motivation. Reports of children pretending to use technology suggest that

children are interested in being "technology users". For example, children have been seen

creating paper replicas of iPods and using carrots as cell phones during play (Wohlwend, 2009).

In addition, many classrooms have child versions of technology such as cell phones, laptops or

video cameras for use during sociodramatic play (Merchant, 2005). Children are highly

motivated to use the real tools and technology that are normally reserved for older children or

adults (Cohen, 2005; Merchant, 2005; Milman, Carlson-Bancroft, & Boogart, 2012; Murray &

Sloan, 2008; Vasquez & Felderman, 2013; Wohlwend, 2009). In a preliminary report on a 1:1

integration of iPads in a prek – 4th grade school, it was noted that children's high level of

enthusiasm for working with the iPads did not diminish, even after many months (Milman et al.,

2012). This was also found in a report by Murray & Sloan (2008) on the use of iPod touch

devices in three elementary school classrooms in Australia. Murray & Sloan (2008) describe a

variety of activities embarked upon by students and teachers. The majority of the students

involved in this project were upper elementary, but children as young as 7 were included.

Activities used with the younger children included using iPod touch devices to practice printing

letters, to record reviews about movies and to make a class podcast. While the final analysis did

not break down students into age specific groupings, the findings did report that students were

observed as confident and independent users of the iPod touch devices. Students who might not

otherwise be as extensively involved in literacy practices, such as English Language Learners

(ELLs), were observed creating podcasts in their native languages (Murray & Sloan, 2008). In a separate study, Vasquez and Felderman report that preschool children who were exploring a collaborative, multimedia slide show continued to work with this program even after numerous technological glitches (2013). The children were so motivated to use the computers and the program that they were willing to overlook difficulties. Finally, in a 2nd grade classroom where students created a podcast called "100% Kids", Vasquez and Felderman (2013) talk about a second language learner who struggled with reading and writing, Subrina. Subrina was so motivated to participate in creating the podcast that she pursued through literacy activities that were difficult for her. It would appear that the technological affordances of the digital technology is highly motivating for all types of young children.

Variation in children's response to digital opportunities in the classroom was also seen in a case study report based on young children's home and school experiences with technology (Levy, 2011). Levy reports that while children may exhibit similar abilities and high interest on computers at home, this same level of engagement is not always apparent at school. Specifically, Levy describes two children who were extremely engaged and capable using their home computers. At school, however, one child did not exhibit the same level of interest, while the other child did. As studies are beginning to delve deeper into analyzing how children interact with computers, research still shows children that are engaged and capable learners, but that there can be variation in their interest in different settings.

Ease of use of tools. With the advent of mobile technology including digital cameras, cell phones, and tablets, it is easier for children to use digital technology in the classroom. Research has shown that even children who have not yet used a specific type of technology, are able to learn quickly and easily how to use various digital tools. Children are viewed as

confident users of technology who can transfer skills from one setting or digital tool to another (Levy, 2011).

Tablets are acknowledged to have advantages over mouse-driven devices such as computers and laptops in that their touchscreen technology is more accessible for young children (Couse & Chen, 2010; Verenikina & Kervin, 2011). These devices are cheaper than laptops, and the cost of applications are very competitive, especially in comparison to software programs used on computers. However, there is a lack of research on iPad use with young children due to their newness (Banister, 2010). Some studies have shown advantages among middle and high school students who use iPads in school settings (Couse & Chen, 2010). This paper will contribute to this body of research as I look at the ways that children interact with and create messages with iPads in an early childhood setting.

Couse & Chen (2010) found that children learned how to interact with the tablets very quickly, needing less modeling than anticipated (Michael Cohen Group, 2011). They also found that the qualities of the drawings produced on the tablets were comparable to those drawn with traditional media. Children in this study stated that they preferred the tablet for a variety of reasons including being able to select colors, ease of erasing, ability to print, less messy than using actual paints. (Couse & Chen 2010). Finally, children's interest in using the tablet was high through the study (Couse & Chen, 2010; Milman, Carlson-Bancroft, & Boogart, 2012). Tablets are especially suited for classroom use because they are portable, can support children on various levels (as seen in Milman et al, 2012), allows for collaboration, and children enjoy using them (McManis, 2012).

This was also seen in Vasquez and Felderman's (2013) analysis of preschool children using VoiceThread, a multimedia slideshow program. After only a short time exploring the

program, these young children were comfortable with VoiceThread, and quick to interact and work with the program. In a preliminary report on the impact of a 1:1 iPad iniative in a preK through 4th grade elementary school, Milman et al. (2012) report that students were often able to act as "tech helpers" in the classroom, assisting both teachers and students, even on new programs.

Researchers examining digital literacy practices among young children have investigated the ways that young children use the digital camera (Cappello & Hollingsworth, 2008; Ching et al., 2006; Pastor & Kerns, 1997; Walsh, 2008). Interestingly, researchers found that this technology was used in various settings, including those not typically considered "literacy" areas. For example, In Ching et al.'s (2006) study, kindergarten and first grade students were given digital cameras to record events throughout the day. Students were then offered adult support to create a photo journal on the computer the following day. Since there was only one camera available for use, children were given full use of the camera for one day before it was another child's turn. In their analysis, Ching et al. (2006) found that the portability of and ease of use of the camera allowed children to use technology in places that technology had not been used before. For example, they photographed tables during lunch time and the playground at recess. One child was even seen creeping closer to the teacher (and eventually leaning over the teacher's shoulder) who was reading a story aloud during a whole group lesson in order to take pictures of the book as the teacher read aloud.

Multimodal composers. Children are mixing and matching, using tools, images, and concepts from their experiences around them to create digital products. Young children have done this in the past with pen and paper, but technology has opened up the doors for different opportunities for these compositions. Researchers and theorists have described children as

composers who draw liberally from all known modes, moving between image, print, language and gesture as they pull from all available resources. Digital product studies report that children are active in the composition process, drawing across various sign systems to create multimodal products.

Walsh's (2008) research demonstrates that students are capable of interacting with and creating multimodal texts using available technology in her report on digital technology in 2 different classrooms. In one classroom of 8 year olds, students were guided in the production of podcasts, a process that included researching, writing, planning, recording and digital editing. The second classroom paired 6 and 9 year olds in a fairy tale study that incorporated traditional reading strategy and skill instruction using print and digital texts together. Students then created their own written fairy tales using word processing, clip art and power point. Beyond providing two exemplars of technology integration in literacy classrooms, this research has shown the "convergence and interdependence between modes of reading, writing, talking, listening and viewing while using both print and digital texts" (Walsh, 2008, p. 104). Walsh (2008) demonstrates how digital technology has the ability to be more multimodal than traditional printed text, allowing for the integration and manipulation of visual, graphic, and sound modes. Most importantly, the children in these classrooms were able to capitalize upon the potentials of the various modes offered through print and digital texts in ways that created integrated compositions.

Labbo, Montero, & Eakle (2002) conducted research to analyze multimodal products of young children. Using the Digital-Language Experience Approach (D-LEA), Labbo et al. (2002) engaged kindergarten children in the creation of digital products. The original Language Experience Approach (LEA) approach gives young children opportunities to orally tell stories

about recent meaningful events which are then written down by an adult (Labbo et al. 2002). The hope is that the child's involvement with the activity and the creation of the text will enable him to access the final, printed text more easily (Wilson, 1979). Incorporating digital technologies, the D-LEA uses digital photography and computers to guide the child through the composition experience. D-LEA includes: setting up the experience, photographing the experience, composing a multimedia story or photo essay and engaging in follow-up activities (Labbo et al., 2002).

Children responded in unique ways to the opportunities to create digital texts using the KidPix program in authentic and meaningful ways. Looking specifically at a struggling student named India, the researchers noted that her experience with D-LEA gave her opportunities to see literacy as an "authentic expression of experience that involves multiple sign systems" (Labbo et al., 2002, p. 10). She created a digital text, incorporating drawings, images and writing based on her experience finding a rock on the playground. Another child, Savannah, exhibited a reliance on visual and aural modes during her D-LEA experience, choosing to use the stamp option in the KidPix program, copying known words from around the classroom, and using the computer voice function. Labbo et al.'s 2002 study demonstrates that children respond differently to the different affordances of the modes, drawing on their existing knowledge and interests to create a new text.

Bearne (2009) looked at three different texts, analyzing a power point presentation, an oral storytelling episode and a paper-based picture book created by 7 and 8 year olds. Bearne (2009) reported that all products analyzed contained visual elements, an important conclusion considering the traditional focus on print based literacy (both written and spoken). She also found that language was integrated with these visual elements, however, the degree to which

language is incorporated in the final product varies. Each product relies differently on modes, with some modes more predominant than others. For example, image and language were relied on more heavily in the picture book product while language, vocalization, gaze and movement contributed more to the oral storytelling product. Through this analysis, Bearne (2009) is able to offer insight into the ways that children weave together different modes to create a specific text format.

Delving into an examination of how modes are used by young children, Labbo (1996) spent a year in a different kindergarten classroom watching children interact with the KidPix program on classroom computers. She conducted an elaborate analysis to examine how each mode was used by children. She found that children use signs symbolically in three different ways: depictive, transformative, and typographic. Depictive symbolism refers to children's use of images to represent ideas (i.e. a child selects a tree stamp and says, "Here is a tree."). Transformative symbolism refers to children's use of an image to represent another image (i.e. a child draws a circle on the screen and says, "Here is my house."). Typographic symbolism refers to children's use of letters and other tools to represent ideas (i.e. a child selects a rainbow stamp and says, "Now we have good luck."). This research exemplifies how children use the symbols and letters available to create messages and meaning through symbolic work. Young children are capable of acting in transformative and meaningful ways when using technology.

Social behaviors. Considering literacy as a social practice (Barton & Hamilton, 1998), researchers have also investigated how the practice of digital composing is linked to wider social structures, which help to shape existing digital literacy practices. For children, being social is not a new characteristic, rather young children have always been classified as social beings, using language to interact with care givers from an early age (Bloom, 2000). Emergent writing

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research has reported that children are impacted by interactions with adult and peers when writing (Larson, 1995; Rowe, 2008; Wiseman, 2003).

The onslaught of social networking and communication linked with the advent of technology has placed a newfound focus on the digital relationships. Digital literacy practices are often located in shared social practices (McTavish, 2009). As Bigum (2002) points out, "the biggest impact digital technologies are having and will continue to have is on relationships between people and relationships between people and organizations." This is seen in research as young children compose and interactions with peers or family members are highlighted (Davidson, 2011; McTavish, 2009; Milman et al. 2012; Vasquez & Felderman, 2013; Verenikina & Kervin, 2011). One teacher in the 1:1 elementary school reported that there was a sense of fellowship around the technology use (Milman et al., 2012). This comment was supported by data reporting that children interacted with one another, sharing triumphs and asking for help as needed (Milman et al., 2012). In Vasquez and Felderman's (2013) report on the 2nd grade "100% Kids" podcast, children were especially excited about the connection to their families through this project. It was even requested that the podcast be translated into various languages so that non-English speaking family members could access the podcast.

In addition to final products creating a space for students to engage with their families, young children often interact with others during technology use as the need for "tech support" arises. For example, in Davidson's (2011) study of young children's acquisition of digital literacy practices at home, the story is told of a young child, Matt, who wished to find out more about a lizard he has seen in a book. In the course of his investigation, he undertook a Google search, which he needed support to complete. He looked to his mother for support with regards to finding letters on the keyboard and backspacing. Other interactive digital literacy practices

have been observed in homes in which children and parents work together such as the case study reported by McTavish (2009) in which 8 year old Rajan and his father relied on maps, websites, video clips, newspaper clippings and email messages to discuss the previous night's world cup soccer game. Verenikina & Kervin (2011) report young children's reliance on older sibling or parents as a form of tech support, reaching out for help when there is a technical glitch or a question. It was suggested that these tech support experiences can offer opportunities for the parent to share and scaffold a child's creative play (Verenikina & Kervin, 2011).

Acquisition of and use of digital literacies in the home is under examined (Carrington, 2005a, 2005b, Lankshear & Knobel, 2003; Marsh 2006; Merchant 2008). While there are many studies that report the amount of time young children engage with specific types of digital technology, there are only a handful of studies focused more on how young children's use technology outside of school. In the new field of research on digital play, it has been reported that parents do not see the value of digital play, rather choosing educationally based programs for their children when engaging with touchscreens (Verenikina & Kervin, 2011). Parents in two studies were observed to set limits on screen time because they were concerned about the possible negative impact that screen time might have on their children (Ching & Shuler, 2010; Verenikina & Kervin, 2011).

Summary: Young children as digital composers. Young children have been shown to be confident and capable when composing with digital technologies. In general, these children have a high level of interest and engagement when offered the chance to interact with technology. In addition, children find using various digital tools easy, transferring skills from one screen or setting to another with little difficulty. When children compose digitally, they often draw from multiple modes, creating complex products. Finally, children's use of digital technology has

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been shown to offer opportunities for interactions with others whether it be in the form of "tech support" or a way to interact with a friend. It is essential to continue this investigation into children's digital composing practices with various tools both at home and at school.

Methodological Insights

While small in amount, the research on digital composing practices of young children does offer insight with regards to methodology for this study. Specifically, the tool of multimodal analysis is seen in much of this research. In addition, specific strategies when using iPads in research are discussed. Both areas of insight into methodology will be discussed, and have been used in the planning of this study.

Multimodal analysis. Studies on the digital composing practices of young children draw from a combination of theories, and multimodal theory tends to be a central component in the majority of studies. When considering the multimodal nature of today's digital landscape, it is justified that multimodal analysis has become more popular when looking at digital literacy practices. While the multimodal aspect of children's literacy practices and texts is not a new perspective, it is still an important one to consider in order to best understand all aspects of young children's interactions with digital texts. This section of the paper will consider several studies that employ multimodal analysis to consider the modes of digital products and how this methodology can be applied to this study..

To analyze multimodal products, researchers most often consider image, print, sound and language (e.g. Labbo et al., 2002; Bearne, 2009; Mavers, 2007).   For example, in one study, Mavers (2007) looked at various characteristics of email products in her case study analysis of 6 year old Kathleen's email exchange with her uncle. Beginning with the smaller units of analysis, Mavers (2007) analyzed elements such as word choice and spacing. Then she pulled her focus

outwards, incorporating visual elements, the connections between signs and symbols and finally, considering individual emails within the entire series of email messages. The categories used for this analysis included: choice of mode and medium, words and wording, punctuation, spacing, spelling, grammar, beginning and ending and presentation. Conceptualizing writing as a process of design, Mavers (2007) was able to consider various modes through her analysis of Kathleen's use of text size, color and font in her email compositions.

Returning to Bearne's (2009) analysis of three multimodal texts created by 7 and 8 year olds, she analyzed image, language, sound, gaze, and movement. In her selection of varied texts, she acknowledges the difficulty in comparing them, as the format of each text offers various constraints and affordances. Bearne however, discussed at length the individual projects with regards to each mode in the framework while also considering the ways in which the students created coherence through their combination of modes in the production of their texts.

Like these studies, this research will draw on multimodal analysis to look closely at children's finished products. Using multimodal analysis will allow for an investigation into the various aspects of the digital products including drawing, printing, typing, stamp and photos.

Use of tools. The iPad is different from a desktop computer, and yet much of the research discussed has reported on children's use of computers. While these are forms of digital technology, and need to be considered, there is also a need to focus on the specific touchscreen technology. Different from the computer due to the user's ability to simply tap or draw on the screen to control the programs, the specific affordances of the iPads have not been extensively explored in the literature. There are very few studies that report on young children's use of touchscreen technology (Couse & Chen, 2010; Kucirkova, Messer, Sheehy, & Flewitt, 2013; Matthew & Seow, 2007). In these studies, children were extremely comfortable and interested in

using the touchscreen devices. Couse & Chen (2010 and Matthew & Seow (2007) reinforced this ease of use as they found that children did not need or want instruction after they began interacting with the tablets. Studies have shown children's high interest and ability to use touchscreen devices regardless of prior experience.

For my study, children were offered the touchscreen technology of an iPad with adult support. Supports were focused on basic access points (i.e. "This button shows you the photos.") and task directions ("Let's send an email."), and included specific procedural directions regarding how to swipe, tap and interact with the iPad. While studies have begun to offer specific notes about planning and implementing activities using the touchscreen technology, they only begin to explore the ways that children can use these digital tools. This study will further explore the ways that children compose digitally when offered opportunities to send emails using iPads.

Gaps in the Existing Research

While much is known about children's *exposure* to digital technology in the school home (e.g. how many computers are in the household), little is known about what children's *interactions* with technology look like (e.g. how the child uses the computer). This study will attempt to address the gaps in the research through this investigation into how children interact with the digital technology of iPads. Classroom based video data of digital composing, parent survey data, parent interviews and home visits have been collected in an effort to fully consider children's digital message making practices. This information should help to add to the small research base on the ways that young children compose digitally using touchscreen technology.

CHAPTER 3

RESEARCH METHODOLOGY

The purpose for this study was to examine children's digital message making practices and products. This study moves beyond simply reporting what types of technology children are interacting with, and looks at how children compose digital messages in school and their out of school involvement with technology. This study used a qualitative approach to examine children's digital message making process. The research questions that guided this study were:

1. What do young children understand about email?

2. How do adults interact with children to support the joint construction of email messages?

3. How do young children interact with iPads during the digital composing process?

4. What kinds of digital products do young children create on iPads when using Sketches2 and Mail?

This research examined the digital practices of a group of preschool digital natives with iPads. By introducing iPads in the purposeful, message-making context of email, I was able to consider both digital composing process and products of 4 year old children. In this chapter, I first describe the research site and participants, then turn to methods for data collection and data analysis.

Design of the Study

I began with open-ended qualitative observations in the classroom environment. Much like emergent writing researchers of the past, children's behaviors and products were the focus of

this research.   Observing patterns of behavior through digital product composition and out of school activities, allowing for a deeper understanding of children's digital message making practices. In this section, I will discuss the research methodology.

Site and Participant Selection

Site selection and description. The site for this study was Parsons Preschool[1] which is housed at Parsons United Methodist church in an urban city in the southeastern United States. It was accredited by the National Association for the Education of Young Children (NAEYC) and licensed by the State as a "3 Star" center. Being a "3 star" preschool refers to the school's voluntary assessment by state evaluators and is the highest rating, awarded based on the quality of the child care program.

In order to examine how children engage with technology in preschool learning experiences, it was necessary to select a site that was open to incorporating experiences involving technology. Parsons Preschool was chosen as a research site because it was an example of a high quality preschool program that was making an effort to incorporate more writing into their classrooms. The administration and most teachers were open to creating learning experiences with technology in order to help them move towards their goal of offering more literacy based activities. Parsons is an example of an early childhood setting where developmentally appropriate practices were valued and enacted on a regular basis (Coppe & Bredekamp, 2009). A focus on language, literacy, social-emotional and physical development can be seen in the classrooms at Parsons Preschool.

The population served by Parsons Preschool reflected its geographic location. Parsons

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[1] Pseudonyms have been used for the names of the school and teachers in this study. Children's real first names are used due to the importance of the child's name throughout the project. Parents have consented to this type of identification for their children.

Preschool was located near a number of large universities and hospitals, near downtown; and thus it attracted many local employees in need of child care. Families attending Parsons were described by the director as middle to upper class.

Parsons Preschool used the Creative Curriculum (Dodge, Heroman & Colker, 2002) as a basis for their program, and also attended to NAEYC "best practice" criteria (Coppe & Bredekamp, 2009) and the state Early Learning Standards (Tennessee Department of Education, 2004). The school had recently acquired the newest edition of the Creative Curriculum (Dodge, 2010) which includes more literacy based objectives and activities. In the previous three years, there had been an added focus on incorporating more literacy based elements such as phonemic awareness and writing into the curriculum. The school recently had a Literacy Focus team comprised of educators that created school wide literacy based goals and suggested practices for all teachers to incorporate into their existing practices. Traditionally, Parsons Preschool focused on developmentally appropriate play-based activities with a focus on language, cognitive and social development.

Including both full and part-time programs, Parsons Preschool served children ranging from 12 months to 5 years of age in a total of 10 classes. Specifically, the Day School 4 classroom (DS 4) was chosen as a research site because it exemplified the quality characteristics for which Parsons Preschool was selected. There were two teachers in the DS4 classroom. Both teachers were committed to engaging children in developmentally appropriate learning experiences that would prepare them for the ever increasing demands of kindergarten. In addition, they were open to incorporating technology with their existing literacy rituals and routines.

Much like other preschool rooms, the DS 4 classroom, had a large, brightly colored rug

for whole group time, tables for snack and lunch, and many center areas. Centers included

writing, art, books, blocks, home living, science, math, manipulatives and a sand table. Children

signed in every morning, and then chose among centers until whole group time at 9 am. This

group time lasted approximately 20 minutes, and was normally focused on reading a story out

loud. After group time, the students went to work centers to complete specific tasks that the

teachers had planned.

Emergent writing at Parsons. Each child's morning routine included the opportunity to

sign in by writing her name on an index card. At the beginning of the year, a book of children's

names were available for children to refer to when signing in, if needed. In addition, children

wrote their names on art work and other projects throughout the day. Because of this focus on

name-writing, the children in this class were confident name spellers.

Most afternoons, a teacher led the students in a whole group note-writing activity. Using

the same format each day, students worked with the teacher to dictate a note to the parents that

was written on a laminated sheet of posterboard with a dry erase marker. It typically began

"Dear Parents", and then had four or five sentences reporting on the day's events that children

verbally created and teachers wrote down. The message usually ended with an appropriate

closing such as "Love, DS 4 Kids". Then, it was posted on the wall near the parent sign in/sign

out book. Teachers reported that students often interacted with the letter at pickup, showing

parents words, or talking about the content of the note.

Participant selection and description.

Teachers. There were two lead teachers in the DS 4's classroom: Jane and Grace. Both

consented to participate in this study. This was Jane's first year in DS 4 and at Parsons

Preschool after receiving her Bachelor of Science in Elementary Education and Early Childhood

Education. She began working at Parsons a week before data collection. Prior to working at Parsons, Jane worked as a substitute teacher at a preschool in a nearby southern state, and as a full-time teacher for one year at a daycare in a nearby city. Grace had an Associate's Degree in Early Childhood Education and had worked at Parsons for 5 years. This was her fourth year in the DS 4. Prior to working at Parsons, she taught preschool for 5 years at a college lab school, and had worked in a daycare for 3 years before college. Grace had attended many local literacy focused workshops. Both teachers were interviewed to gather information regarding writing instruction, student composing practices and beliefs about writing and technology. In addition, teachers were observed during whole group note-writing activities. These lessons were videotaped at the beginning and end of the study to document the note-writing practices modeled by the classroom teacher.

 Students. While there could be a maximum of twenty students in the classroom, at the time of the study there were 16 students enrolled. When the study ended, there were 15 students enrolled. As of September, the age range of students in this class spanned from 3 years, 7 months to 4 years, 9 months. DS 4 students typically moved on to kindergarten or another year of preschool. Of the children enrolled in this study, nine went to kindergarten at the end of the school year, and six remained in preschool for one more year.

 All students in the DS 4 class were invited to participate in this study. Consent forms were sent home via children's school bags for parents to complete. Consent for participation included a request for parents' email addresses so that children could send emails to family members. Sixteen students consented for the project. In total, however, 15 students participated in the study due to the fact that one child left the preschool in September. Of the 15 students, 75% were identified by parents as White, 13% as Asian, 6% as Black, and 6% as Other. Parents

self-reported their educational levels as Doctoral degree (13%), Professional degree (38%), Masters degree (31%), College (12%) and Some college (6%). Overall, the parents in this study were well-educated, and reported to work in professional jobs.

The children in this study had more access to a variety of digital screens than the national average. For example, a 2011 study reported that 52% of 0-8 year olds live in a house with a smartphone, a video iPod or iPad (Common Sense Media, 2011). In this current study, all children lived in a household with at least one of these screens. According to the parent survey, 11 of the 14 students lived in a home with an iPad, and they all lived in a home with both a television and a computer. However, as access to digital technology does not necessarily relate to the amount of time spent using that technology (Plowman et al., 2010), it is important to consider actual amount of use.

Notably, the amount of time that children in this study used digital technology, was similar to the national average. With regards to passive technology such as watching television and videos, the children in this study watched just over one hour per day. This number is in line with the national average of one hour for 4-6 year olds (Rideout & Hamel, 2006). In terms of more interactive technologies, this group of 4 year olds spent about 2 hours a week using a computer and less than 1 hour a week playing with mobile handheld devices such as smartphones and iPads. The 2011 national average for 5-8 year olds using a computer was 2 hours and 20 minutes per week and for using a handheld device it was 35 minutes per week (Common Sense Media, 2011).

In general, the children's digital technology usage was reflective of the national average. However, unlike the average 4 year old, these children had access to a wider variety of technology including computers, smartphones and iPads. Therefore, I acknowledge these

participants might not be representative of the entire population of digital natives. My intention, however, was to focus on how young children compose and how this can be supported at home and school.

　　Parents. One parent per child was consented. If both parents' email addresses were listed on the consent form, both were included in the email activities. All consenting parents were asked to fill out a survey and participate in an interview regarding their child's engagement with digital and print media. In addition, families were asked to participate in a home visit in which the researcher visited with the child at his home. Parents could consent to all components of the iWrite program or they could choose not to participate in any of the out of school components. Overall, 14 parents completed the parent survey, 11 families participated in home visits, 12 parents participated in parent interviews, and 14 parents participated in the iWrite email activities.

Data Collection

　　Data collection occurred over a 6 month period using the primary methods of surveys, interviews, observations, and technology activities. An overview of the data collection activities can be found in Table 2. Data were collected between August and the end of January. The majority of in-classroom data collection occurred between August and November, while home visits and parent interviews continued after November. Because this study focused on how children engaged in digital message making practices, it was necessary to rely on a variety of data sources described in this section.

Table 2

Overview of Data Collection

Method	Who	What	Where	When
Survey	Parents of PS students	Pilot Parent Survey	At School	Pre-Study
	Parents of DS4 students	Parent Survey	At Home	August
Interviews	Teachers	Interview about writing and digital practices in the classroom	At School	September
	Parents	Interviews with parents about children's literacy practices outside of school	At School or Home	Oct → Jan
	Children	Home visit interviews with students about practices at home	At Home	Oct → Jan
Observations	General	Classroom Activities	At School	Aug → Sept 8:30 – 10:30 am 2 sessions
	Focused	Writing Center Daily Note-writing activity	At School	Aug → Sept 8:30 - 10:30 am 3 sessions Aug →Nov 2:30 – 2:45 pm 5 sessions
Technology Opportunity		iWrite Technology Activity	At School	Sept → Nov 8:30 - 10:30 am 28 days

Surveys. Parent Surveys were used to collect data about children's literacy and technology practices at home (see Appendix A). The survey was based on Marsh et al.'s (2005) parent questionnaire used in their investigation of young children's use of popular culture, media and new technologies. The survey was modified to reflect my interest in children's message making with print and digital media. For this study, I deleted popular culture questions, and added of a section on email use, mobile technology, apps and interaction with print resources. The purpose of this survey was to gather data that would then be used to guide parent interviews and home visits, and to better understand each child's literacy practices (both digital and print) at

home. Surveys were sent home to all consenting families through the child's school bag. Of 15 surveys sent home, 14 were returned, a 93% response rate.

The Parent Survey was piloted in July in order to determine whether the questions were clear and relevant (see Appendix B). Five parents of preschool age children were asked to complete the survey and to give feedback on the usability and the coverage of the survey. Specifically, parents of Play School (PS) students were targeted by soliciting survey takers during PS drop off and pick up times (9:00 am and 2:30 pm), ensuring that there was no overlap with students in the DS 4 classroom. Parents involved in the pilot process were asked to take the survey, and then briefly questioned regarding their experience taking the survey (see Appendix C). The Parent Survey was not modified based on the pilot data gathered.

Interviews. Teachers, parents, and children were interviewed in order to gain more information regarding the digital practices of these child participants.

Teachers. Interview data were collected in order to learn more about each teacher's literacy instruction, views on technology, and about the children in the class. Teachers were interviewed individually for approximately 30 to 40 minutes in a location within the school. This interview followed a discussion about the purpose of this research. A semi-structured, in-depth interview format was used to obtain teacher views about: 1) composing practices of 4 year olds, 2) the use of technology in the classroom, and 3) children's interest in both writing, drawing and technology. The questions provided in the Teacher Interview Guide (see Appendix D) were used to initiate conversation, with follow-up questions used to probe further on the topics or examples provided by the teachers. All follow-up questions fell under the three broad topics listed above. Teacher interviews were audiotaped for transcription purposes.

Parents. Interview data were collected from at least one parent of each child. The purpose of this interview was to gain more knowledge about the children's digital practices outside of school. Beginning in October, parents were interviewed individually for approximately 30 to 40 minutes in a location of their choosing. Often these interviews occurred in conjunction with the home visit. The interview followed a short discussion regarding the goals of this study. Some interview questions were prepared ahead of time based on information gathered from the Parent Survey. In general, this interview focused on children's use of technology outside of school and their composing practices with print tools. The questions provided in the Parent Interview Guide (see Appendix E), coupled with specific questions about survey data were used to probe further. All follow-up questions applied to the literacy practices of their child. Parent interviews were audiotaped for transcription purposes. Of the 14 parents who consented to be interviewed, 12 parent interviews were completed. The remaining two interviews were not completed due to scheduling difficulties with those families. Of those 12 interviews, 6 were conducted with one parent, and 6 were conducted with 2 parents.

Children. Twelve children were visited at home during the study in order to better understand children's out of school digital message making practices. In this home visit, I interacted with the child, asking open-ended questions about their life out of school. Questions were based on information gathered from the Parent Survey and on interactions with the child in the classroom. Then the questions were used to initiate conversation, with follow-up questions to probe further. By asking children these questions, in their home, responses were hoped to be more informative and descriptive than if they had been asked in the classroom. All follow-up questions applied to the literacy or digital practices of that child. Children's interviews were audiotaped for transcription purposes. When I entered a child's home, I typically asked them to

show me where they liked to play. I often asked questions about screens if they were visible (e.g. "I saw a computer in the kitchen. Do you ever use it?"). Home visits were most productive when I interviewed the parent(s) first. Information gathered from parent interviews often guided my questions and I was able to focus children on specific areas related to my study. For example, I asked Sam to show me how he checked sports scores on the iPad based on his father's report that even though Sam was a non-reader, he "read" the sports scores most mornings using an ESPN app (Field Notes, October 28). Overall, these visits gave me a general understanding of the child's out of school activities and interests.

Classroom Observations. The first week in the classroom was spent observing the class during typical morning activities. Notes were taken during these observations with a focus on existing classroom environment (including centers) and literacy practices. The purpose of this phase was to observe the activities of the students and teachers, in an effort to better describe the existing literacy practices in this classroom.

During the second week of the study, I began focused observations on literacy activities. During these observations of the writing center and note-writing activities, a video camera was used to record activity. Field notes were also written and used to create methodological and theoretical notes weekly. In addition, a digital camera was used to capture student writing or other products created during center time or the whole class note-writing activity. The purpose of these observations was to learn more about the activity at both the writing center and during the whole group note-writing experience. Teacher behaviors were recorded to document the ways in which note-writing is enacted in the classroom. Student behaviors were recorded to document the ways in which students accepted and responded to composing opportunities.

iWrite activities. Beginning the third week of the study, during center time, I offered iWrite activities to children. These activities were designed to give children the opportunity to compose and send emails to parents using iPads. The iWrite activities were offered during center time in the DS4 classroom from September through November.

Materials. Digital materials used for the iWrite activities included iPads, a digital camera, and computer applications, which were provided by myself. There were three iPads available for classroom use, and one digital camera. Two software applications (or 'apps') were used in this study, Sketches2 and Mail. Digital materials used for data collection included two video cameras, a digital audio recorder and a digital camera. The digital camera was used both for recording data and taking pictures for use in iWrite activities.

Described as a "mobile art studio", the Sketches2 program offered many of the same materials in digital form that would be found in a writing center. Materials include: various colors and thicknesses with which to draw and print, picture stamps and a pop-up screen-based keyboard to type with. In addition, there was the ability to resize and move images and text. Finally, photographs could be imported as either background or images in a composition. This program used icons to visually support material selection and use of the digital tools, making it accessible and user friendly for young children. Once work was completed, students could save their work or email it. The final Sketches2 product was a multimodal composition that could contain various colors, marks, typed letters, stamps and photographs. An example can be seen in Figure 2. Research has shown that children prefer creative apps (like Sketches2) over skill reinforcement apps due to their no fail environment, ability to control the pace, and the endless possible outcomes (Michael Cohen Group, 2011). For the purposes of this discussion, the products created in Sketches2 will be referred to as *multimodal products*.

Figure 2. Multimodal Product Example

The Mail program was a simple software application that allowed users to send and receive emails. Navigation buttons included both text and images to allow this program to be accessible by young children with some support. For example, the "to" and "from" fields were spelled out, but the send button was an icon of an airplane. In the Mail program, children could only type on a pop-up keyboard. They could not draw or stamp as in Sketches2. An email address (iWriteAtSchool@gmail.com) was created specifically for the purpose of this study. To facilitate recognition by students, parent email addresses were stored in the email program with a picture of the child and a label containing the child's name. For example, Zuri's mother's email

address was stored as "Zuri Mom". All automatic formatting tools (e.g. auto correct) were turned off to allow for children's inventive spelling and unconventional use of punctuation. Final Mail products were comprised of only typing and looked like a traditional email (see Figure 3). All emails concluded with a message from myself about the project. The first series of iWrite emails had the following message:

This email was generated by your child through the iWrite project. Your response is greatly appreciated. If you respond to this email, it will be received at school where your child can read the email with the help of iWrite researcher, Emily Bigelow.

All emails thereafter, simply said, "This email was generated by your child through the iWrite project. Your response is greatly appreciated." For the purposes of this discussion, the products created in Mail will be referred to as *email products*. These emails included photos or any multimodal products composed in Sketches2 as attachments.

Figure 3. Email Product Example

From: iWrite <iwriteatschool@gmail.com>
Date: September 27, 2011 10:02:25 AM CDT
To: Zuri Mom
Subject: Re: iWrite

Zuriamirazrwoklsshpopssds4kids

Zuri says, "Zuri. Amira. I made a zero book. We are learning about colors, shapes and opposites."

This email was generated by your child through the iWrite project. Your response is greatly appreciated.
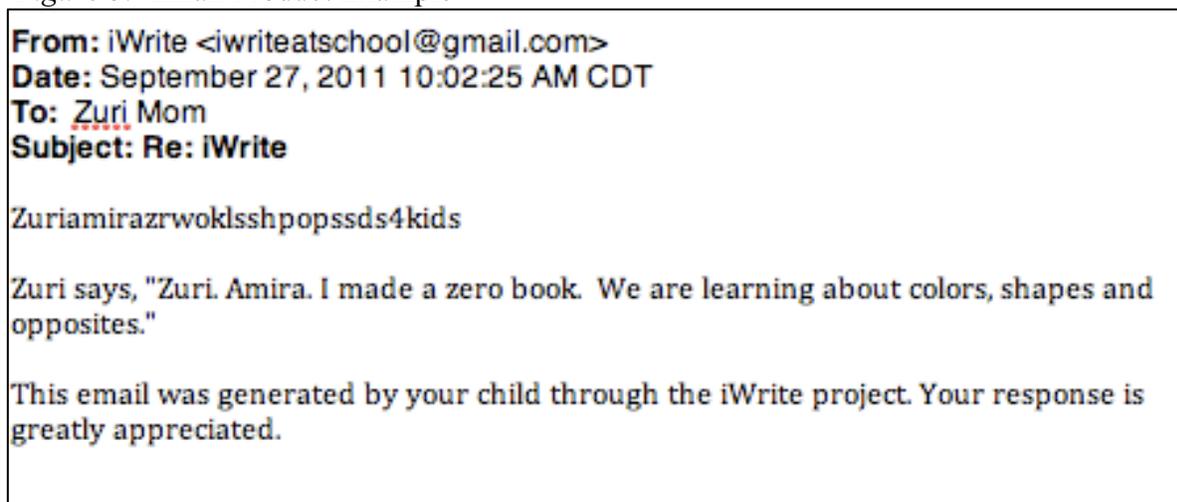
Activities. Beginning in September, iWrite activities focused on composing messages and communicating via email were introduced to the classroom by the researcher during center time. I allowed two weeks for each of the first four proposed iWrite activities in order to allow

enough time for all students to participate in the activity during center time. While four iWrite activities were originally planned, due to time and interest, some children also participated in a fifith iWrite activity. For a brief summary of each activity, see Table 3.

Students rotated through the iWrite activities as they did other centers, ensuring that all children had the opportunity to participate. I invited children to join me during center time, each child had the option of either joining me or engaging in other center activities. When offered the opportunity to come to the iWrite table, children generally chose to join me. There were instances, however, when children were invested in other center play (e.g. playing with the new veterinarian supplies in home living, Field Notes, October 11) and declined the invitation. For the first session of each activity, children generally worked in pairs. At other times, I called children over individually or with another child to work with me.

Table 3
iWrite Activity Summary

iWrite	Purpose	Invitation Example
#1	Exploring	"So we can send some messages to your moms. Would you like to do that? Would you like to make a message for your mom?" (September 1, Ben & Lin)
#2	Self-Portrait	"So, it's really, really good that you guys have been making all these pictures of yourself, your self portraits. And I thought it would be fun to make some on the iPads. And then we could email them to your family. Does that sound fun?" (September 19, Ben & Nollie)
#3	Classroom Message	"I was thinking that it might be fun if we sent them an email about what you're doing at school. . . what do you want to tell them about school?" (October 11, Ben)
#4	Classroom Message with Photo	"I want you to think about all the pictures we saw, and I want you to pick one that had you in it that you want to send to your mom to tell her about." (November 2, Kate)
#5	Classroom Message with Photo	"Today we are going to send a different picture. . . you can draw or type or write a message to them." (November 10, Van & Ben)

For each activity, children were first invited to compose a multimodal product using the Sketches2 program, and to email using the Mail program. In order to email the Sketches2 products, children used the Mail program to send the Sketches2 multimodal product as an attachment. Then, when parent responses were received in the Mail program, children were issued an invitation to type an email product response. When children inquired about drawing a picture or using stamps for a reply email, they were told that they could type their message. This decision was made because it took children much longer to compose a multimodal message and I was concerned that I would not have enough time to allow children to initiate an email exchange and reply numerous times during the study.

In general, the children followed a similar process when composing in the iWrite activities. While no two composing sessions were identical, each child generally followed a series of steps when composing the first email message for the first three iWrite activities:

1. Tap the Sketches2 (or 'Star') button to open a new page.

2. Compose the message. This might have included drawing, typing, changing the colors, erasing and stamping. During this process I typically asked questions about what she was doing and what message she might be composing.

3. Push the email button. When the child decided that the message was complete, the email button (with the white envelope) was pushed. This opened an email in the Mail program that had the Sketches2 multimodal composition as an attachment.

4. Choose recicpient(s). The child then pushed the 'To' button, typed her name on the pop-up keyboard, and then selected the appropriate email address (e.g. Zuri would select "Zuri Mom" to send to her mother). Then, this was repeated to add another email address if needed. See Figure 4 for a screenshot of this process.

Figure 4. Typing Email Address in Mail Program
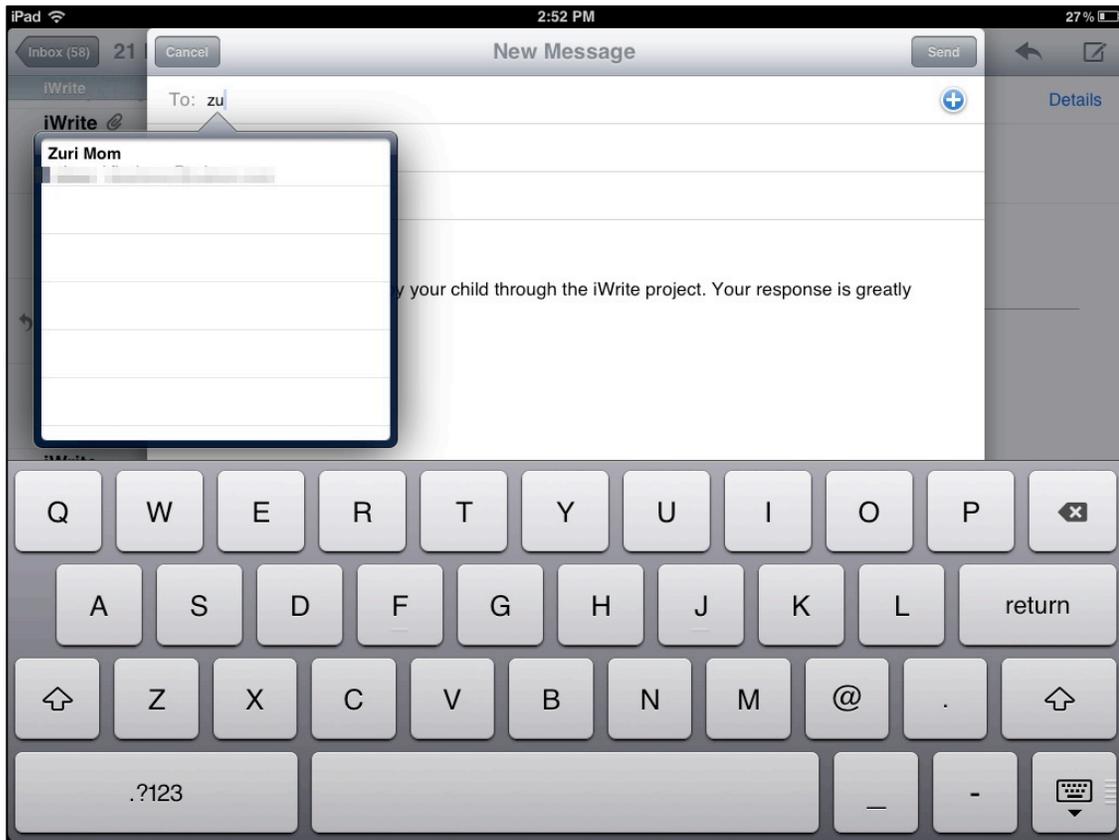
5. Type the iWrite subject line. At this point, I typically stepped in and typed "iWrite" in the subject line.

6. Record the message. Then I asked the child to read me the message, and I typed her response in the body of the email.

7. Send the message. Finally, the child pushed the blue 'send' button.

For the fourth and fifth iWrite activities, the composing process also included

photographs. In both of these activities, children began by pushing the 'flower' button to access

the photos. Then the child swiped through the photos like a picture book until she decided upon

a photo to use. At this point, I guided the child through the process of attaching the photo, and

then allowed her to type a message in the Mail program. Then the process was the same as the previous iWrite activities, and the children typed the email addresses and pressed send.

When a child was responding to an email from a parent, I guided the child through the reading of the parent's email (often reminding the child of the email that she had originally sent to the parent), and then offered the opportunity to press the "reply" button and type a message. Children typed and when they were done, I took over and typed their dictation. Then the child pushed the send button. Children interacted with their products and their parents' email on the screen only. Products and emails were not printed during the course of the study.

Based on interest, and availability, a few students were offered multiple opportunities to engage in some iWrite Activities. While every effort was made to invite children back to read all email responses, this did not happen for every email response. In particular, emails that were received once a new iWrite activity had begun were most likely not read with the child. Therefore, a child who received many responses, and was interested in participating with the researcher, visited the iWrite center table much more frequently than a child who had less interest. Those who were less interested tended to receive fewer responses from family members.

There were specific plans for four iWrite activities (see Appendix F), however, they were altered during the data collection period due to instructional plans and student interests. As has been reported in other studies (Couse & Chen, 2010), young children are quick adopters to technology, and the children did not need the lengthy modeling sessions that I had planned throughout the iWrite activities. For example, instead of modeling an email conversation with my mother as planned, I simply used the iPad to introduce a new tool (i.e. "This flower button lets you see all of the pictures I have on the iPad.", iWrite #4, November 11), and then used the

lesson plans to invite the child to compose (i.e. "Would you like to send a message to your mom?", iWrite #1, September 1).

In general, I began activities with the iPads stacked on the table, and talked with each child as I offered an invitation to use them. I felt that this was a more engaging, and less distracting, way to offer children opportunities to engage in different iWrite activities. Sometimes, however, children pulled iPads out before I could stop them. I introduced a new tool (e.g. inserting photos), and then verbally offered children an invitation or suggestion such as "I was thinking that it might be fun if we sent them [parents] an email telling them something you are doing at school." (iWirite #3, October 11). As apps and content were the same, children used either the black or the gray iPad. Some children differentiated between the two, and requested "their" iPad when they came to work at the iWrite center.

Children typically sat side by side with their backs to the video camera. While there were three iPads available at the iWrite center, I only worked with one or two students at a time. I made this decision for two reasons. First, at the beginning of the study, I worked with two students, thinking I would add a third student as I got more comfortable with the process. When I found that working with two students was demanding at times, I decided to limit the participants to two at a time. Also, I found that it was difficult to video three children at once given the size of the tables, and the nature of the classroom. As a result, only two iPads were used by students at the iWrite center. On rare occasion, I used the third iPad to model for the students.

Once children were seated, the iPads were propped up and angled towards the child slightly so as not to distract the neighboring child. I sat behind or beside the two children and moved as children needed support. See Figure 5 for an example of this lay out. In general, the

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children worked independently and I pointed out features or tapped a button when needed. On occasion, I stopped a child from trying to access other programs or doing something detrimental to the research, such as deleting emails or modifying other children's multimodal products. Children needed the most support as they attached multimodal products to emails or typed email addresses. I offered these supports to children by talking them through the process and pointing to buttons on the screen. If necessary, I physically assisted the child by tapping a button. This typically happened when a child became frustrated or if time was running out. Also, on occasion, some buttons were non-responsive. In other words, when the child pressed the button, nothing happened. This occurred most often with the "to" button (that children used to type email addresses) and the color wheel button (that children used to change color). In these situations, I intervened and aided the children by tapping on the screen. When a child was working, I reminded him of the original invitation if he began to work off topic, but ultimately, I tried to let the child's interests guide the session. My goal, as a teacher researcher, was to offer support and guidance as needed but to also allow the child to compose as independently as possible.

Figure 5. iWrite Center Set Up

Since each iWrite activity used the same software, each opportunity allowed the children to build on existing knowledge of the programs and technology as the children continued to compose multimodal products and emails over the course of the study. Using the same program, various features were introduced (e.g. using photographs). Each of the planned iWrite activities built on prior experiences with the iPad and the 2 apps, and created a cohesive set of activities that were potentially meaningful to the child, and were also integrated with existing classroom practices.

In the first iWrite activity (exploration) children began to use an iPad and the two software applications, Sketches2 and the Mail program. Before beginning, each child was asked about their knowledge of email in order to assess their current understanding of this message-making practice. Next, I modeled the activity as I composed a birthday message for my mother, and then offered children an opportunity to send a message to their parents. Children were

introduced to drawing, changing color, typing and stamping in my modeling. The main purpose for this activity was to have the student email a message to a parent. Beyond that, the goal was for each child to explore and in doing so, learn how to navigate the iPad programs for future iWrite activities.

In the second iWrite activity (self-portrait), I asked each child to compose a self portrait in the Sketches2 program that was emailed to his or her parents. This activity was created as the classroom teachers completed an "All About Me" unit, that focused on painting self-portraits in the classroom and on physical attributes of the children in the class such as eye, hair, and skin color. In addition, children labeled their picture with their name, which gave them the opportunity to print or type, which for some was a new tool. In general, children were prompted to add their name to the product. For those who needed additional encouragement, I asked if the child would like to print or type her name. Finally, if a student printed her name first, I asked if she would also like to type her name. This was done to ensure that students were aware of the typing option in the Sketches2 program.

In the third iWrite activity (classroom message), children created a message about an activity in school. This activity was tied to the whole class note-writing activity in that children were asked to report on classroom experiences. This iWrite invitation was crafted knowing that children were regularly asked about their day both in and out of school. Building on children's familiarity with this social practice, the iWrite activity went further and asked the child to compose an answer digitally.

In the fourth iWrite activity (classroom message with photo), children composed a message about a photo taken at school. This was similar to the third iWrite activity, but with a photo as the focus. Typically, children selected a photo from a group of photos that I had taken,

and then typed a message in the Mail program. Again, this activity related to the whole group note-writing activity in that it focused on reporting classroom happenings to family members.

Due to timing at the end of the classroom data collection period, some interested children were offered the opportunity to participate in a fifth iWrite activity, that was similar to the fourth iWrite activity. Again, children selected a photo and composed a classroom-based message. Children were also given the opportunity to import the photo into Sketches2 and add drawings, text and stamps. On occasion, children requested to send an email or they received an email from parents that was not directly connected to an iWrite activity. For example, at her request, Katie sent a birthday email to her father on October 19. These non-activity specific emails will be referred to as Miscellaneous iWrite activities.

Data collected.

Email products. All digital products, including emails, created or received were collected for analysis. There were two types of products that were collected: the multimodal products created in Sketches2 and the typed email products created in Mail. There were 83 multimodal products created by children in Sketches2 and 140 email products created by children in Mail. During the course of this study, 140 emails were sent and 139 emails were received. In general, emails were sent between child and parent(s). For one child, grandparents were also given the iWrite email address and they also sent emails. All student generated digital products were analyzed.

On average, children composed four multimodal products and seven emails over the first four iWrite activities that all children participated in. Some children also participated in the fifth and miscellaneous iWrite activities. The number of multimodal products produced by each child ranged from three to five, and the number of emails ranged from four to 11.

Video data. All iWrite activities were videotaped throughout the study. For analysis purposes, video data were divided into sessions. Each session was a complete iWrite activity (from beginning to end), and included one or more children. For instance, when two children sat at the table, the session began when a child sat down and did not stop until both children were completely finished with the activity. In a few instances, one child finished first, and was replaced by another child. In these situations, the session was not complete until the activity was complete for all children at the table. This overlapping of students explains the varying length of time of these sessions. Of the 110 total sessions, 31 were comprised of two or more children (26 were comprised of pairs and 5 were comprised of three or four children). The other 79 sessions had only 1 child.

In total, there were 110 sessions (either individuals or pairs) in which children spent approximately 1270 minutes with the iPads composing, sending and receiving messages. The average length of each session was 11.5 minutes, with a range of 1-53 minutes. While this range is quite large, most of the iWrite sessions lasted between one and 22 minutes, with a mode of seven minutes, and a median of 10 minutes. Of the 110 total sessions, only eight sessions lasted more than 24 minutes, and of these, two included three children. Field notes were recorded and used to create methodological and theoretical notes.

Data Analysis

Qualitative data analysis was ongoing throughout the study using a constant comparative method (Strauss & Corbin, 1998). This method involved reading and rereading sources of data for the purpose of identifying emerging patterns and categories of modes and actions. Data analyzed for this study were field notes, multimodal products, email products and videos. Open coding was used to identify concepts that emerged from data and axial coding was used to

organize and synthesize those categories. Strauss and Corbin (1998) explain that the analytical

processes of open and axial coding are not necessarily linear steps, but rather a recursive process

where codes are revisited and refined throughout the analysis process. Throughout the data

collection period, I noted possible patterns of action and themes across children's behavior and

email products. I recorded these as theoretical notes. I then used these emerging patterns to help

shape the direction for my first round of coding. There were two main stages to my analysis

process, analyzing digital products and analyzing the composing process. The analysis of

student generated digital compositions (both multimodal products and email products) was

completed first, and the findings from it were used, along with theoretical notes, to create open

codes for the composing process analysis. As suggested by Strauss & Corbin (1998), codes were

revisited and clarified throughout this process.

Email product analysis. Throughout the data collection period, I looked at all digital

products, watched videos of sessions and read field notes looking for possible patterns both with

regards to characteristics of the products and of the children's behavior within each iWrite

activity.   These initial wonderings were used to help shape codes during the initial coding period.

For example, I noticed that many children opted to use the typing function when composing the

text of their message. This led to the generation of the Typed code.

As data collection concluded, I entered videos, transcripts and digital products into

NVivo 9, a qualitative data analysis software program. The units of data were created based on

codes created throughout the course of the study. I conducted the open coding on a selection of

email products between parents and children that were representative of both the children and the

tasks within this study. To ensure representative sampling, this round of initial coding included

one email chain (including all multimodal and email products associated with a specific child's

iWrite activity) from each child selected across all five iWrite activities (see Table 4).

Specifically, I wanted to ensure that both activities and participants were represented in this stage.

To do this, names were evenly selected across all iWrite activities. Three children's products

were selected for each iWrite event to allow for some variety among the products. Units of

analysis included photos, markings, hand drawn letters, stamps, words and sentences.

Table 4
Distribution of Student Samples for Open Coding of Products

Activity	iWrite #1 explore	iWrite #2 self-portrait	iWrite #3 classroom message	iWrite #4 classroom message w photo	iWrite #5 classroom message w photo
Student sample	Liza Nelle	Nollie	Deborah	Elsbeth	Yiannis
Student sample	Larkin	Kate	Xander	Katie	Sam
Student sample	Rowen	Van	Zuri	Ben	Henry

Following the initial open coding of email products, I began axial coding as I looked for

connections between the categories. As I did this, I eliminated some of the categories as

irrelevant to the research questions at hand. For example, codes concerning children's references

to popular culture (e.g. Disney Princess or Legos), did not advance the purpose of this study with

regards to understanding the process and products of children emailing, and thus was eliminated.

Next, I organized the data into seven larger categories called parent nodes. These

categories, which contained a number of codes (child nodes) within them, were developed both

from a priori hypotheses and from patterns that emerged in the data. For example, because of the

research questions guiding this study, I identified multimodal characteristics of the email

products produced by children. Therefore, I coded the types of pictures children created as being

either hand-drawn or created with photos or stamps. These codes were then collapsed to create

an image category with 3 codes. Thus, the notion of coding for product characteristics was a

priori. Also, existing descriptors commonly used in the analysis of young children's writing (i.e

Clay's Principles (Clay, 1975)) were used to guide the analysis of children's text creation.

However, other nodes, such as Note Language, Name, Connect to Parent Response, and Print

arose through my involvement with the data. The final nodes can be found in Table 5

Table 5
Final Codes for Product Analysis

Visual Codes		**Message Content Codes**		**Classroom Practice**	
Color	1 color	Purpose	Ask a Question		Note Language
	Multicolor		Describe a Picture		Names
Images	Hand-drawn		Express Love		
	Stamps		Share Information		
	Photo	Message	None		
Print	Handwritten		General		
	Typed		Specific		
Writing	Generating	Model	Follows		
	Inventory		Does Not Follow		
	Flexibility				
	Contrastive				
	Copying				
	Space				

Overall, these codes represent the most relevant characteristics of the digital products and

will be discussed in more detail. A full description of these codes can be seen in Appendix G.

These codes were used to describe the physical elements of the digital products such as visual,

color and type of image as well as the forms that the child used. In addition, codes were used to

describe the content of the message including the actual message, the genre of the message, and

the purpose of the message. Finally, codes were used to represent the connection of the iWrite

activity to classroom practice.

Visual content. Codes are useful in describing the visual elements of the digital products, specifically multimodal products composed in Sketches2. Codes that directly relate to the visual elements of the final product included: Color, Images and Print. Specifically, Color had two nodes: 1 color and multicolor; these nodes refer to whether the product used either 1 color (excluding colors from photos and stamps) or more than 1 color (including typing, writing and drawing). Images refers to the format that the images used took including hand-drawn, stamps and photographs. Finally, when a child wrote a message she did so either by printing a message handwritten or using the typing tool.

The forms that children used when composing messages were coded building on Clay's hierarchy of writing forms. As Merchant (2005) pointed out, children using technology continue to show understandings similar to young children's understandings when using pen and paper. After observing children using computer, keyboards, and cell phones, Merchant (2005) continued to build on Clay (1975) by creating digital examples of Clay's principles and concepts. Using both Clay's (1975) and Merchant's (2005) principles of young children's composing, I was able to create additional codes that pertained to my interests.

Message content. Looking beyond the physical characteristics of the digital product, I also considered the content of the message in both multimodal and email products. First, the level of specificity was recorded by coding the message as either specific or general (or none if there was no message attached to the product). Specific messages refer to content that is for a specific person and contains specific information relevant to that child. General messages could be directed to most people. For example, a child may read his text as "This is the house that does the fire. I love you. Could you show this to Jonah?" The first and third sentence would be coded as *specific*, but the second sentence would be labeled *general*.

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In consideration of the meaning of the child's message, the purpose was also coded. The purposes included: asking a question, expressing love, describing pictures or sharing information. Like other codes, children may create multimodal products with multiple purposes. Returning to the previous example, each sentence would be coded differently. The first sentence would be coded as describing the picture, the second sentence would be expressing love, and the third would be asking a question. Each sentence offers a different purpose for the child. In cases where I offered a model, it was coded whether the child created a product that mimicked the model (Follows or Does Not Follow).

Finally, while the responses from parents were not the focus of this study, it is important to consider that the type of response from a parent may have impacted a child's response. Because of this, emails were coded with regards to parent response. Specifically, whether a child's response connected to the content of the parents' email was noted.

Classroom practice. One of the purposes when creating the iWrite activities was to create authentic and purposeful classroom based activities. One of the regular classroom literacy events observed early on was the note-writing activity. See Figure 6 for an example of a note produced during a whole group note-writing activity. Of particular interest was the way that children did or did not draw from their whole group note-writing experiences when composing emails. While email is a separate genre from note-writing (Wollman-Bonilla, 2003), it does share many salient characteristics with note-writing. Specifically, I was interested in tracking children's use of letter forms such as "dear", "love", and "from" to see if children drew on their whole group experience when composing emails. Calling this Note Language, I looked for instances in which the text of the email drew from traditional note-writing language as observed in the classroom.

Figure 6. Note-writing Product
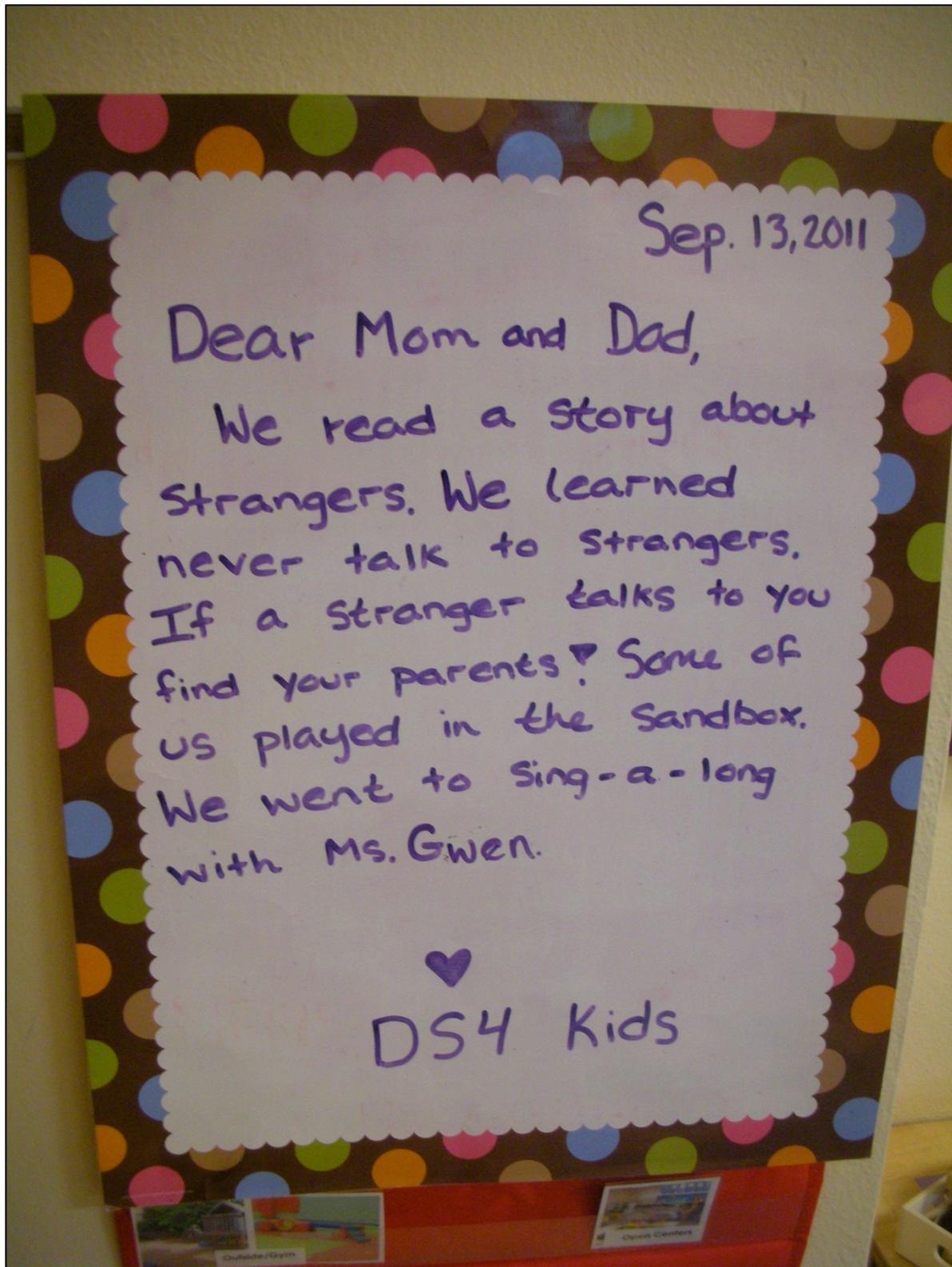
Names have long been associated with emergent writing, and were the basis for many literacy practices in the DS 4 classroom as children signed in every morning and printed their name throughout the day on paintings, projects and more. See Figure 6 for a picture of Liza Nelle signing in. Research has highlighted the importance of children's names to children learning to write (Bloodgood, 1999; Ferreiro & Teberosky, 1982; Levin & Aram, 2004; Treiman & Broderick, 1998). Names are among the first print forms that children associate meaning with and begin to try to replicate independently. As they do this, the letters in their name become especially important. Children also become aware of the letters in the names of friends and family. Because of the importance of children's names to emergent writers, I coded the use of names (both their own as well as parents, siblings and friends).

Multiple use of codes. Due to the nature of children's compositions containing multiple, often overlapping, components, many of the products analyzed were representative of more than one category. Therefore, I used multiple codes for those products. For example, in a multimodal Sketches2 composition, when a child typed her name and placed it with a drawing of a cake and a stamp of a pumpkin, the digital product would be coded as Print (typed), Name, Image (drawing), Image (stamp), 1 color and Multicolor (see Figure 7). And, for example in a typed Mail product, when a child typed: **ilvu**, it was coded as *express love*, *invented spelling*, and *general message*.

Figure 7. Coding Example
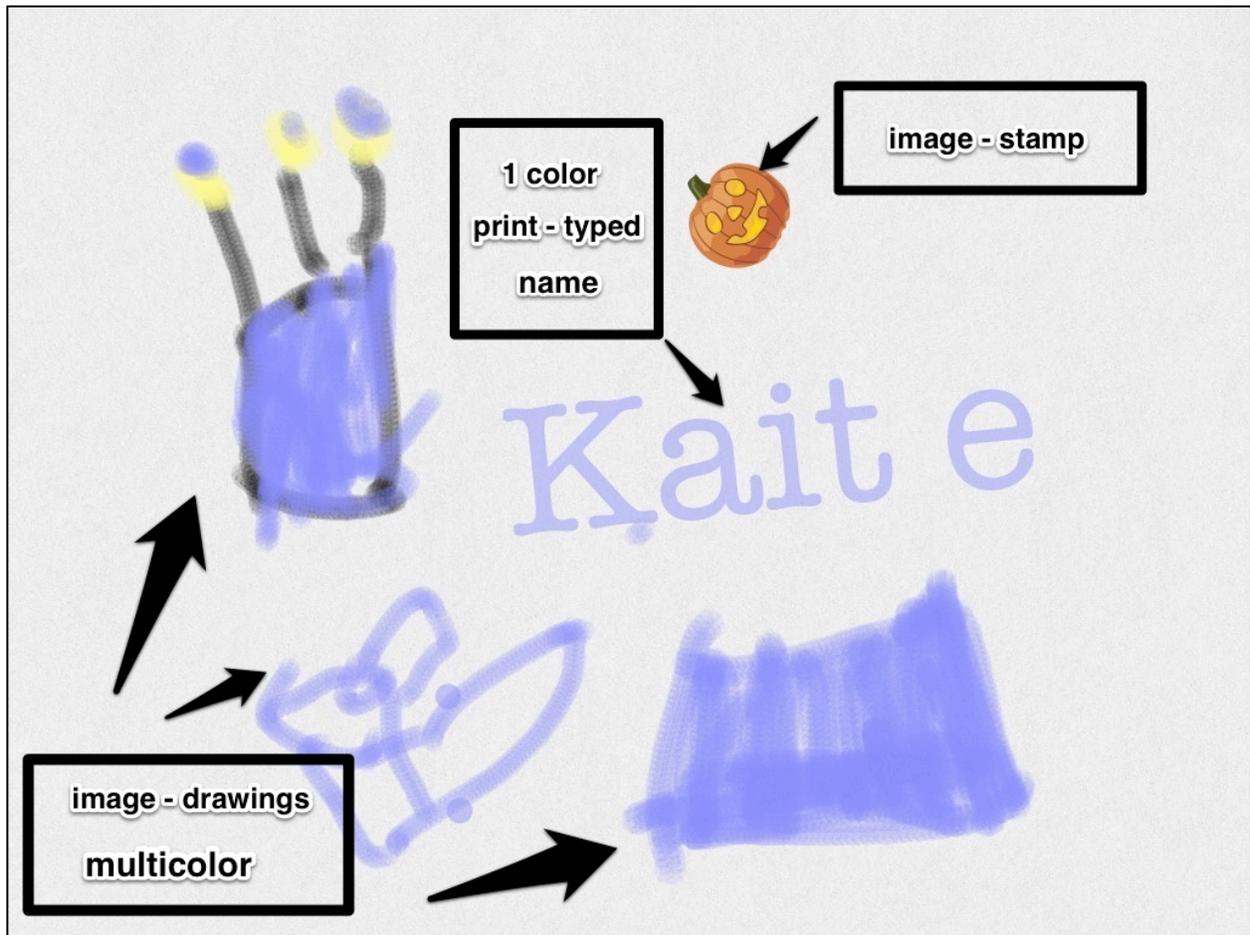
  Application of codes*.* Two types of products were coded: multimodal products created in

Sketches2 (could contain drawings, text, stamps and photos) and email products composed in the

Mail program (that contained typing from the child and transcribed response typed by the

researcher). While many codes could be used on both typed of product, some codes were unique

only to one product. For example, the Follows/Does Not Follow Model code was only

applicable to the multimodal Sketches2 compositions as I only modeled composing using that

program. Names, on the other hand, could be used to code both Sketches2 and Mail products.

Codes and the product with which they were used are listed in Table 6.

Table 6
Application of Codes

	Sketches2	Mail
Products	Multimodal	Email
Modes	Typing Printing Drawing Stamps Photos	Typing
Process	Student first composes Sketches2 multimodal products for each iWrite activity	Student types email responses to parent emails
Codes	Name Note Language Writing Forms	Name Note Language Writing Forms
	Connect to Parent Response Follows (Does Not) Model Hand-drawn Images, Photos, Stamps 1 Color, Multicolor Print, Typing	Connect to Parent Response Message: None, Specific, General Purpose Speech-Print Match

Email process analysis. Following the analysis of the multimodal and email products, I

began the analysis of the children's behaviors during the iWrite activities. My interest was in

how children engaged in the iWrite activities, specifically with regards to the children's

interactions with the screens and their talk during the activities. To do this, I first transcribed a

selection of sessions that were selected to represent both the children and the tasks within this

study (see Table 7). Similar to the analysis of email products, one session for each child was

selected randomly across the iWrite activities, including sessions when children were offered

opportunities to respond to parent emails. This ensured that there was a representation of

children, iWrite originating tasks and student responses to parent emails. Because many children

sat in pairs, but worked independently, some sessions included two children. Therefore, 10

sessions were analyzed in this first round of coding. To transcribe the videos, special attention

was given to both the talk and the child's interactions with the screen, as they were the focus of

this analysis. Transcriptions included all talk, in addition to interactions with the screen.

Sometimes children mumbled or could not be heard. Also, in some video sessions, the children's

movements were blocked due to the placement of the camera or the location I was positioned.

Table 7

Distribution of Student Samples for Open Coding of Process

Activity	Students	Date
iWrite #1	Henry & Kate	9-7
explore	Larkin & Van	9-7
iWrite #2 self-portrait	Ben & Nollie	9-19
	Yiannis	9-19
iWrite #3 classroom message	Zuri & Katie	10-14
iWrite #4 classroom message with photo	Xander & Deborah	11-9
	Rowen	
iWrite #5 classroom message with photo	Zuri & Larkin	11-7
Student response to parent email	Elsbeth	9-26
	Liza Nelle	9-6

These transcripts were then used in an open coding process to generate codes. In

determining units of analysis for the coding process, I wanted to have a focus on children's

behaviors since the focus of the study was on children's digital message making practices.

Often there were often two children at the iWrite table, so it was important to divide the data into

units centered on one child at a time. In order to do this, data units most often consisted of

several exchanges of action or conversation between myself and a child or just one child. These

units looked like question-answer sequences or a child's complete action, but at times, small

units such as sentences were identified. When children interacted with one another, each child's

behavior or talk were considered as individual data units. In general, units ended when another

child talked or interacted with the iPad in a new way (e.g. changed the color or inserted a stamp).

For an example of data units, see Table 8.

Table 8
Data Units Example, iWrite #1, September 1

Zuri: [Draws line down middle of screen.]
Liza Nelle: [Changes color.]
Emily: What did you do? Zuri: I made a t. Emily: You made a t.
Liza Nelle: [Draws in new color on left side in green.] Emily: Look at you, Liza Nelle, you changed colors.

After this initial open coding, I began axial coding as I looked for connections between

the categories. Some categories were eliminated or combined to best match the purposes of this

study. Next, I began to organize the data into larger categories, or parent nodes. These categories,

which contained a number of child nodes within them, were developed (see Table 9). For

example, all of the categories noting ways children interacted with the iPad screen were

collapsed into the screen interaction category. A full description of these process codes can be

seen in the Appendix H. After this first round of codes was generated, 25 of the iWrite session

video transcripts were then coded in order to allow for a more thorough analysis of the data.

These sessions were selected to represent the students and iWrite activities, attempting to analyze

across students and iWrite activities.

Table 9

Final Codes for Process Analysis

Screen interactions		Child Initiated		Researcher Initiated		General Events
Changing Colors		Support	How do I?	Background Knowledge	What is email?	About Parents
Drawing			Spelling		What is an iPad?	Classroom Practice
How to Use Your Fingers			Tech Support	Birthday Model		Name Talk
Photos			Button	Message Generation		Peer Interaction
Repetitive Play		Comments	On Drawing	Modeling		Unexpected Event
Resizing/Pinching			On Letters	Encouragement		
Stamping				Inquiring		
Undo				Invitation		
Typing	One hand			Talking it Through		
	Two hands					
	Hold Down Keys					
	Talking					
	Professional					
	Hunt & Peck					

Screen Interactions. With a focus on how children compose messages, it was essential to consider the ways that the children interact with the screen. Behaviors that were coded for included changing colors, drawing, photos, stamping, resizing objects and using the undo or delete key. In addition, many subcategories were created to describe the ways that children interacted with the pop-up keyboard as they typed. These included the number of hands used, the style (hunt and peck or professional typist), as well as acknowledging whether a child talks out loud or repeatedly presses a key. Finally, the repetitive play category refered to instances when children were playful, tapping on buttons over and over or engaging in a behavior that was more playful than purposeful.

Child initiated activities. Child initiated codes referred to the conversations initiated by the child that focused on the product or process. One group of these conversations involved requests for support (e.g. "How do I do this?" or "How do I spell this?"). It also included requests for technology support, which were not always verbal (e.g. a child taps repeatedly on the screen with no outcome or the child might exclaim "Uh-oh"). Queries about specific buttons, either where a button was located or asking about the function of a button were included. Children often commented on their products, saying things such as "Look! I drew me!" or "I made an N."

Researcher initiated activities. While the focus of this study is on children's behaviors, I would be remiss if I did not acknowledge the role that I played in these activities. In order to consider what this role looked like, codes were generated based on actions that I initiated. These included asking questions about background knowledge (e.g. "What is email?"), modeling, making a birthday message, encouraging, and inquiring about products. In addition, I observed that I often talked children through tasks, not necessarily modeling, but instead offering verbal prompts (and occasional finger pointing) to guide the child. Whenever an invitation was issued, it was coded to help describe the language I used and the ways that I was offering each iWrite activity to children. Finally, the purpose of the iWrite activities was to send a digital message to parents. The generation of these messages was most often guided by myself, and was coded as such.

General Events. Finally, the last category, general, referred to other important events observed throughout the study. This assortment of codes included connections to classroom practice, peer interactions, and unexpected events. In addition, discussions about parents (which parents to send emails to, conversations about parental email activities) were coded to help

understand children's understanding of the email process with relation to their parents. Due to the fact that children frequently used names in their digital products, name talk was coded, including any discussions about names.

Descriptive Analysis of Children's Home Digital Experiences. Quantitative data analysis was used to analyze parental responses to the Parent Survey. Specifically, I tabulated frequencies of response types as well as averaged these sums in order to report on children's use of technology outside of school. In addition, I used quantitative data analysis to report on the quantity of the products composed. Relying on frequency counts, averages, and ranges, these numbers were used to describe the amount of digital products generated both across activities and across children.

This information was used to generally describe this data set with regards to children's access to and use of various types of digital technology. Individual children can be focused on and compared to others in the classroom using this data. In addition, information from surveys, interviews and home visits were combined to create profiles for each child. As children were spotlighted in this report, information from these profiles was used to describe the child's digital practice in and out of school more fully.

Report of findings.

In order to best share the findings from this study, I will be reporting in four chapters as I address my research questions. These questions include:

1. What do young children understand about email?

2. How do adults interact with children to support the joint construction of email messages?

3. How do young children interact with iPads during the digital composing process?

4. What kinds of digital products do young children create on iPads when using

Sketches2and Mail?

First, I will begin broadly with a description of children's general understandings of email. This

will serve as a description of their knowledge base regarding the specific digital literacy of email.

Secondly, I will report on iWrite activities with a focus on the ways that I interacted with the

children. Specifically, I will describe my scaffolding patterns and the ways that the children and

I jointly constructed messages. Third, I will focus specifically on the children and their

behaviors as they used the iPads to compose email messages for their parents. Finally, I will

report on the characteristics of the digital products composed by the children. Overall, in these

chapters, I will work towards describing the digital composing practices of the young children in

this study.

CHAPTER 4

YOUNG CHILDREN'S UNDERSTANDINGS OF EMAILS

Research has shown that young children have out of school experiences with digital technology that are typically not replicated in preschools (Grunwald Associates, 2009; Lynch & Warner, 2004; Marsh et al, 2005; Wohlwend, 2010; Zevenbergen & Logan, 2008). Children are coming to school with understandings of digital literacies, like email, that are being ignored (Albers et al., 2009). Drawing on research that has shown the importance of role models with regards to children learning about literacy (Heath, 1983; Martens, 1996; Schickedanz, 1990). As children observe adults interacting with print by reading and writing, children begin to build understandings of literacy. Applying this concept to digital literacies, I was interested in learning more about the understandings children have about email before beginning the iWrite activities. To do this, I gathered data focused on children's digital practices outside of school including parent surveys and home visits in order to better describe children's experiences with digital technology prior to their involvement with the iWrite activities. In addition, I asked children about email at the beginning of the first iWrite session. Drawing from these data points, I have worked to answer the first research question: What do these children understand about email?

It is important to consider children's existing knowledge of and history with email, as the ways that children understand email may impact the ways that they engage with the iWrite activities. First, considering the DS 4 classroom environment, technology did not play a prevalent role. While technology was not a regular feature during lessons, Ms. Grace used a laptop to share an email that a parent sent to the class with a picture of a spider during the class

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study on spiders (Field Notes, October 14). Also, both teachers were observed throughout the study checking smartphones for emails from parents if there were children absent from class. Comments such as "Hmm...Ben isn't here yet. Have you gotten an email from his parents?" were observed in relation to these smartphone-checking activities (Field Notes, September 6). When asked, Ms. Grace and Ms. Jane reported that they did not use technology in front of the children. But, when asked further, they clarified that they did not use technology for personal reasons in front of the children, and that they were comfortable using technology for professional purposes (i.e. checking for email from parents or working on the laptop during naptime). Neither teacher was observed using technology with children outside of the email sharing episode on October 14. This is in line with research on technology usage in early childhood classrooms that reports when digital technology is used, it is typically handled by teachers or used by children in isolation from other classroom activities (Grunwald Associates, 2009; Marsh et al., 2005; Pasnik & Llorente, 2011; Wohlwend, 2010; Zevenbergen & Logagn, 2008).

By asking children directly about email as a part of the first iWrite activity, I hoped to gather information regarding their individual understandings of email. In an effort to learn more about children's specific understandings of emails, I asked them a few questions as a part of the first iWrite activity began. Typically, I asked, "Do you know what an email is?". I then asked follow-up questions based on the child's response. Some follow-up questions included: "Do your parents email?" and "How do you send the message?". This inquiry mainly occurred in groups of two at the iWrite center at the beginning of the study. Based on data from the parent survey, I knew that none of the children in this study had their own email accounts, and only a few had actually participated in emailing before. However, according to parents, the majority of children in this study had been exposed to email, whether through personal experience or

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observing parents email or talk about email. Outside of school, parents had smartphones, communicated regularly with teachers via email, and even sent birthday party invitations over email, it is reasonable that most children had at least heard conversations about email. Using data collected from parents and children, I will now describe these children's understandings of email including what email is, who emails, how one emails, and why one might email.

What Email Is

About half of the class was described by parents as having strong understandings of a family email account, the purpose of email, and typing or sending emails. When asked, "Do you know what an email is?", children had varying responses. Of the 15 children, three did not answer my question, instead shaking their heads or saying, "I don't know". Even when prompted further, asking "Does your mom or dad ever send email?", these children still had no answer.

The majority of the class, however, had at least a few things to say about email.   From this data, most children in this study were aware of the term "email", and had a vague understanding that it has to do with "sending" and messages. Four of the 12 responding children used the word "message" when describing emails, and seven children used the verb "send" when talking about emails.

The children who shared the richest descriptions of email were those who responded by talking about specific experiences. It is clear that specific experiences outside of school impacted some children's understandings of emails. Examples of these specific responses will be discussed in the following description of children's understandings of various components of email. Other children, who did not report on specific experiences replied with more generic responses such as "And sending messages" (Henry, iWrite #1, September 7) or "My Dad always

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does email" (Nollie, iWrite #1, September 13). Overall, the students' responses indicated a group of children who were exposed to email but did not yet have a strong understanding of email, its purpose or how it works beyond that of sending messages.

Who Emails

In considering the parties involved with emailing, 11 of the 12 respondents named people, typically adults (and most often parents), as doing the emailing. Email was viewed as an activity mainly for adults, with only three children including themselves in the group of those who email. One of these three self-identified emailing children, Elsbeth was able to explain that she had received an email from a former teacher, Ms. Julie, but was not able to say more than that. This shows Elsbeth's understanding that emails can be sent and received between two people, both kids and adults. Her parents later shared that Elsbeth and her twin brother, Henry, had exchanged a few emails over the previous summer with Ms. Julie who used to work at Parsons Preschool (Parent Interview, October 15).

Even though the majority of children viewed email as an adult activity, they had no problem taking on the role of emailer over the course of this study. Even Nollie, who informed me that she was not allowed to email, took part in the email activities once I shared with her that her mom had said it was okay. Children eagerly took on the role of emailer, one that is typically viewed as "adult." This echoes digital literacy findings which portray children as early adopters, ready to take on roles with technology that are typically seen as being played by adult (Merchant, 2005; Wohlwend, 2009).

How We Email

When asked about how email works, the children in this study did not appear to understand the intricacies involved in typing, sending or receiving emails. Instead, they broadly

generalized that emails were sent, and offered no further details. Interestingly, only one child

brought up the technology used to send emails (a computer, in this instance) without my

prompting. Few seemed to understand that pushing buttons or using digital technology such as

computers, smartphones or iPads were an integral part of the process. When probed about how

emails are sent, Liza Nelle described helping her mom, "She pushed – I pushed and I picked my

Dada!" (iWrite #1, September 1). Liza Nelle knew that emails were created by pushing buttons

as opposed to it being a pen and paper activity. Some children were puzzled when asked how

emails were sent. One child even suggested that the email man delivered them (Larkin, iWrite

#1, September 7), and another child agreed when I offered the suggestion that emails were sent

via car (Elsbeth, iWrite #1, September 7).

While this study did not focus on the technology involved in actually transmitting emails,

it did utilize specific tools with which emails were sent including iPads, apps, and a pop-up on-

screen keyboard. Over the course of the iWrite activities, children were quick to adapt to this

email technology, as well as the terminology. Children remembered how to type in names for

email addresses, how to push the flower button to see photos, and how to push the airplane

button to send the email. Again, the experiences children had impacted their understandings of

email, and specifically how emails were sent.

When We Email

While I did not question children about when people use email, the topic did arise a few

times. For example, Nollie requested that she email her pets after sharing "When I got to Florida,

and my mom said that this [email] is the way we are going to talk to the dogs" (iWrite #,

September 19). She understood that email could be a way to communicate to others when far

away. Interestingly, there were some instances over the course of the study that indicated

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children's understandings of appropriate times to email. For example, two children asked to send birthday emails to parents who had birthdays during the study. This was probably due to the fact that I modeled sending a birthday email to my mother, but the understanding that birthdays were a time to send birthday emails impacted children's understandings of when to use email.

Why We Email

Only two children discussed the purpose of emailing when answering my question about email. Zuri was one of the few children in the class that had a strong understanding of the potential message sharing for email, and this understanding was evidenced across multiple points include her actions, the parent survey and parent interview. Her response to my original email inquiry was "Email is when you want to send something to a friend so you want to have a playdate with them." (iWrite #1, September 1). Zuri's understanding of email as a vehicle for playdates was further reinforced by her parents through both survey and interview data. Survey data filled out by her mother reported that Zuri had been exposed to and was developing an understanding of email uses and purposes (Parent Survey, August 30). While Zuri did not send emails herself at home, her mother reported that she frequently requested that her mom email her friend Avery to set up playdates (Parent Interview, November 15).

Zuri's understanding of email can be seen in her first iWrite exchange with her mother. Zuri connected emailing with Avery, as she wrote "Avery" in her first email to her family (see Table 10). Her mother's email response indicated an understanding of the connection between Avery and emails when she stated "I can't wait for your next playdate with Avery!" and proceeded to send a photo of Zuri and Avery at their most recent playdate. Each email in the

exchange between Zuri and her mother included Avery. Both mother and child composed

messages based on their shared history with emails.

Table 10
Zuri, iWrite #1

Date & Context	Text	Child's Verbal Message
9/1 Sent to Mom		"Avery"
9/1 Mom response	Hi Zuri, I can't wait for your next playdate with Avery! I love you, Mommy!	
9/2 Response to Mom typed by Zuri	SdkbvghdckaVHBCHSBSDdshbdsvkhhcbjscdbAkhbchcadbhskcsdaiportwjerj,bd,ahfhmvbmaffvmjneljrarqeqw Zuri Karen Rudy Avery	
9/2 Mom response with photo attachment	Zuri, This is a picture of your last playdate with Avery. Love, Mommy	
9/9 Sent to Mom and Dad	Zcbsvvggggdzgfhfhhmddjdndjndqwrtyuiopuasdfggjjklzxxcvbnn,, Zzzzzzzzzzzz.zzzzzzzzz	"Dear mommy and Daddy. Dear Avery. Congratulations Avery. I like looking at the picture."
9/12 Mom response	Hello Zuri, I will send you a picture of your latest playdate with Avery after I download them from the camera. I hope you had fun at the xoo. Love, Mommy	
9/18 Mom response with photo attachment	Hi Zuri, Here is a picture of you and Avery from your playdate. Enjoy! Love, Mommy	

It is interesting to note that children who were not able to verbalize understandings of email purposes were still able to use email in very specific ways over the course of the study, including purposes outside those of the initial iWrite activities. These instances will be discussed further in Chapter 5 in my discussion of joint message construction.

Summary

At the beginning of this study, as 4 year olds with limited involvement with email, children's understanding appeared to be surface level, with only a general understanding of emailing. However, through their involvement with the iWrite activities, children readily engaged in and began to understand more about email, its purposes and how it works. Children's understandings of digital literacy are formed through different experiences both in and out of school. In this study, while most children were aware of the term email, their understandings were fairly non-specific. In general, children understood that emails were something that adults engaged in (sometimes for work), and that they were most often sent somewhere. Previous research has also reported that young children (ages 3 to 7) could understand the concept of sending email to a person not here (Cohen, 2005; Couse & Chen, 2010; Levy, 2011; Verenikina & Kervin, 2011). These findings were reinforced by the findings in this study. In this study, children's concepts about email drew from experiences out of school, and then continued to build on experiences in the iWrite study. As has been seen in emergent literacy work (Clay, 1975; Harste et al., 1985; Sulzby, 1985), children's participation in literacy-based events greatly impacted their understandings of literacy.

CHAPTER 5

JOINT CONSTRUCTION OF EMAILS

In order to fully describe children's digital message making practices, it is important to consider the ways that email messages were composed during the iWrite activities. Looking beyond children's understandings of email, I will now consider the ways that email messages were jointly constructed between myself and the children. To do this, I will report on the role that I took as the teacher at the iWrite center, the ways that I interacted with children, and the impact that this had on children's construction of email messages. First I will discuss patterns I have observed in my behavior as I scaffolded children's composing process. Then I will look closely at the ways messages were generated throughout the study between myself and the children.

Adult Scaffolding Patterns

As the teacher at the iWrite center, my behaviors impacted the iWrite center environment, the structure of iWrite activities, and (at times) the children's behavior. Being the adult gave me the ability to set the tone for how the iPads were used in the classroom. I had control over elements such as seating arrangements, which children were invited, and how the invitations were offered. In addition, I encouraged, prompted and answered questions when children engaged in iWrite activities. It was my intention to scaffold the children's interactions at the iWrite center by observing their abilities, and offering supports as needed (Vygotsky, 1978; Lancaster, 2001). I supported children with regards to procedural issues such as the use of the software programs and the iWrite activity procedures.

Procedural Scaffolds

After extending invitations to the iWrite activities, I then engaged in activities that included, but were not limited to, prompting a child to push the color wheel button when she wanted a new color, talking her through the process to open and send an email, and helping her compose a message. As I watched the children compose, I then offered support when I felt a child was ready for the next step. For example, here is an excerpt when I guided Kate, who was ready to send her second iWrite multimodal composition, a self-portrait.

> Kate: I typed my whole name.
> Emily: Oh wow, Kate! . . . . Are you finished?
> Kate: Ya. . . .
> Emily: Good job. Now, do you remember how to email it?
> Kate: This? [Points to envelope button.]
> Kate: This?
> Emily: Mmm hmm.
>
> (iWrite Activity #2, September 14)

In these adult-initiated situations, I responded to various cues, both verbal and non-verbal, in my effort to support children in their involvement in the iWrite activity. For example, in this situation, Katie announced that she had printed her name and I responded by asking if she was finished, as the purpose of the second iWrite activity was to make a self-portrait and label it with their name. Knowing that Katie had printed her name cued me to think she could be done with the activity. In some situations, I simply asked the child if they were ready for the next step or what they wanted to do next, not necessarily receiving a verbal cue from the child. In other situations, children stopped working and I noticed non-verbal cues such as still hands or wandering gaze, both of which I interpreted to mean that the child needed guidance with regards to the next step.   Since I was so familiar with the sequence of events in the iWrite activities, I typically offered the next step as I did in the previous example. While I was not demanding that children follow steps in a specific sequence, I did offer guidance as to the preferred next steps

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when needed. In addition, children knew I was available as a resource to navigate the use of the

iPads and the iWrite process. In one case, Sam attempted to send the Multimodal Product

created in Sketches2 by himself, but he selected the wrong button and exited the program. He

pressed a button to reopen Sketeches2 and then asked, "How do you send it again?" (Sam, iWrite

#1, September 2). It was clear from his actions that he knew I would offer guidance as needed.

Joint Construction of Email Message

In addition to guiding children through the steps of the iWrite activities, I also supported

children as they composed during the iWrite activities. Since the messages were from the child,

I tried to refrain from composing for the children, but instead encouraged and supported in order

for children to compose both a digital product and a verbal message to share with their families.

In reviewing the videos of the iWrite activities, I observed that I encouraged children throughout

the study to compose, speak and send a message. When looking specifically at my talk during the

10 coded iWrite sessions, I spent more time asking, encouraging or commenting about children's

messages. At times, I did more than simply encourage message generation, but rather pushed a

child to compose a message to meet the purpose of the iWrite activity. For example, I asked

children to compose messages that matched the purpose of the project, questioning their existing

messages or products saying things such as "Well, what were you going to tell your parents

about?" (iWrite #3, October, 11) or "Do you want to say caterpillars eat leaves?" (iWrite #3,

October, 11). This section will report on the ways that I supported children's message

generation and jointly constructed various types of alternate messages.

Supporting children's message generation. Since composing messages, for many, was

an internal process, I asked questions along the way in an attempt to encourage the child to think

aloud and to share the message verbally. For example, I said things such as "What are you

drawing?" or "Tell me about what you are doing". I did this for two reasons. First, it helped illuminate the writing process for my own research purposes. When I asked a child to explain her product, it gave me insight into the meaning that she has assigned to her work and allowed me to analyze the children's message and purposes accordingly. Second, I used this information as I supported the child to compose a message for each iWrite activity.

Generating messages for young children can be hard work. There are many steps in this composing process, and children can become distracted or find other purposes along the way. In order to support successful message generation, I tried to ask each child early on in the session if she had a message for her parents before she actually began composing. The purpose of this request was to establish intentionality early on and offer appropriate scaffolds along the way.

At times, children seemed to need help generating a spoken message. While they were comfortable drawing, adding stickers, and even typing, there was a hesitancy when it came time to speaking a message attached to the digital product. As children finished their drawing and typing, I typically asked, "What does it say?", and then I would record the children's response in the body of the email to act as a translation for parents if needed. Children's reactions to this query were varied. Some children were quick to read the word, picture or stamp that they had included in their product (e.g. "There is a pumpkin and a cup and a hat" iWrite #1, September 19; "It says Rowen", iWrite #1, September 6). Others repeated the same message they had generated at the beginning of the activity.   There were children, however, who had difficulty generating a verbal message to go along with their verbal product. Some children simply shrugged their shoulders or replied "I don't know" (e.g. Van, iWrite #1, September 7; Zuri, iWrite #1, September 6) or "I can't read it" (e.g. Liza Nelle, iWrite #1). Finally, there were a few children who heard my query as a reminder to go back and generate some text with a

message. For these children, I often asked more questions about the product and eventually led

them to the generation of a message. It is these children who did not have specific messages to

attach to their digital products that are of interest as we worked together to jointly construct the

email message.

Rowen was a child who responded to my query with an "I don't know". He had begun

to type a response to an email his mother had sent, but was having difficulty assigning a verbal

message to his typing. I attempted to scaffold his verbal message generation as he worked. See

Figure 8 for the final Mail product.

> Emily: What do you want to say?
> Rowen: I don't know.
> Emily: You don't know? Do you want to send your message back? Do you want to tell
> your mom anything?
> Rowen: [Nods.]
> Emily: What would you like to tell her?
> Rowen: (mumbles)
> Emily: [Points to screen.] Does this say something?
> Rowen: [Types with one finger on screen.]
> ….
> Emily: No? Do you want to tell me a message and I can type it to your mom?
> Rowen: [Nods.]
> Emily: Yeah? Okay, so here's what I'm going to do. I'm gonna use my grown up
> spelling and typing to say "Rowen says". Okay Rowen, whatever you say I'll type. What
> do you want to say to your mom? (pause) Do you want to tell her anything about school?
> Rowen: [Shakes head.]
> Emily: Do you want to tell her you love her? You miss her? What do you want to say?
> Rowen: I love you.
> Emily: I love you. That's always a great message. [Types on screen.] "I love you." Is
> there anything else you'd like to tell your mom?
> Rowen: No.
> Emily: Okay. Would you like to push the send button? [Points.]
> Rowen: [Nods.]
>
> (iWrite activity #1, September 13)

Figure 8. Rowen iWrite #1 Response

On Sep 13, 2011, at 10:03 AM, iWrite <iwriteatschool@gmail.com> wrote:

Nctttk n
Rowen says,"I love you."

This email was generated by your child through the iWrite project. Your response is greatly appreciated. If you respond to this email, it will be received at school where your child can read the email with the help of the iWrite researcher, Emily Bigelow.
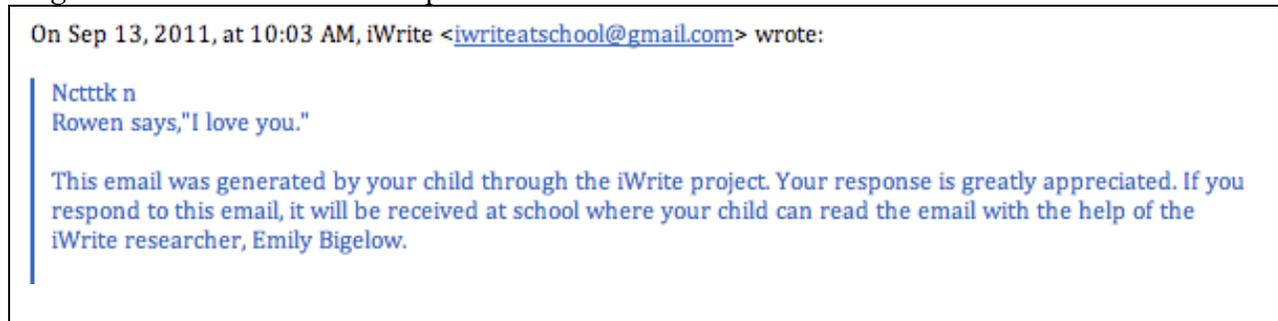
Rowen knew he wanted to reply to the email, but he appeared to have difficulty composing a message. While he was comfortable typing a reply, he did not have any specific message associated with the typing. In this situation, I supported Rowen's verbal message generation by asking open-ended questions, offering suggestions, and finally, typing his verbal message.

When asked about their message, some children responded by saying, "I can't read it." This was especially common for children who had typed responses quickly with little attention to letters. For example, after expressing interest in typing a response to her mother, Liza Nelle seemed confused when I asked about the content of her message.

> Emily: Ok, come sit with me. All right, now Liza Nelle...Liza Nelle, let's get yours up.
> Liza Nelle: Your mom wrote you a messge back. Liza Nelle, it must be so fun to type on the iPad. Are you having fun. Love you. Who wrote that?
> Emily: [points to screen]
> Liza Nelle: Mom
> Emily: Mommy. Do you want to write her a message back . . . or not really?
> Liza Nelle: [nods]
> Emily: You want to write her a message back. Ok.
> Emily: [pushes buttons]
> Emily: Let's see. . .you may start typing.
> Liza Nelle: [begins typing]
> …
> Liza Nelle: I'm done.
> Emily: Ok. Let me see it. Hang on. What does it say to your mom?
> Liza Nelle: I can't read.
> Emily: Well, what were you thinking when you typed your message?
> Liza Nelle: Umm. . .

Emily: So, why don't you type another message that means something. Can you do that?
Can you type a message that means something?
Liza Nelle: [Nods yes.]
Liza Nelle: Go to the zoo.
Emily: You want to type, go to the zoo? All right, how could you do that?

<div align="right">(iWrite #1, September 6)</div>

Figure 9. Liza Nelle, iWrite #1 Response, September 6

In this situation, I instructed Liza Nelle to start typing, which she did, but she did not have a specific purpose in mind for this task. This was seen when she said, "I can't read" response when I encouraged Liza Nelle to type a message that "means something". Liza Nelle immediately stated a message, and then began to type it. As she typed her go to the zoo message, she sounded out the words, and typed "Bzo" to represent her final verbal message of "Go to the zoo with Catherine and Sam's mom." I supported Liza Nelle's message generation by encouraging her to typing with intention.

Finally, a few children responded to my question by returning to their composing, as if they had forgotten the message generation portion of the process. For example, note Sam's response to my question in this excerpt from the first iWrite activity as he composed a Multiomodal Product in the Sketeches2 program.

Sam: How do you send it again?
Emily: Are you all done?
Sam: Yeah.

Emily: What does your message say?
Sam: I'll try one more.
Emily: Oh, well what did you...did you want to add some typing to your message?
Sam: [Presses on screen to bring up keyboard.]
Emily: Do you want to add letters? What do you want to say? What do you want to say?
Sam: [Types with one finger on screen.]
Emily: I know those letters.
Emily: Huh! Look what you just did! You put your name on it!
Sam: Okay now what do you say...I want to say 'for mom'.

(iWrite #1, September 2)

In this case, it would appear that my question reminded Sam that emails need a message, so he went back to work to compose a specific message. He did not need support generating a message or knowing how to represent that message on the screen as he quickly pulled up the pop-up keyboard and began typing. Instead, he simply needed a reminder to add a message to his product. It is interesting to note that he did not apply a verbal message to the existing product, but rather he returned to add marks with meaning. In this case, he typed his name "Sam" and then added 2 more M's to make "Sammm". Then he assigned the verbal message "It is a race track from Sam & Lightning." (see Figure 10 for example).

Figure 10. Sam, iWrite #1, September 2

My talk and actions were used to encourage, guide and co-author with children in order to create a final product. Similar to Rowe's (2008b) findings in a print-based writing center with 2-year-olds, the textual intentionality of these message was socially constructed between myself and the children. In Rowen and Liza Nelle's examples, I encouraged them to compose a product with a message by asking "What do you want to say?" and "What does it say?" In both situations, children responded by composing messages that had meaning. In Sam's example, I merely needed to remind him that he needed to construct a message. These examples are representative of the data set as they showcase the ways that I encouraged message generation, and ways that children responded.

Joint Construction of Alternate Messages

Children were invited to engage in iWrite activities that had assigned purposes (e.g. send a message to your parents about a classroom activity). Generally, the children accepted these invitations as well as the underlying purposes that focused on sending digital messages to parents. There were instances, however, when children needed guidance to stay true to the purposes of the original intent of the iWrite activity, and sometimes alternate messages ensued. For example, some children who had a message in mind that matched the iWrite purpose, but the content was modified during the composing process as the child was distracted by drawings and stamps, seeing a photo or thinking of something else. At other times, children had purposes independent of the iWrite activity. Ultimately, the content of the email messages was negotiated throughout the composing process between myself and the child. In this section, I will discuss some of these alternative messages and the ways that children and I negotiated the content of these messages. This consideration of children's use of technology for personal purposes is important, as it directly ties to existing technology goals within the Common Core. For example, in a kindergarten writing standard, it states that children should "with guidance and support from adults, explore a variety of digital tools to produce and publish writing, including in collaboration with peers" (Common Core Standards, 2012). It is important to consider how children will use digital technology independently for their own purposes as they become digital citizens.

I guided the composing process during the iWrite activities in a few ways. As discussed, I invited and then supported children in their message making. Specifically, when children composed verbal messages that did not match the iWrite activity purpose, I tried to guide the child back towards the original intent of the iWrite activity. As a result, the final messages were

often jointly constructed between myself and the child. I have observed that my focus on the content of the message increased with the third iWrite task in which children were asked to send a message about a classroom activity to their parents. During the first two iWrite activities, I encouraged children to attach a message to their products, but I did not support specific message content as I did in later iWrite activities. For an example, consider my discussion with Rowen as he composed his "I love you" message (iWrite #1, September 13). I asked open ended questions such as "Do you want to tell your mom anything?" and "what would you like to tell her?" (iWrite #1, September 13). In the subsequent iWrite activities (#3, #4, #5), however, I strongly encouraged children throughout the activity to compose a message that met the iWrite purpose for that specific task, mainly reporting on a classroom activity. I will now report on the ways that a variety of messages that were jointly constructed. First, I will report on messages that originated from children, and were multimodal products composed in the Sketches2 program. Second, I will discuss typed email responses created in the Mail program that were composed in response to parent emails. Finally, I will discuss situations in which children had very specific personal purposes for composing emails.

Joint construction of multimodal product messages. For children who attempted to compose an alternate verbal message, that did not match the iWrite purpose, I typically intervened, but children's responses varied. First, I will look at join construction of the message in the Multimodal Products composed in the Sketches2 program. Some children remained true to their message, never straying despite my attempts to change it. Other children went along with my suggestions, only to return to their initial message, and a few children dropped their initial alternate ideas completely. I found it especially interesting when children appeared to be modifying their message to meet the purpose of the iWrite activity at my suggestion, only to

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return to their original alternate message at the end of the session. For example, Ben came to the

iWrite center interested in telling him mom that he loved her, but I encouraged him to compose a

message about a classroom activity (iWrite #3, October 11). Before coming to the iWrite table,

Ben had been playing with a firehouse toy. Once at the iWrite table, when I asked what he liked

to do in the classroom, he shrugged his shoulders. When I asked what he wanted to tell his

parents, he responded by saying, "I love you." Then, I suggested that he also write or draw about

the firehouse, which he drew on the screen. The following excerpt picks up after Ben is done

drawing the firehouse. See Figure 11 for the final product.

> Emily: So if you're done with your picture, lets write the message to go with it. Do you want to write a message with your finger to make letters or do you want to type?
> Ben: Mmmm... type it?
> Ben: I need letters. How do I do it?
> Ben: [Starts drawing with finger.]
> Ben: How do I spell I love you?
> Ben: [Draws.]
> Emily: What do you want to say about this picture?
> Ben: [Moves finger around screen.]
> Emily: Good job. Should we type a message now?
> Ben: [Nods.]
> Emily: What do you want to say about your picture? What do you want to tell your mom and dad about that?
> Ben: I love you.
> Emily: Okay... I know you want to say I love you, what do you want to say about that?
> Emily: [Points to picture.]
> Ben: Mmm. I dunno
> Emily: Hmm? Ben?
> Ben: I dunno
> Emily: You don't know? Well what is that?
> Ben: Um. A firefighter. That's a house that did some fire
> Emily: That's the house that what?
> Ben: That's the house that did some fire
> Emily: That's the house that does the fire?
> Ben: Uh huh
> Emily: Can you type that? That's a great message. That's the house that does the fire.
> Ben: [Starts typing with one finger.]
> Ben: [Hits B repeatedly.]
> Ben: B B B B B
> Emily: B B B B B B. Lots of B's. What does your message say?

Ben: Mmm
Ben: [Continues typing.]
Ben: I don't know.

Figure 11. Ben, iWrite #3, October 11

In this situation, Ben had a specific purpose in mind and even though I encouraged him to

compose a message about a classroom activity, he continued to return to his message of "I love

you.". Ben's final product was accompanied by this dictated message, "This is the house that

does the fire. I love you. Could you show this to Jonah?" (iWrite #3, October 11). Ben accepted

my guidance when I made suggestions regarding drawing a picture and typing, but was not

willing to give up his original message. Ben's willingness to engage in the social practice of

email with regards to physical behaviors such as drawing and typing offer an example of a child trying on the behaviors associated with a specific digital literacy practice. He was only willing to engage in this behavior up to a point, stopping when it meant impacting his message.

Joint construction of email responses. I also worked with children when they replied to parent emails using the Mail program. Remembering that children first composed Sketches2 products, and then could reply to emails from parents, it is important to note that children's intentionality with regards to messages could change over time. In addition, time had passed between the emails, so the child may not have remembered the original message or may have had some new information to share. For example, a child might initiate an email message exchange based on a classroom activity, but then change intent when responding to a parent's email. This is understandable, as the content of the parent email sometimes introduced a new topic, therefore impacting the child's response. For example, Katie received two very different emails in response to her iWrite #3 email about playing legos in the classroom. See Table 11 for this email exchange.

Table 11
Katie, iWrite #3, October 14

Date & Context	Text	Child's Verbal Message
10/14 sent to Mom and Dad		"Katie. Mom and Dad. I like paying with the Legos"
10/14 Mom response	Dear Katie, I love the cakes! I like the coffee cup too. I like tea in my cup. You like milk! Have a fun day. Daddy will pick you up today. Love you, Mommy PS Papa is sending you and John Halloween bags in the mail.	
10/14 Dad response	Wow Katie, I love the drawing! Is that a window you made above your name? I played with Legos too and we'll have to get some. Love, Daddy	
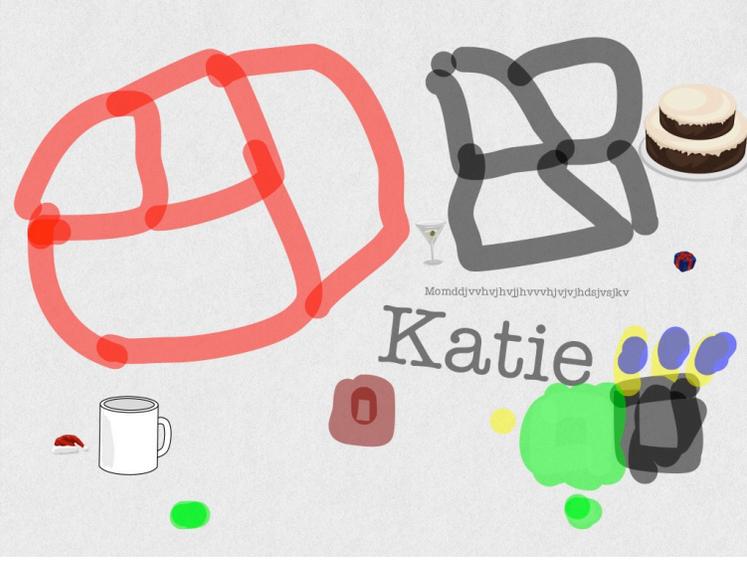
Looking specifically at Katie's mother's response, her focus on the coffee cup and Halloween

bags from Papa might shift Katie's attention to other topics than playing with Legos. While

Katie did not reply to these emails due to time constraints, there were many instances in which

children did reply to parent emails with my support. My goals for children's writing responses

were for the child to stay on topic. For example, if a parent responded by asking a question, I

would encourage the child to answer that question in her response. An example of this can be

seen when I guided Deborah in typing a response to an email she had received from her father as

a part of the third iWrite activity. The final product can be see in Figure 12.

> Emily: Do you want to write your Daddy a message back?
> Deborah: Mm-hmmm.
> Emily: Uh-huh. Ok. What did he ask you?
> Deborah: Book center.
> Emily: He said, "How many books are in your book center?" Do you know how many books are in the book center?
> Deborah: I don't know.
> Emily: Hmmm. . .(pause). . . What are you going to tell him?
> Deborah: How many books in it?
> Emily: I don't know. How many? How many books are there? Do you want to go count?
> Deborah: Yes.
> Emily: Ok. Go count. I'll save your seat for you.
> [Long pause while Deborah leaves the iWrite center.]
> Deborah: I can't.
> Emily: You can't? That's ok.
> Emily: You couldn't count the books. So that's ok. What do you want to type to your dad?
> Deobrah: My name.
> Emily: Your name. That's a great thing to type.
>
> <div align="right">(iWrite #3, October 25)</div>

Figure 12. Deborah, iWrite #3 Response, October 25
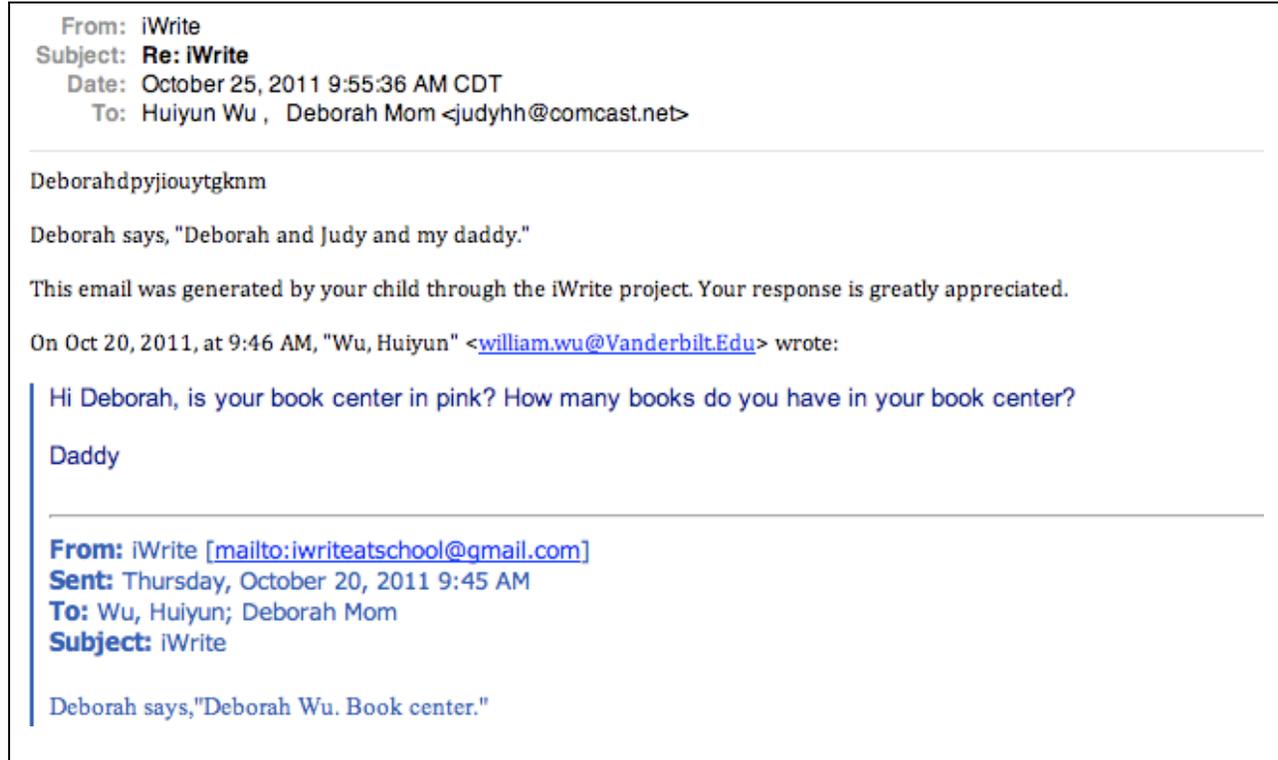
At the beginning of this session, I did not simply ask Deborah "What message do you want to write?", but instead I was more focused, encouraging her to look to the original email for a question, and then to compose a response. The idea of counting the books at the classroom book center was a bit too daunting for Deborah, so she returned to the iWrite center without an answer. This time, I moved away from encouraging Deborah to respond to the specific email thread, and instead returned to the typical inquiry of "What do you want to type?", My first effort to encouraged Deborah to respond directly to her father. When this didn't work, I returned to a more open-ended question which gave Deborah more flexibility in the generation of her message. I began with a more focused purpose, but when I did not receive a message, I widened the purpose, allowing Deborah enough space to generate a message. These two examples show how parent responses also played a role in the joint construction of email messages.

Individual Purpose

Up to this point, the discussion has focused on children's responses to my invitation to participate in an iWrite activity. There were, however, occasions when the child took the lead with regards to setting the purpose for email. On a few occasions, children came to the iWrite table requesting the opportunity to email with a specific purpose in mind. For example, Van, Rowen and Katie all requested sending birthday emails to parents. Another time Van wrote to his mom about wanting to go on a camping trip (Field Notes, November 4). While there were only a few of these child-driven parent-centered emails throughout the study, they showcase children's understanding of email for personal communication. Obviously, all of the iWrite activities utilize the parents as audience, but in these situations, children initiated the activity instead of waiting for me to suggest it.

As children moved through the iWrite activities, their own personal intentions for emailing became more evident. Children became aware that parents were reading and responding to the emails, and that these digital messages were ways to communicate for a variety of purposes. Specifically, children's messages became more varied and did not always match the original iWrite activity purposes. I will now focus on the ways that one child, Sam, constructed emails for reasons beyond those of the iWrite activities.

Sam.

Sam was a happy, active 4 year old in the DS 4 class. Often found in the block center, Sma was always involved in a project of some kind. Sam was a frequent visitor to the iWrite center, often requesting that I call him name next. At home, Sam's parents report that he is comfortable using his parents' iPhones, and the family iPad (Parent Interview, October 28). When I visited Sam at his house, he was eager to show me the iPad and all of the things he could

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do. We played a digital hockey game before going up to his play room (Home Visit, January 20).

Sam is an example of a child who had his own purposes for emailing. Sam's email exchanges were selected as his emails illustrate the ways that children brought personal purposes even within the confines of the iWrite activities. At the beginning of the study he did not verbalize a strong understanding of email when asked in first iWrite activity. However, he clearly showed an understanding of the possibilities of email through his engagement with the iWrite activities. When asked I asked Sam and Katie about email at the beginning of the study, Sam responded to my queries with brief, vague answers.

> Emily: Do you know what an email is?
> Sam: A message.
> Emily: What else do you know about it?
> Katie: Work
> Emily: Say it again. (pause) Work? Emails are work? So who sends emails?
> Sam: My mom does (pause) iPad.
> Emily: She sends emails. Ok.
> Emily: What do you say in emails? What messages do you send?
> Sam: Work.
>
> (iWrite #1, September 2)

Although Sam's understanding of email seemed rather vague, especially considering his high level of involvement with digital technology, he showed an ability to engage with mail in appropriate manners over the course of the study.   Sam's behaviors showed an understanding that email was a vehicle for communicating to his parents at a fairly rapid rate, even if he could not communicate this when asked about email. For example, in the first iWrite session, Sam asked "Is my mom gonna see what I did on the computer?" after he sent his email, showcasing his knowledge that his mom would see the email on her computer. Sam was also one of the few students that would drop by the iWrite center to ask if his parents had replied yet. He had an understanding that email offered the opportunity to communicate quickly with his parents.

As the study progressed, Sam used email to share important messages with his parents. For example, Sam's mother replied to a photo of boys wearing fire hats that Sam had emailed as a part of the fourth iWrite activity, saying that she was also going to be a firefighter. When Sam heard this message, it was clear that his mother's response did not match his original purpose of sharing a photo of his friends. Concerned that his mother thought he wanted to be a firefighter for Halloween, Sam reacted quickly. Here is the conversation after I read the email aloud to Sam. See Table 12 for the complete email exchange between Sam and his mother.

> Emily: Is your mom gonna dress up?
> Sam: Bzzzt! I am still gonna be a skeleton!!
> Emily: Oh, that's fine, you can be a skeleton. I think she thought you guys were playing Halloween dress up on the playground.
> Sam: Can I just type "I am gonna be a skeleton."?
> Emily: Yes. Yes. Yes. Let's just get your mom's (pause) [Emily taps on screen.] Ok. Type "I am going to be a skeleton." You better let her know, Sam.
> Sam: How do you spell "I am still going to be a skeleton?"
>
> <div align="right">(iWrite #4, October 27)</div>

The next day, when Sam was offered the opportunity to respond to his father's email message to the same fireman picture, he offered a silly response, obviously without the same kind of urgency from the day before. Again, Sam was emailing with a specific purpose, but instead of correcting his mother, this time he was playing around with his father.

> Emily: He wrote "Hi Sammy, I like your picture. Stay dry today and have fun". Do you want to write him a message back?
> Sam: Sure. [Sam begins tapping keys.]
> Emily: Sure. Hang on. Hang on. Clicky-clicky fingers. . . .What do you want to say? All right, what do you want to say to your dad? He said, "I like your picture. Stay dry today and have fun." What are you gonna say to him?
> Sam: I'm gonna say, "Stay fun. And stay pumpkin head."
> Emily: [Chuckles.] Ok. I think he'd love hearing that message.
> Sam: No. I mean, I'm gonna say, "Basketball pumpkin head" and then say "Basketball head." Ok?
> Emily: Ok.
> Sam: How do you say "Basketball pumpkin head?"
> Emily: What do you think?

Again, this example shows a child who used email for personal purposes beyond those of the

iWrite activities. Sam was able to use the iWrite activities to communicate in various ways

throughout the study. While this use of email for personal purposes was seen in other children

during the study, Sam had the most instances of personal messages.

Table 12
Sam, iWrite #4, October 27

Date & Context	Text	Child's Verbal Message
10/27 Selected photo, then typed in Mail Sent to Mom and Dad	Osm	"Awesome.
10/27 Mom response	Hi Sammy! I am going to be a firefighter for Halloween too! You guys look great!	
10/27 Response to Mom typed by Sam	I amslgontbslt	"I am still going to be a skeleton."
10/27 Mom response	The BEST and Scariest skeleton ever! Love you	
10/27 Dad response	Hi Sammy, I love your picture. Stay dry today and have fun! Love, Daddy	
10/27 Sent to Dad	Btblpnhds am	"Basketball pumpkin head."

Summary

This chapter has focused on the various ways that children jointly constructed email messages with my guidance. There were two ways that I supported children's involvement in the iWrite activities through my scaffolding behaviors. Descriptions of these can be seen in Table 13.

Table 13
Teacher Scaffolding Behavior Catergories

Category		Description	Example
Procedural	Demonstration	Teacher models process	"It is my mom's birthday, so I am going to make an email to send to her."
	Invite	Ask child to engage in email process	"Would you like to send your parents an email?"
	Answer Question	Respond to a child-generated question about the process	"Yes, if you are ready to send, that is the button you should use."
	Tech Support	Offer technical support (whether requested or not)	"Oh, that button doesn't always work, let me try it for you."
	Verbal Prompt	Give a verbal prompt when child seems unsure or in need of direction	"So, if you want to type your message, you could push the T button."
	Physical Prompt	Physically show the child on the screen by pointing	[This is the T button you push for typing.]
	Teacher Led	Engage in the activity for the child by tapping, swiping or drawing on the screen.	"Here, that is hard. Let me change the color for you."
	Comment	Comment on the process that the child is engaging in.	"Oh, so you pushed the T button, you must want to type a message."
Message Generation	Demonstration	Teacher models process	"It is my mom's birthday, so I will say "Happy Birthday".
	Invite	Invite the child to compose a message for the email.	"What would you like to tell your parents?"
	Encourage	Encourage child to compose a message.	"Why don't you think about what you'd like to tell your parents?"
	Prompt	Give a prompt to begin the	"So. . . you could tell your

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		message generation process.	parents, I like to . . . what do you like to do in school?"
	Co-Author	Work with the child to compose a joint message So you said outside. . .what do you like to do outside?	"So you said outside. . .what do you like to do outside?"
	Author	Generate a possible message for the child.	"I noticed that you were playing with the firehouse. Would you like to write "I like to play with the firehouse?"

First, I offered guidance as children navigated through creating Sketeches2 products and emailing them using the Mail program. Looking specifically at the procedural scaffolding I provided during the iWrite activities, other research has also found that teachers took a similar role when guiding digital activities, offering assistance to one child at a time as needed (McManis & Gunnewig, 2012; Sandvik, Smordad & Østerus, 2012). When children interacted with iPads in the classroom, Sandvik et al. (2012) report that the teacher was more withdrawn, and did not exhibit traditional teacher-led talk typically found in instructional settings. While I do not feel that my teaching interactions could be classified as withdrawn, it certainly was not that of typical teacher-led talk. Rather, I followed the children's lead, asking open-ended questions, offering supports as needed and observing the child's process.

Second, my behaviors throughout the study centered on supporting children to compose messages to send to their families. Specifically, I was focused on children's generation of a verbal message to go along with their digital products. This was a concern for many reasons. First, I felt that children's unconventional products might be difficult for parents to respond to if

there was not a conventionally typed messages associated with it. Also, I wanted to have the children's verbal message to enable future data analysis with regards to connections between digital product and intentionality of messages. It is interesting to note that children needed little encouragement to compose digitally, but often needed support to share their message verbally. It was not something they were used to doing.

An underlying concept for this study is the idea that digital composing, much like print writing, is a social practice which has specific ways of being done in a particular community (Barton & Hamilton, 2000; Gee, 1999). In this situation because children had very little exposure to email, I modeled and guided children through these experiences, and thus greatly impacted the way that this social practice was shaped. Children were exposed to, and picked up on procedures, message generation, composing processes and ways of doing email in ways that were valued by myself and their parents (Barton & Hamilton, 2000; Street, 1995).

Though all children typed when entering their name for the email address field, not all children understood that the typed text had potential for meaning. Similar to print-based findings (Harste et al., 1984), children are capable of making marks that do not have attached messages. My expectation, however, was that children's typed text should contain a message, so I encouraged children to attach meaning to this typing. I encouraged children to assign meanings to existing typing as well as to create messages by typing. Similar to Rowe's findings with at a preschool writing center (2008a), this was a part of the social practice at the iWrite center.

Through my actions at the iWrite center, I promoted a particular kind of digital access and usage (Crafton, Brennan & Silvers, 2007). I privileged digital products that had messages that matched the iWrite activity purpose. While I offered children much freedom when

composing multimodally, I strongly encouraged children to attach a verbal message to each digital product.

Many messages composed in this study were jointly constructed between myself and the child. While some children composed messages that fell under the original purpose of the iWrite activity, other children did not. In these cases, I attempted to offer guidance and support to keep children's messages on track. The children, however, responded in various ways, sometimes creating messages with unique purposes. I had specific intentions when I guided the children through the iWrite activities. Specifically, I was focused on assisting children as they generated messages to send to their parents. Research has shown, however, that adults draw attention to the message content (Rowe, 1994, 2008b), and I was no different. It was clear that my focus was on children's text and message production as the majority of my talk centered around children's messages.

CHAPTER 6

CHILDREN'S DIGITAL COMPOSING PROCESSES

In this chapter, I will examine children's behaviors during the digital composing process as I work to answer the research question: How do young children interact with iPads during the digital composing process? To do this, I have chosen to focus on children's behaviors as they composed with the iPad. These analyses describe the children as they interacted with the iPads and the software programs. First I will consider children's ease of use of the iPad in addition to the few resources that they requested during the iWrite activites. Next, I will look specifically at their engagement with specific tools including the pop-up keyboard, editing message and photographs. Overall, this chapter describes young children's engagement with the iPad when composing emails using Sketches2 and the Mail program.

Children's Behaviors During Digital Composing

Digital technology such as iPads offer different ways to interact with literacy than with pen and paper. Specifically, children must navigate within the app in order to compose a digital product. For example instead of grabbing a green marker and drawing as she would at the writing table, in the Sketches2 app, a child must tap the color wheel, select the color green, then select the thickness of the line before beginning to make marks.

Ease of Use

Because the touchscreen technology of the iPad is so intuitive, children were able to interact with the iPads immediately with very little instruction. Research has shown that touchscreen devices such as iPads are easier for young children to operate than other devices such as a computer mouse (Battenberg & Mebler, 1989; Scaife & Bond, 1991).   While I was

prepared to lead short mini-lessons in which I would model various aspects of the software design; I found, like other researchers (Crafton et al., 2007; Couse & Chen, 2010) that these teacher-led lessons were not needed. Rather, children merely needed me to offer the access to the digital technology.

Beginning with my first demonstration of tapping the home key and swiping the arrow to unlock the screen, children were quick to take on the physical navigation of the iPads.   In this study, children needed very little direction as to how to physically use the touchscreen. A few children needed direction about how to use their finger tip as opposed to their nail or knuckles (e.g. Kate and Van), but otherwise they were able to begin using the iPad independently with little difficulty. Van was the only student who needed support throughout the study, frequently dragging his knuckles across the screen, which would interrupt the work that he was trying to accomplish with his index finger.

The children's abilities extended into opening both the Sketches2 and Mail apps. Children did however, need some support as they navigated through Sketches2 and the Mail program. Once exposed to various features, however, they became more independent users of this digital technology. As the iWrite activities progressed, many children did not need a demonstration when new tools were introduced (e.g. replying to an email or selecting a photo). Instead, verbal direction was enough.   When introducing how to access photos, I simply said, "Press the flower button to see some pictures" and children were able to access the photo albums independently.

Children acquired other integral motions such as tapping on buttons, pinching to resize images, sliding to move items and swiping to flip through stickers or photos. Some of these movements, however, were more difficult to master than others. Children readily acquired one-

finger skills such as swiping and tapping, but had more difficulty with motions requiring two fingers. For example, children needed support when resizing objects, which required two fingers that had to be moved in unison as they pinched or stretched an object.

Procedural supports. When composing on the iPad, children used me, the adult at the iWrite center, as a resource. When children asked for help during an activity, one common request was for procedural support. Most often, in these situations, children were asking about the next step in the emailing process or how to perform an action that they are aware of, but couldn't remember how to make it happen. In the following example, Katie was interested in erasing text she had typed.

> Katie: [Types K. Katie types A.]
> Katie: Uh oh. I want to erase that.
> Emily: Okay, remember how to erase?
> . . . .
> Katie: How do you erase it?
> Emily: That button, sweetie.
> Emily: [Points to delete key.]

(iWrite #, October 14)

Children also asked questions about other buttons, either where specific buttons were, or what a specific button did. For example, Elsbeth asked about the black cancel button one day when working in the Mail Program. This lead to a discussion about the word "cancel" and what cancel meant. Other children remembered that they needed to push a button to get the stamps, but couldn't remember which button it was, and would ask for guidance finding the correct key. For example, a child might say "I want to stamp." My response was generally to offer a verbal prompt, and then point or tap the key if needed.

Children also asked for technological support when something did not work properly. Within both apps, there were bugs and design issues that often required adult assistance. For

example, in Sketches2 the color wheel button did not always respond to touch, and children had

difficulty selecting the specific color they were interested in because the swatches of color were

so small. In the Mail program, the 'To' button that needed to be pressed in order to type in the

desired email address was placed in the far upper left hand corner, and children often had

difficulty tapping the button with enough force to get a response.   These were the technology

support requests I had most often, and as the study progressed, I observed myself pushing the

'To' button for children before they could ask for help, as if I knew they would need some

assistance.

      Spelling support. Like print-based emergent literacy work has shown (Clay, 1975),

there was a variation among the children's spelling abilities. Some children were extremely

focused on conventional spellings, while others assigned meaning to any letters regardless of

letter-sound correspondence. There were also those who wanted help sounding letters out, and

were able to use inventive spellings in their messages. In general, when children asked how to

spell a word, my response was to slowly say the word and then ask the child, "What sounds do

you hear?" or "What do you think?" As the children spelled, they asked for help locating a key

(e.g. "Where is the N?"). I typically gave the child the general location of the key. For example,

I might say, "It is on the bottom row, near the middle." Then, if the child still needed help, I

would point out the letter to the child.

      Spelling played an interesting role in this study due to the fact that email addresses were

stored based on the child's first name, and had to be spelled correctly. If a child mistyped her

name, then the correct email addresses for her parents could not be accessed.   This group of

children were confident name spellers, but on occasion typed an incorrect letter. So, while

children did not ask for help spelling their name, I did oversee name spelling to check that the

spellings were correct. In addition, since some children's names were similar (i.e. Kate and Katie), this supervision ensured that the correct email addresses were being used.

Engagement with Digital Tools

While there was variability in the ways that children interacted with the iPads and the programs of interest for this study, several patterns stood out. Specifically, this section will focus on patterns of behaviors surrounding children's navigation of the app with a focus on the pop-up keyboard, editing tools, and photos as well as their use of resources outside of the digital technology.

Pop-up keyboard. The pop-up keyboard is a specific tool found in both Sketches2 and Mail program that children interacted with regularly. It was available for use in both the Sketches2 and Mail programs, and all children utilized it during each iWrite activity. At the least, a child would type her name to address the email before sending, ensuring that all children typed on the keyboard regularly throughout the study. In the Sketches2 program, children pushed the 'T' button to access the keyboard. A screenshot of the pop-up keyboard in Sketches2 can be seen in Figure 13. In the Mail program, the pop-up keyboard became available automatically when an email was opened, and looked similar to the keyboard in Sketches2. In the Sketches2 program children had to select the typing option to access the keyboard while the keyboard automatically popped up in the Mail program.

Figure 13. Pop-up Keyboard in Sketches2
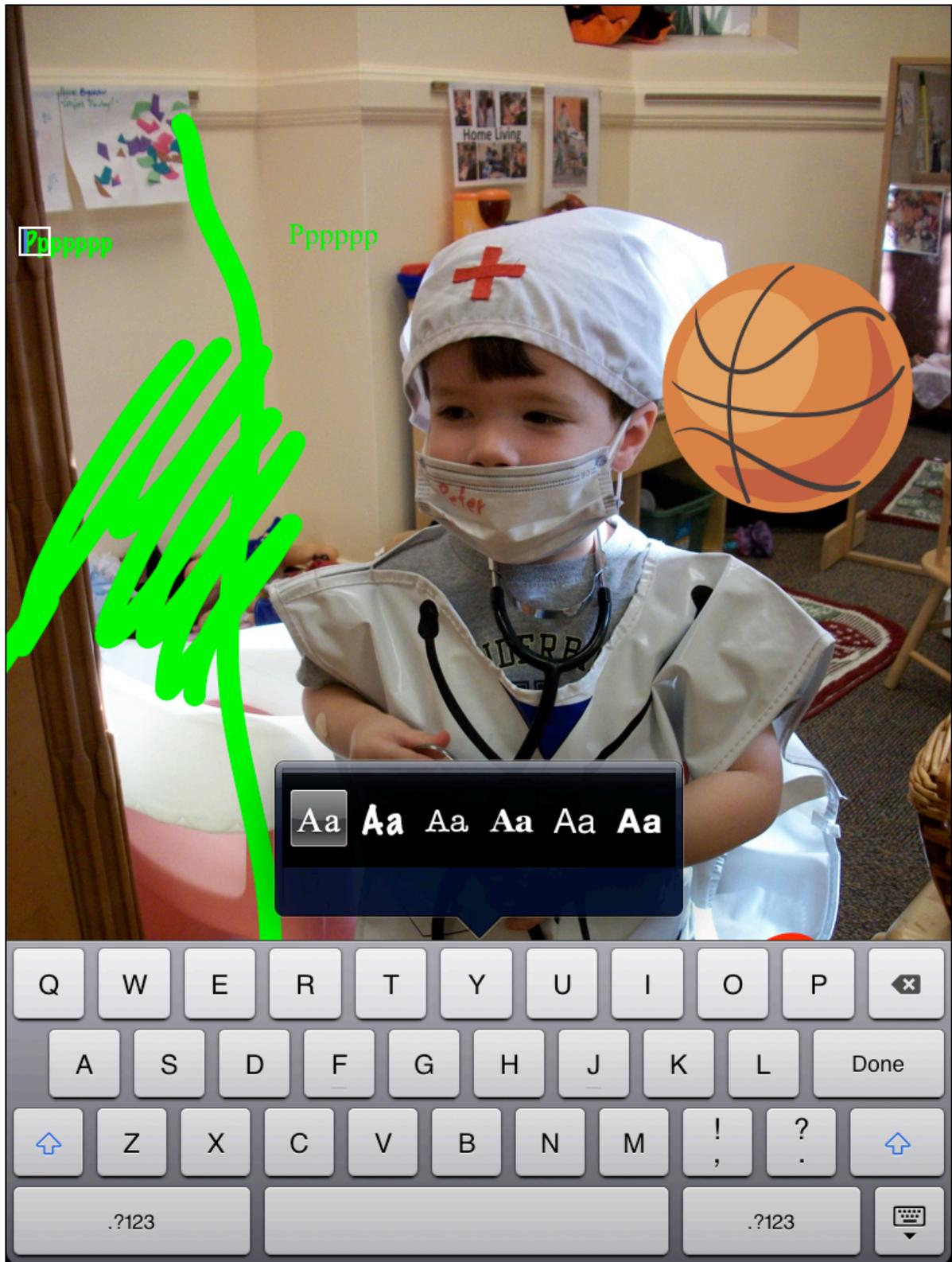
Children engaged with the pop-up keyboard in different ways. Some children were able to independently navigate within the app, moving between typing, drawing and stamping as needed. Other children asked for help or relied on my verbal and pointing prompts when they composed. For some children, their keyboard behavior utilized two hands (the way one might be taught to type in a typing class) and other times only one hand. See Table 13 for an example of both styles. Typing processes observed regularly included a one finger "hunt and peck" style of typing and a two-handed grown-up style of typing. The one finger hunt-and-peck style was slower and more deliberate, and was often used when children knew the specific letter or key they were looking for. Therefore this pattern was used most frequently when children had a specific message or letter in mind, and were typing names or sounding out messages. This style of typing resulted in messages that were shorter in length. At other times, children typed more quickly with two hands, often mimicking the posture of an adult seated at a computer keyboard with two hands on the keys. This typing was often very rapid and resulted in long strings of text. Children engaged in both styles of typing across the two apps.

Table 13
Styles of Typing with Xander, October 14

Two-Handed, Grown Up Typing	One-Finger, Hunt and Peck Typing

One-handed, hunt-and-peck typing. Many children elected to type slowly, using one finger at time as they searched for specific letters. This was observed the most when children were asked to type their name in order to address their email. In this study, every child used one finger and tapped the letters in their name one at a time. Beyond addressing emails, however, children engaged in one-finger typing to varying degrees. Of the 10 video sessions coded, there were 67 instances of typing, 41 were the one-finger hunt-and-peck style. Of the 15 students observed in these 10 sessions, all 15 engaged in this typing at least once. Children used this typing process most often when sounding out or spelling known words. Henry relied on the hunt-and-peck method whenever he typed throughout the study. For example, on October 12, Henry typed a message as a part of his third iWrite activity (classroom-based message). In this excerpt, Henry's slow typing occurs in conjunction with his sounding out of the words "Block Center". To see his final product, see Figure 14.

Emily: What were you going to say next?
Henry: B. [Types B.]
Emily: Mmhmm
Henry: Luh. . . B – L. [Types L]
Emily: Mmhmm
Henry: R?
Emily: Ahhhhh.
Henry: A? Do an A?
Emily: It's an O. The Ahhh is an O like in Octopus.
Henry: O. [Types O.]
Emily: Blaaaahhhh—kkssss.
Henry: K and I hear an S. Center. [Types K.]
Emily: Do you want a space? Good job. Sssss-enter
Henry: S? And then what? [Types S.]

(iWrite #3, October 12)

Figure 14. Henry, iWrite #3, October12

Mommy. Daddy i. Love. Too. Play. In. Bloks. Sndr

Mom and. Dad. I hop. You. Like. My. Eml
Love. Henry
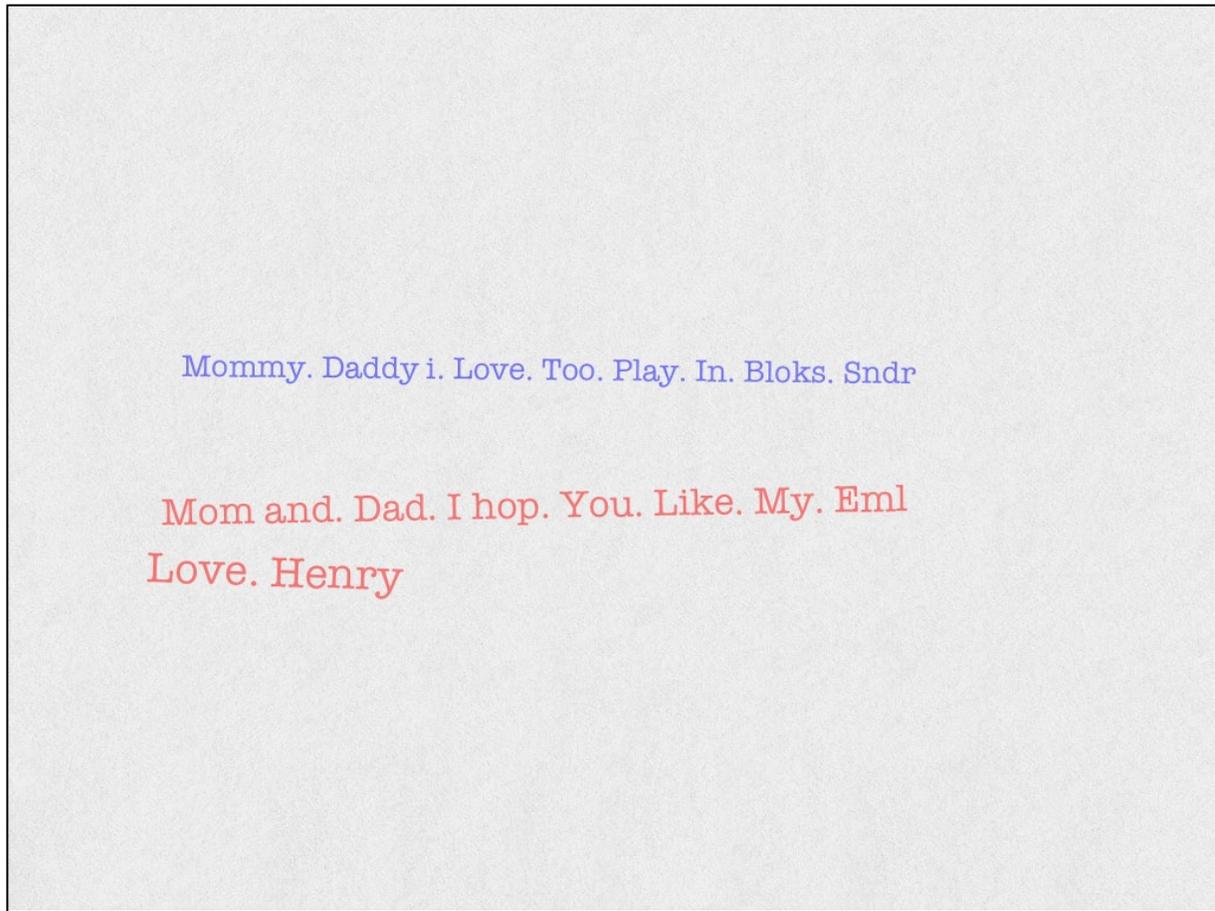
Two-handed, grown-up typing. Some children typed using two hands, like a grown up

and quickly created products with large amounts of typed text. Of the 67 instances of typing

behavior coded over the 10 iWrite sessions, 26 were of this rapid style. While children did

attach meaning to the text produced by this behavior, there was rarely any speech-text match.

Xander was by far the most prolific typist in the classroom. His products contained more typing

instances and more typed text than any other child in the class. The majority of Xander's emails

and multimodal products contained long strings of typed text, with short verbal messages

attached after the fact. See Table 14 for examples of both multimodal and email products

created by Xander. In his first Sketches2 product created in the first iWrite activity (September

6), Xander typed 12 times, creating long strings of text in the multimodal product. During his composing process, Xander would often press the 'T' button, opening up the pop-up keyboard, and then he would type.

Xander commented on the speed of his typing, saying "I can go fast" (iWrite #1, September 14) and "I'm typing fast" (iWrite #3, October 14). He enjoyed typing so much that when asked to generate a message about a classroom activity, he composed "I like to type". Outside of typing his name to address email addresses, Xander was only observed typing slowly three times in the study as he looked for specific letters in a "hunt and peck" style of typing with one finger.

Table 14
Examples of Xander's Typing

iWrite #1 Multimodal Product September 6

iWrite #4 Email Response November 2

Jhfdabhfudaivfdbvaifduhbvfdaufvgreiuagfyveryiugfraeiuyfgaeriytfverauytfaerfiytreafretyifgreyifgewydigew
yyifdeeawgiyfdagiudfagyufrawygigfwrauyvgeawfgyiyrefaygugfreaguvyraefuggyrfeayguivuyhgj 4$4(:(:
(:)cbcb cbcbvfbsdhhafdbgifadhvisdhbhisdqohdscauuhohodsachadsciyhudyiyucxzgkhvcdzgyui
hciuohghquisuhiouihosohiuvgdusvihugvfehguierfauyigrefaiyufaveiguugfeayguifvaeigueaffggiyaerfigyfygirae
ygiyrfyygiafreygiyraggaefygidafvyuigdafuigyfwdgifeqigyqdewiyggedqwygugwqedyigggewqehfvbnmk
Asdgdgdgdgxgcxggggggggeddgchchcufg9(7254(3571<1;v4387;1(467gefroggu9431;
(67143967(4;317&6(34;1&7(641;3&47;
(63476yudcugyeqfrgliequfvelhuqierqefkrrghleiqtugfgelwgiuwfh,2(;3/,;:7@8,
(/;:luivfdsdfgvivlsdfilvvdsfuildvsfvsfvflisdufvluisfgvwdluifhvvrwgllyurfgyvtyygbglrgiygwfrvuhiwkvfdwjhbfdv
cgfbjhkfvwhkjcwdbvfadhvasdvvhgjadsjbhkdavfuhgsvfhkgfsfdjhhksfgbjhsdggjlhbgbfsljkbfgbsnjl

Xander says,"I like that picture."

Playful Typing.

 Across both styles of typing, children were observed engaging in playful ways with the keyboard. In these situations, children did not appear concerned with the message, or the actual letters being typed, but rather were having fun tapping on the keyboard. When the keys were tapped, a clicking sound could be heard, and as children varied their taps on the keys, the sounds also varied. This noise-making seemed enjoyable to children. Other children, like Van (iWrite #4, November 4) would tap letters in the order that they appeared on the keyboard, following one row from left to right and then followed the next row on the keyboard going right to left.

 When playing with the keys, children created visual patterns by either repeating a key (i.e. "mmmmm") or repeating a string of keys (i.e. "asdfasdfasdfasdf"). Some children were aware that their typing behavior was resulting in repetition of letters, but others were not. Children like Xander, who typed quickly, often used the same keys, so repetitive patterns often appeared without the typist's knowledge. See Xander's Multimodal product from iWrite #1 (September 6) for an example. In the top line of text, the letters "fh" are repeated. Other children purposely made patterns, such as repeated letters.   For example, Ben frequently knowingly pushed keys repeatedly, creating both Mulitmodal and Email products with repetitive letter strings. See Table 15 for examples of these products. Overall, he produced eight products that had typing, five of which had strings of repeated letters.

Table 15
Ben's repeated letter patterns

iWrite #1 Multimodal product September 1
Hyhhbnnbbgbgjjjbhjlkhjhhggjkjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjj jjhhhhjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjjj Ben says "I love you."
iWrite #1 Email Response September 2

iWrite #3 Multimodal product October 11
bikkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkkk kkkkkkkkkkkkkkkkkkkkkkkkkkk& 88888888888888888.8899988 Ben says, "i love you Mom."
iWrite #4 November 2
nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnn Ben says, "that is the n's that I wanted to do."
iWrite #4 Email response with multimodal product November 4

Ben was aware of this repetition, as he had to tap the letter key over and over (as opposed to

being able to push down and hold a key to produce repeated letters). Also, he commented on the

process as he worked, highlighting the fact that he was typing a string of the same letters. For

example, in the fourth iWrite activity Ben had finished working in Sketches2 and began to type

in the Mail program.

Ben: Done

Emily: Wow! Would you like to email that to somebody?

Ben: Daddy.

. . . .

Emily: [Taps screen. Opens Mail program.] All right, tell it who you want to send it to.

Ben: I should spell my name? [Ben types B, E, N in To field.] B-E-N. Ben starts with B-E-M? I thought it was N. N. N.

…[Emily assists another child.]

Ben: [Begins to tap the N key repeatedly.] N. N. N. N. N. N. N. N. [Continues to tap N key.]

Emily: Whoa, Ben! Hang on, You are doing too many N's. [Emily deletes extra N's.] [Emily guides Ben through addressing the email.]

Emily: Do you want to type. . umm . .

Ben: Type what?

Emily: I don't know. Do you want to type a message?

Ben: Yea.

Emily: What would you like to type?

Ben: Uh. I don't know.

Emily: Ok. Do you want to say anything? Do you me want to type for you or do you want to type?

Ben: I wanna do a lot of N's.

Emily: You wanna do a lot of N's? Ok. Go for it.

Ben: A bunch. A bunch. [Ben taps the N button repeatedly.]

Emily: A bunch of N's? Ok.

Ben: Uh-huh. I'll never push another letter again. [Ben continues to tap the N button repeatedly.]

. . .

Ben: N. N. N. N. N. N. N. N N. N. N. N [Ben continues to tap the N button repeatedly.]

Emily: Wow!

Ben: That's all the N's.

Emily: That's a lot of N's.

Ben: That's the N's I wanted to do.

Emily: Ok. [Emily begins to type.] Ben says, "That's all the N's I wanted to do."

(iWrite #4, November 4)

Typing and composing messages. At times, the act of typing appeared to interfere with children's message generation. Children enjoyed playing on the keyboard and often did not compose a message to go with the text. Xander was observed frequently enjoying typing so much that it conflicted with his message generation. In the following excerpt from the first iWrite activity, Xander had already typed 6 times, and continued to type, and was not focused on

the content of his text. I attempted to draw Xander's attention to composing a specific message

to send to his mom.

> Emily: Alright, are you ready to send this message to your mom?
> Xander: [Taps 'T' with one finger and keyboard pops up.]
> Emily: No, you want to type more.   You are a typing fan.
> Xander: (mumbles)
> Emily: Can you type a message to your mom?
> Xander: [Types with one finger then both hands.]
> Emily: Good job.
> Xander: [Typing with both hands.]
> Emily: That's a lot of letters. Yeah, nice. Okay, tap it if you like it. Give it a tap.
> Xander: [Taps with one finger.]
> Emily: There you go. [Uses fingers on screen to position text.]
> Xander: [Taps 'T' on screen with one finger and opens keyboard.]
> Emily: More typing. You're the typing king. Okay but you gotta type a message when you type.
> Xander: More.
> Emily: Hmm? Do some more?
> Xander: [Types with right and left pointer fingers.]
> Emily: Push (pause) you're done. [Pointing.]
> Xander: [Presses button with one finger.]
> Emily: And then [moving text by drawing with one finger] do you like it there? Tap it.
> Xander: [Taps with one finger.]
> Emily: So should we send this message to your mom?
> Xander: [Taps 'T" on screen with one finger.]
> Emily: Alright, last typing and then we'll send it to your mom.
> Xander: [Types with right and left pointer fingers.]
>
> (iWrite #1, September 6)

After three more typing instances, I told Xander it was time to stop typing. I wanted him

to complete a finished product with a message that aligned with the original intent of the iWrite

activity, while Xander was enjoying the act of typing.

This was typical of Xander, as he enjoyed typing and creating typed text in his

compositions. Because he could navigate within the Sketches2 app independently, he was able

to type as much as he wanted. While I verbally encouraged him to assign meaning and finish his

typing, Xander was able to continue with his own typing-based agenda because I did not physical

intervene or take the iPad away. Xander's email reflected his interest in typing and lack of

interest in composing messages to accompany them. The same is true of his email replies

throughout the study. For an example of email responsse reflective of his composing in the Mail

program, see Table 13. Unlike in Sketches2, Xander was not limited when typing in the Mail

program, so his responses tended to be lengthy. Of the five email responses he typed in the Mail

program, he averaged 827 characters per message. While this was a pattern for Xander, it is

important to note that in his last email response (November 10), he simply typed *ilvu* to represent

"I love you". This was an anomaly for Xander because it was short, reflected letter-sound

knowledge, and was composed before he began typing. See Table 16 for a summary of his typed

email responses and their messages.

Table 16
Summary of Xander's Typed Email Messages

Date	Number of Characters	Message assigned
9-16	868	"Dear Mom and Dad."
10-19	1703	"I love Mommy."
10-27	711	"I like playing fireman."
11-2	848	"I like that picture"
11-10	4	"I love you."

Xander's behavior with the pop-up keyboard was reflective of the physical motor activity

as seen among many adults. His quick, temporal pacing is reflective of a child mimicking adult

typing at a computer. His focus seems to be on the embodied act of typing, with little concern

regarding the message potential of his actions. The action superseded the message, and the

attached message was an afterthought. Rarely did Xander focus on the letters that he was typing,

or assign meaning to the text he had created until after he was done.

Editing Tools

The use of editing tools by the children was exploratory in nature, as opposed to being

used to compose a specific type of message. Looking at children's use of undo (only available in

Sketches2), delete (available in Sketches2 and Mail) and resizing (only available in Sketches2), children were seen engaging in various ways.

In Sketches2 children were observed making marks and then undoing their action. Some children tapped the screen to make polka dots or else scribbled lines repeatedly before pressing the erase button over and over to undo the marks. Many times children repeated this "mark up and erase" process a few times before finally keeping the marks. There were occasions of purposeful use in response to comments such as of "Oops! How do I take that away?", but the undo button was also used in an exploratory manner. In other words, children were tapping the undo button repeatedly and watching as elements of their multimodal product disappeared, one layer at a time. It is interesting to note that when the children used the undo button, many marks were completely erased, and therefore not seen in the final product. This is unlike paper-based activities in that it is difficult to completely erase the marks for a paper (and impossible when using crayon or markers), especially for young children. Similar to typing, the child's main use of the undo button appears to be on the process of marking and unmarking.

The delete key was available in both the Sketeches2 (with the pop-up keyboard tool) and in the and Mail program. The delete button was used when children were typing in both programs, but only in a purposeful manner.

The resizing tool was only available in Sketches2, and most often used to modify typed text and stamps, allowing children the ability to move and resize these images. Resizing was difficult at first for many children as it required the use of the thumb and index fingers in unison to pinch and expand. I often labeled one's index finger and thumb as "pinchers" and described the resizing movement as "pinching". Children could also drag an image around the screen to the preferred location. Once a size and location were decided upon, the child tapped the image

to lock it into place. Similar to the undo tool, children enjoyed resizing and moving images, especially stickers. The act of making a sticker image larger and then smaller again seemed enjoyable to the children.

Photographs

In the fourth and fifith iWrite activities, a variety of school-based photographs of the children were introduced as a way to initiate discussion about classroom experiences. I frequently took pictures during center time, and the children knew they could ask me to take pictures of classroom activities such as block towers, paintings, or dressing up in home living. I also accompanied the children outside and occasionally would take pictures there. These photos were placed in the iPad photo album, ensuring that each child had numerous photos of herself participating in activities both in the classroom and outside on the playground.

At the beginning of the fourth and fifth iWrite activities, children were asked to push the 'Flower' button to open the photo album on the iPad. Children were then directed to use their finger to slide through photos as if they were looking through the pictures in an album. I encouraged each child to look for a photo of herself that she would like to send to her parents. This process of looking for a photo was time consuming, and some children spent more time looking through photos than they did actually creating and composing messages in these two tasks. For example, Ben spent approximately 9 minutes looking at pictures before selecting one. He then spent 2 minutes, 30 seconds to compose a message to support this photo (iWrite #4, Noember 2).

When looking through photos, children were very verbal, making more comments than in previous iWrite activities. As children looked through the photos, comments such as "Look!" and the names of peers were heard. While children did talk in other iWrite activities, some of

this talk was prompted by my questioning and other talk was driven by children's need for help. When looking at the photos, children commented on the images, something that had, until this point, happened infrequently in the study. This had not happened, for example, when children looked at the stamping options in Sketches2, an activity similar to the photo album in that there were a plethora of images to look through. It would seem that the personal connection children had with the photos encouraged commentary, while the stamping images did not warrant such talk.

In addition to an increased amount of talk during the iWrite activities when using photographs, there were also more interactions between children. Children were clearly engaged with one another when looking at photographs, as they talked and interacted with one another's screens. This engagement between students was an increase from earlier iWrite tasks when students rarely talked or engaged with each other's iPads. For example, Zuri and Ben worked together as they received and composed emails to their parents as a part of iWrite activity #1 (September 2). There was little interaction between the two children as they both explored and created a multimodal product to send to their family. Each child did glance at the other's iPad twice each during the 4 minute session, but these glances appeared to be a reaction to a loud comment from either myself or the other child as opposed to a purposeful engaging act. Similarly, on September 7, Larkin and Van also minimally interacted as they participated the first iWrite activity. After receiving their own iPads, Larkin glanced at Van's screen 4 times, and Van glanced at Larkin's screen 3 times. Like Ben and Zuri's session, these glances were in response to a loud comment. When Larkin finished composing, she turned the screen towards myself and Van and announced, "Ta da da!". Van responded by looking at her iPad. This instance is an example of a purposeful peer interaction in that Larkin was requesting Van's

attention, and he gave it to her. These examples are representative of children's interactions during the first three iWrite activities. Children were more focused on their individual iPads than on what other children were doing at the iWrite table when they were composing messages using Sketches2 and Mail. This finding is very different from prior research reporting high levels of engagement between two children composing using one computer station (Daiute, 1989; Daiute & Dalton, 1988; Dickinson, 1986; Jones, 1998, 2003; Lomangino, Nicholson & Sulzby, 1999), and even research on the interactions between children using paper-based tools at writing centers (Larson, 1995; Rowe, 1994; Wiseman, 2003; Wollman-Bonilla & Werchadlo, 1999). It would appear that having access to one's own iPad encourages children to focus on the screen.

Turning attention to a session in which children were using photographs, a different scenario emerges. On November 7, during the fifth iWrite activity, Zuri and Larkin engaged with one another, giggling and commenting on photos of one another as they selected a photo to use in their digital composition. The girls each went on to select similar photos that showed them cutting, and composed messages about these photos, even selecting similar colors of pink for typing. See Table 17 for both Zuri and Larkin's final products. While the presence of peer interactions in iWrite activities does not necessitate composing similar products as Zuri and Larkin did, it does mean, however, that children are engaging with one another and each other's screens. In this transcript, it is clear that Zuri and Larkin are engaged with one another through the presence of the photos.

> Larkin: Hey! Look what I found.
> Zuri: [Leans over.]
> Zuri: Wow! Uh-huh! That's me!
> Emily: It's Zuri!
> Zuri: Look what I found.
> Larkin: [Leans over.]
> Emily: Larkin!
> [Girls slide through photos.]

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Larkin: Oh! Look what I found!
Zuri: [Leans over.]
Zuri: Larkin!
Zuri: Look what I found
Larkin: [Looks at Zuri's screen.]

(iWrite #5, November 7)

Both girls were calling out as they saw each other's photographs. They drew one another's attention by saying one another's names and by saying "Look" or other similar phrases. Overall, I saw an increase in verbal comments and interactions when photographs were a part of the digital composing process.

Table 17
Zuri and Larkin, iWrite #5, November 7

Zuri 11-7	Larkin 11-7

Summary

This chapter reports on children's digital composing practices including the ways that children interacted with various elements of the apps such as the pop-up keyboard, editing tools and photographs. Specifically, the children's behaviors with the iPad are described in Table 18 including the ways that they interacted with the touchscreen, the resulting on-screen behaviors, the request for support and the comments that the children made throughout the study.

Table 18
Child Behavior Categories

	Category	Description	Example
On-Screen Interactions (the child uses her hands to do this to the iPad screen)	Taps	Taps screen with finger tip	
	Swipes	Slides finger horizontally across screen with finger tip	
	Draws	Makes marks on screen with finger tip	
	Pinches	Uses two fingers to pinch together to resize an image	
	Knuckle Drags	When fingers are bent, knuckles knock against screen	
	Types Two Hands	Types using two hands to type like a grown up	
	Types, One Finger	Types using one finger in a hunt-and-peck style	
On-Screen Actions (the result of the child's interaction with the screen)	Deletes	Deleting text with the delete key	
	Draws	Makes marks on screen with finger tip	
	Prints	Adds letters or marks representing letters with finger tip	
	Types	Adds letters with the keyboard	
	Stamps	Adds stamps to product	
	Undo	Deletes marks, text or stamp with undo key	
	Changes Color	Uses color wheel to select color	
	Changing Thickness	Uses color wheel tool to select	

			thickness of line
Requests for Help	Technical Support	Asks for help with technical issue	It won't work. Can you fix it?
	Spelling	Asks for help spelling a word	How do you spell? Or What letter comes next?
	Procedural	Asks for help with email process	Am I done? How do I send it?
	Button Finding	Asks for help finding a button or feature of app	How do I type? I want it to be blue.
Comments	Own Work	Comments about own product or actions	"The monkey bar lines are long."
	Others Work	Comments about other child's product or actions	"I want to type like Zuri."
	Photos	Comments about photos	"Look what I found!"

The four general findings will be reviewed here. First, children learned to use the iPad technology with ease. They were quick to adopt the physical skills needed to interact with the iPads in order to compose digital messages. Specifically, navigating within both Sketches2 and the Mail apps was easily undertaken by these young children. On-screen interactions observed in this study are described in Table 18 and include tapping, swiping, drawing, pinching, knuckle dragging, typing with two hands and typing with one finger. These physical movements resulted in a variety of on-screen actions reported in Table 18 and include deleting, drawing, printing, typing, stamping, undoing, changing color and changing thickness. Children were easily able to engage in these actions with little modeling, thus supporting research that has pointed to

touchscreen technology as a more accessible option for young children (Batenberg & Mebler, 1989; Couse & Chen, 2010; Crafton et al., 2007; Matthews & Seow, 2007; Scaife & Bond, 1991). Couse & Chen (2010 and Matthew & Seow (2007) reinforced this ease of use as they found that children did not need or want instruction after they began interacting with the tablets. Studies have shown children's high interest and ability to use touchscreen devices regardless of prior experience. Children turned to me, as the adult at the iWrite center for supports when they needed help with specific issues related to procedures, technology support and spelling. Young children have been seen in research reaching out to adults or family members for help, especially with "tech support" (Davidson, 2011; McTavish, 2009; Verenikina & Kervin, 2011). Description of children's support requests are described in Table 18 and include request for technical support, spelling, procedural, and button finding.

Second, various typing styles were observed with the pop-up keyboard, including a two-handed grown-up style and a one-handed hunt-and-peck style. These typing styles have also been recorded in research as being prevalent among preschool and kindergarten-aged children (Labbo, 1996; Merchant, 2005). While these studies used desktop computers, reports of children assuming grown-up two-handed typing postures accompanied by rapid typing can be found. Merchant (2005) refers to the rhythmic characteristic that this type of typing can take. Children seem to enjoyed the embodied action of typing, as they feel the pressure of the keys, hear the clickety-clack and product long strings of text (Labbo, 1995; Merchant, 2005). Labbo (1996) reports on a child who had similar typing behaviors to Xander. The difference, however, is that this child composed narratives while she typed. It is interesting to note this difference in message generation in connection with long strings of text.

Looking at the slower, one-handed hunt-and-peck, children most often created messages that were shorter and had specific meaning attached. There appears to be a connection between the way that children type and the certainty of their message. After typing long strings of letters, some children would comment, "I can't read it." This is similar to findings in emergent literacy in which children print strings of letters and then ask, "What did I write?" (Clay, 1975). When children did focus on the message when typing, the typing was typically slower, and children made connections with letters and sounds, often sounding out words as they typed.

Third, there was much exploration of the materials (specifically the pop-up keyboard, the resize button and the undo tool) within the confines of the Sketeches2 program. In general, when exploring the tools, the children's focus was on the playful process as opposed to generating a specific message or multimodal product. Much like reports of children at print-based writing centers who explore the tools available (Rowe, 1994, 2008b), these children experimented with various aspects of the digital program. In these instances, children were seen exploring the available digital tools and how they worked. Much like has been reported in emergent writing research, children were treating the digital tools similar to tools found in a print-based writing center (Rowe, 1994; Rowe 2008a). Digital literacy work with young children has also found children's engagement with the screen to be playful (Björkvall & Engblom, 2010; Hyun & Davis, 2005; Labbo, 1996; Merchant, 2005). Labbo (1996) refers to the computer screen a "playground" (p. 368) due to the playful nature children exhibited when composing on the screen. Sandvik et al (2010) described children exploring the resize tool in Puppet Pals, a multimodal composing app that offers children the opportunity to tell a story with animated characters. Finally, Yost (2003) reports children engaging in repetitive exploration with digital stamps in a composing

program. Overall, this study supports existing research in which young children explore tools during their composing processes.

Both print-based and digital research has also reported that young children who explore tools when writing tend to focus more on the composing process than the actual product (Labbo, 1996; Rowe, 1994; 2008a).   In this study children were observed making marks and then undoing them only to create a completely different product. This focus on the exploratory process, as opposed to the final product is important, especially when considering suggestions for practice. Allowing children plenty of time to explore with digital tools is important before assigning tasks with specific message-based purposes. It has been suggested that children's playful exploring of digital tools is different from their play with print-based tools (Gelfond & Salonius-Pasternak, 2005). It is hard to compare specific digital tools with print tools as they are so different. However, it is noteworthy to think about the ways that children can create products on the screen that can so quickly and easily be erased. This does not happen in with paper-based texts.

While the undo and the delete key have the same basic purpose, it is interesting to note the different way that the children interacted with these tools. Children were not seen exploring the delete keys in the same playful manner as they did with the undo key.   Considering that the delete key is only used with typing, and the undo key is used with multimodal composing, it would seem that children enjoy the key that offers a bigger impact. With the delete key, only one letter is erased at a time. With the undo button however, children have the ability to make grand changes to their products (i.e. making all of the typing disappear, or removing the large pumpkin stamp) with just the tap of a button.

Finally, children focused on their iPad screen, paying little attention to other children, and only interacting with the adult when necessary. Comments made by the children are focused on their own work, others work and the photos (see Table 18). This finding is very different from prior research reporting high levels of engagement between two children composing using one computer station (Daiute, 1989; Daiute & Dalton, 1988; Dickinson, 1986; Jones, 1998, 2003; Lomangino et al., 1999), and even research on the interactions between children using paper-based tools at writing centers (Larson, 1995; Rowe, 1994; Wiseman, 2003; Wollman-Bonilla & Werchadlo, 1999). It would appear that having access to one's own iPad encourages children to focus on the screen. It would seem that the screen-based text is the object of reference and that the children were not motivated to interact with others' screens. Chung & Walsh (2006) attempted partner use of iPads with children and concluded that this was difficult as the iPad cannot be divided the way that a keyboard and mouse can be when using a desktop computer. When classroom-based photographs were introduced to the iWrite activities, there was more engagement between children and iPad screens than in previous activities. Ching et al. (2006) report that children interact more around digital photographs.

In summary, children were comfortable using the iPad and the apps to compose. Playful at times, children appeared to enjoy the process of composing using the Sketches2 program, especially when using the pop-up keyboard, the resize tool and the undo button. During these instances, there was little focus on the message or the ultimate product. Also, when looking at photos within the Sketches2 app, children also explored and interacted with one another in ways that had not been observed in other iWrite activities.

CHAPTER 7

CHILDREN'S DIGITAL PRODUCTS

In this chapter, I address my research question, "What kinds of messages do young

children create on iPads when crafting digital products using Sketches2 and Mail?", as I examine

young children's compositions crafted using Sketches2 and Mail through a multimodal and

content analysis. As described in Chapter 3, the observations noted during this product analysis

have been divided into three groups: visual, message content and classroom practice. First, the

visual characteristics of the products will be discussed. In particular, I identified patterns

regarding children's use of color, print styles and use of picture stamps. These visual patterns

will be discussed as I report on a multimodal analysis of products created using the Sketches2

program only. Next, findings regarding the message content will be described through an

analysis of all messages composed. Finally, connections to existing classroom literacy practices

will be discussed with a specific focus on connections to name and note-writing practices.

Visual Patterns

As a part of the iWrite activities, children produced a variety of products over the course

of the study. Similar to emergent writing research, different children drew from different visual

modes across tasks. Some of this variability is due to the fact that the tasks encouraged children

to rely on different tools and therefore, modes. For example, in the iWrite #2 task, children were

asked to draw a self-portrait and then label it with their name. In this activity all children used

their finger to draw an image. Similarly, in the iWrite #4 and #5 activities, children were asked

to make a message about a photograph to send to their families. In these products, all children

utilized photographs, and some also chose to print, type, stamp or draw. Therefore, it is clear

that some tasks encouraged the use of specific modes more than others. However, even within

tasks, children drew from different modes to create their messages. For example, look at the

three products in Table 19 created in response to the iWrite #3 invitation to send a message about

a classroom activity. From these examples, it can be seen that variation across products occurred.

There is one product that is mainly composed of typed letters (Zuri), another that is only hand-

drawn pictures and letters (Elsbeth), and a third that contains drawing, typing and stamps (Katie).

It is interesting to note that Zuri and Katie composed these products while sitting next to one

another.

Table 19
iWrite #3 Multimodal Product Examples

Zuri 10-14	Elsbeth 10-17	Katie 10-14
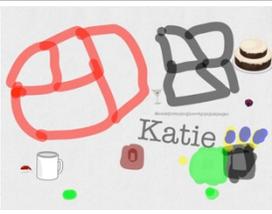
To showcase the variation among the whole data set with regards to the visual elements

of the multimodal products, I have included data regarding the number of times that I identified

each visual mode in the Sketches2 products (see Table 20). For this analysis, I only focused on

the multimodal products composed in Sketches2. This was done because the only option in the

Mail program was typing. Children could not modify the visual aspects of the email messages

(i.e. font style, font color) or add stamps or photos. Therefore, only Sketches2 compositions

were included for this analysis. It is important to note that one composition could have multiple

codes, even if the codes may seem conflicting, or opposing (i.e. print letters and typed letters).

Also, the total column includes all products created in Sketches2 (including Miscellaneous compositions that children composed outside of specific iWrite activities), therefore the total number for each row may be more than the actual sum of the individual iWrite activities.

Table 20
Number of Visual Codes for Each iWrite Activity

	iWrite #1	iWrite #2	iWrite #3	iWrite #4	iWrite #5	
	exploring	self-portrait	classroom message	classroom message with photo	classroom message with photo	total
Single Color	11	12	16	0	9	56
Multicolor	13	11	15	0	3	55
Print letters	3	7	2	0	1	17
Typed letters	10	10	18	0	9	40
Drawings	16	15	16	0	4	51
Stamps	4	3	4	0	6	36
Photos	0	0	0	15	11	27

Looking at the data, there was wide variation with regards to the visual modes. For example, children used colors, printed, typed, and included images that were drawn and stamped. Looking specifically at each iWrite activity, the only activity that does not reflect this variation is the fourth iWrite activity, the classroom message with photo activity. This lack of variation is due to the nature of this task. Since it was the first time students integrated photos into their messages, I encouraged children to select a photo and send it as an email, bypassing the Sketches2 program. Across the other iWrite activities, however, patterns emerged with regards to color choice, use of printing, and stamp usage. These visual patterns will be discussed in more depth.

Color Choice

Looking specifically at use of color, when I analyzed the multimodal products I noticed a distinction between children's use of one color and use of multiple colors. Specifically, I was interested in how the colors were used within the products. Similar to findings in emergent literacy work (Brenneman, Massey & Machado, 1996; Gardner, 1980; Kellog, 1970), children use multiple colors when drawing, but not when printing or typing. In general, children used multiple colors mainly when drawing, and tended to use only one color when printing (n=12 instances) and typing (n=30 instances). While children composed drawings with both multiple (n=36) and single colors (n=26), children only printed and typed with one color at time, never using multiple colors. While this finding may seem repetitive in light of previous emergent literacy research, it is important to showcase the fact that children are comfortable applying pen and paper skills to digital tools. As has been discussed, boundaries between screen and paper are blurred, and this finding supports this point.

An example of this pattern of multicolor and single color usage can be seen in Elsbeth's products, as she always used one color for letters (whether typed or printed) and multiple colors for drawings (see Table 21). Elsbeth's products are representative in that they illustrate this finding that children tend to draw with many colors, and print or type with only one color. In the classroom, Elsbeth was a quiet child who often selected home living or the art center. Focusing on her composing practices, Elsbeth engaged often in drawing. Both teachers reported that Elsbeth spent much of her late afternoon free time drawing (Teacher Interview, September 27). Elsbeth's parents also reported that Elsbeth and her twin brother often sat at the kitchen counter with paper and markers after school and on the weekends. While her brother Henry focused on spelling words during this time, Elsbeth's focus was on drawing. Her drawings were full of

details using many colors (Parent Interview and Home Visit, October 15). This interest in

drawing carried over in Elsbeth's digital work as she used multiple colors for her drawings, and

one color for her messages.

Table 21
Elsbeth's Use of Color in Digital Products

iWrite #1 9-13	iWrite #2 9-22	iWrite #3 10-17	Miscellaneous iWrite* 11-4

Note. In the fourth iWrite activity, Elsbeth selected a picture of herself caring for a fish in the home living veterinarian center. She said, "I want a fish." in her message to her parents. When her father responded by saying "You should tell Santa.", Elsbeth asked to compose an email message to Santa. This product was sent to Santa as well as Elsbeth's parents.

Print

Children typed much more often than they printed when using Sketches2. Revisiting

Table 16, one can see that the total number of instances of printing across all iWrite activities

(n=17) as compared to the instances of typing (n=40). This is important to note because digital

tools such as the iPad offer an alternative to printing with the keyboard, and it is interesting to

see that children selected typing more often than printing letters. This may have been because

pushing buttons was easier on the child compared to forming a letter. It also may be that

children were basing their behaviors on adult models who typically type when using touchscreen

technology.

When considering the design of the Sketches2 software, the first, and most accessible

option is pressing one's finger to the screen. Once the program opened, children could begin to

make marks with their finger immediately. In order to change colors or to begin typing, however,

the 'T' button must be pushed. See Figure 15 for a screenshot of the color wheel and 'T' button

to access the pop-up keyboard. In order for children to type, they must make an active choice to

open the pop-up keyboard.

Figure 15. *Color Wheel and Pop-up Keyboard Access*
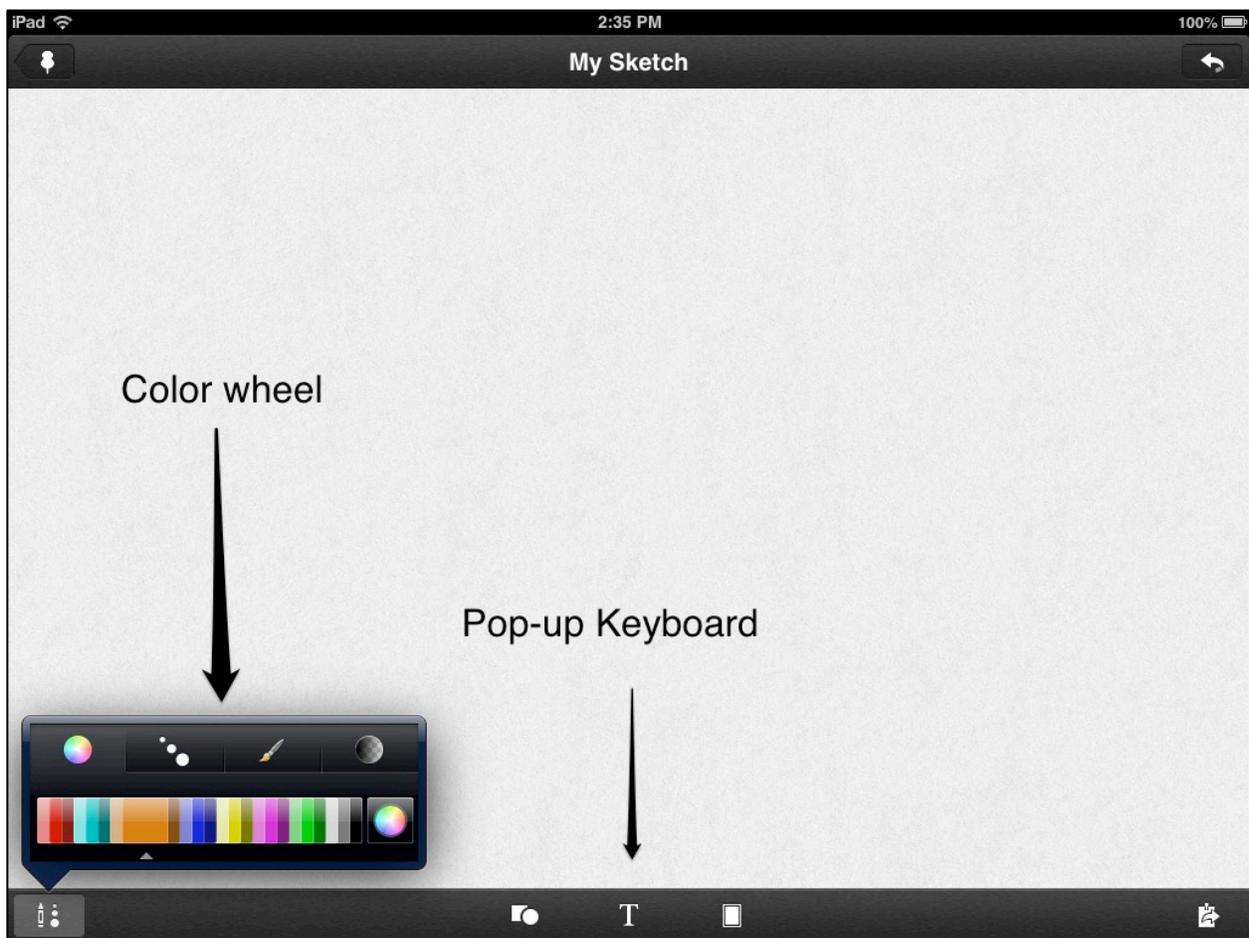
Returning to the home data, parents were asked how familiar their children were with

various technologies, including typing emails. Specifically, parents were asked to rate their child

on their familiarity with typing and email when asked to rate how familiar their child was with

telling others what to type in an email and with typing emails independently. Ten of the 14

parents reported that their children had no exposure to typing emails, while one had exposure,

but was not aware; two were developing understanding of this, and only one child definitely did

this. Based on parent report, children were not extremely familiar typing emails at home. In

addition, more children had experience dictating emails for parents to type. Only six parents

reported that their child had never done this, while the other eight said all of the children had at

least been exposed to this. Drawing from home data, while children were not necessarily used to

typing at home, many children had seen parents typing emails, and were comfortable with the

idea of typing messages.

Looking closely at this data, there were instances where children selected printing over

typing. In the iWrite #2 activity, for example, I asked children to draw a self-portrait and then

write their names. Most students responded by drawing with various colors and then printing or

typing their name. Children were most often prompted to put their name on the screen. If the

child chose to print, then after he had printed his name, I would ask "Do you want to type your

name also?" (iWrite #2, September 19). And, if a child needed prompting to add a name, I

typically said something like "Do you want to draw or type your name?" (iWrite #2, September

19). Children were not encouraged to select one mode over the other, but instead were simply

asked to use the keyboard or their fingers to add their names to the self-portrait.   Many children

(n=8) responded to this request by printing their name, and while others typed (n=4). Two

children printed and typed, while one child typed his brother's name. This group of children

were confident name writers, most of whom could write their names independently. The DS 4

children were frequently asked to write their name (e.g. every morning as a part of the sign in

routine and to show ownership of art products), and this request resembled these activities.

Because of the similarity of the invitations, it could have impacted the children's choice to print their names. Also, children were still exploring in this program, and may not have remembered that the typing option existed as most children had just spent the majority of the time drawing a self-portrait.

Beyond the iWrite #2 name writing request, only 4 children chose to print letters on any other product, but many continued to draw with their finger throughout the activities. Elsbeth (see Table 21) was one of those children who chose printing over typing, printing in four of five Sketches2 products over the course of the study. While Elsbeth's products are not typical of others produced in response to the iWrite invitations, they are important to consider as hers are an excellent example of a child applying existing pen and paper practices to digital tools. In general, Elsbeth seemed less interested in the digital practices occurring at the iWrite center, and more interested in drawing or playing in home living. Over the course of the study, Elsbeth composed 7 emails during 7 visits to the iWrite center in which she participated in 4 iWrite activities. Elsbeth was often hesitant to join me at the iWrite center due to her interest in other centers. On the first day of iPad use in the classroom, Elsbeth came over to the iPad center when I was working with other students and inquired about what we were doing. I told Elsbeth she could have a turn later, and she responded by asking again "But what are you doing?". When I told her that we were making messages, and that she could have a turn later, she responded by saying, "I don't want a turn." (Field Notes, September 1). When offered the opportunity to come to the iWrite center, she declined, indicating that she would rather stay at her current center. Even when she did come to join me, she did not appear especially engaged beyond drawing detailed, colorful pictures. For example, she often declined the invitation to reply to emails. Even typing responses seemed uninteresting to Elsbeth, as she elected to respond to only three

parent emails (out of a total of eight) during the course of the iWrite activities. On November 4, she indicated interest in replying to an email, but did not want to type a response. She allowed me to type her response, and then she hit send (iWrite Miscellaneous, November 4). When she wasn't busy with other center-based activities, she was willing to come and engage in the offered opportunities, but only for a limited time, and she never asked if it was her turn as many other students did. This lack of interest in technology was echoed by her parents who reported that she just "isn't that into computers", preferring dolls and drawing (Parent Interview, October 15). She was less motivated to engage in the iWrite activities, frequently saying, "No thanks" when offered opportunities to join me at the iWrite center. She spent the majority of her time at the iWrite center composing detailed multicolored drawings, much like her pen and paper drawing behaviors at home and school. The majority of the children, on the other hand, typed all of the letters in their compositions, and frequently chose to type responses to parents.

Stamps

Stamping is when a child choses among available images and positions the selected images on her multimodal product in Sketches2. These stamps can then be resized or moved across the composition. Stamps include (but are not limited to) holiday stamps such as a pumpkin or a birthday cake, as well as gadgets such as cell phones and cameras. One interesting pattern in the visual mode data is the children's use of stamps. Of the 15 children participating in the study, 10 children used stamps at least once creating a total of 26 products with stamps. Across these products, there were over 100 stamps used. On average, across products with stamps, four stamps were used per product. Stamp usage ranged from one stamp up to 13 per product. Yiannis used the least, using just one stamp once, and Katie had the most with six stamped products, averaging six stamps per product. Katie also had the product with the most

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stamps, 13. As one of the most prolific stampers, Katie's products showcase many of the patterns I observed across all students. Examples of this can be seen in many of Katie's products, as she used stamps in six of her eight Sketches2 products. One example is the Miscellaneous iWrite activity Katie produced on her father's birthday, October 19 (see Figure 16). In this example, Katie chose to type BH, draw in blue, and stamp a variety of stamps including birthday themed icons (present, cake, balloon and party hat) as well as clothing, gadgets, a golf ball, a t shirt, a Christmas tree and fireworks.

Figure 16. Katie, Miscellaneous iWrite, October 19

There was a strong use of holiday stamps among cildren regardless of message content, as seen in Katie's Miscellaneous iWrite product, where she used fireworks and a Christmas tree along with the appropriately selected birthday themed stamps. Most of the time these stamps did not support the content of the message. Of the 26 stamped products, 19 incorporated at least one holiday stamp, and most had more. Favorite holiday stamps included the birthday cake, present, Christmas tree, fireworks and pumpkins.

Children's use of holiday stamps is an interesting pattern to note, and may be explained by the design of the stamping option within the Sketches2 app. When stamps are opened, the holiday stamps always appear first as options. When one scrolls to the right to see more stamps, the party stamps (also a favorite among children) appear next. See Figure 17 for a screenshot of this. The stamps have to be scrolled through in order to find one to use, and, that as children see stamps, they are often inspired to use them. Labbo (1996) reported on a high level of holiday or themed-based stamping in her research on kindergarten students using open-ended composing programs on a desktop computer.

In addition, the holiday icons may have been appealing to the children perhaps due to the fact that they were brightly colored in comparison to the majority of the other stamps that are black and white or grayscale (see the clothing and gadget icons in Figure 16 for example). Also, this may have been because in the first iWrite session I modeled making a birthday email to my mom and used the birthday cake stamp, which is in the holiday stamp section. Thus, highlighting the holiday stamps. Finally, many of the stamps were simply black and white outlines or grayscale in color, while the holiday stamps were bright.

Figure 17. Stamp Selection in Sketches2
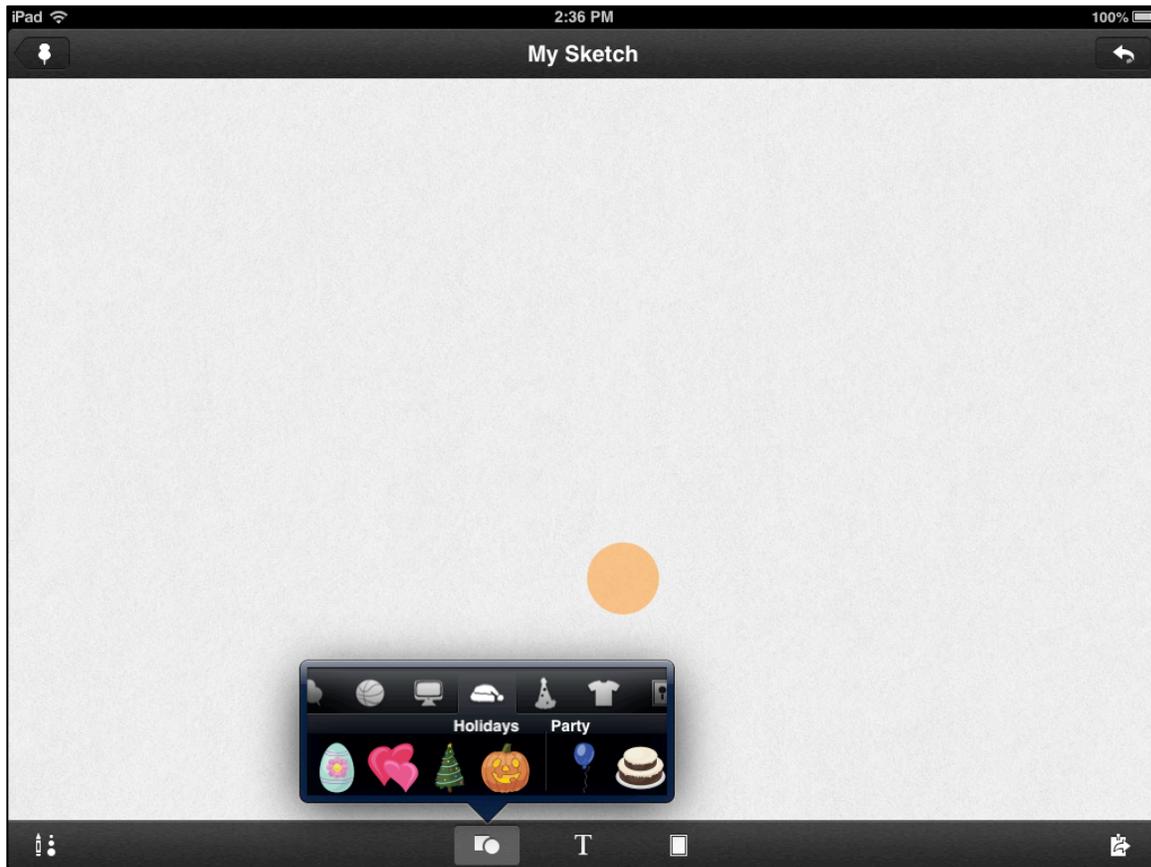
Much of the stamp use was done in a disconnected way, as it seems that children chose stamps that appealed to them, but did not necessarily connect with the topic at hand. Looking at Katie's Miscellaneous iWrite, while the birthday themed stamps definitely supported her original intent to send a birthday message to her father (and also connected to my original model of sending birthday messages to my mother), the others did not connect as strongly to the message. Children that used stamps often created products similar to Katie's in that a variety of stamps were used, stamps that did not necessarily connect with the topic at hand.

Finally, when stamped messages did connect with text, it tended to be either through a labeling or a "reading" of the stamps. Of the 26 products, ten incorporated a labeling of the stamps used. For example, in iWrite #5 (November 11), Sam selected a photo of himself and

Xander playing in the science center. He then put a Santa hat stamp on Xander and added other

holiday icons including fireworks, a pumpkin and a Christmas tree. Then he typed the letters

"pnkmh", which he read as, "Pumpkin, Christmas, Halloween."   See Figure 18 for the digital

product Sam created. He labeled the holidays associated with some of the stamps that he used,

as if he were reading the stamps. Remembering that Sam had been asked to select a photograph

to tell about a classroom activity, it is interesting to note that the use of the stamps seems to have

moved his attention away from the content of the photograph and focus more on the labeling of

the stamps. When using stamps, children seemed to become distracted by the content of the

stamps, and focused on the stamps instead of the original intended message.

Figure 18. Sam, iWrite #5, November 11

Summary

With regards to the visual modes of these compositions, while there was much variability across use of modes including color, stamps, letter format and combinations of these modes, some patterns did arise. It is interesting to note that patterns found in emergent writing research (Harste et al., 1984; Gardner, 1980) (i.e. use of multiple colors when drawing, and one color when writing; and variability among children's products) were also seen in these digital products. The data in this multimodal analysis support the idea of a hybrid literacy with blurred lines between print and digital media. Children both relied on print skills and branched out in new digital ways as they used these touchscreen tools. Focusing on digital tools such as pop-up keyboard and stamps that are not available in traditional print-based writing centers, it is important to consider the patterns attached to typing letters and stamping pictures. Specifically, children selected typing most often, but seemed comfortable printing, often relying on print for known activities such as name writing. Finally, stamping seemed to be a distracting option, with children focused on holiday-specific stamps as opposed to the original content of the message. Again, there was much variability across the products, and children composed messages by drawing on known print skills such as letter formation and drawing, and then blending them with more digital-specific skills such as typing and stamping.

Message Content

Switching to a focus on the content of the messages created by children, I will now report on analyses of Mail products. Due to the fact that children's writing is not always conventional, children were asked to read their messages aloud before sending, thus allowing insight into the intentionality of the marks. The researcher then transcribed the verbal message as a part of the body of the email so that parents could have a translation if needed. These typically read:

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Liza Nelle says, "I made a house."
Rowen says, "Rowen loves mom."
Larkin says, "I like playing teacher."

I coded verbal messages based on their purpose. Like modes, there were a variety of purposes

across the emails generated by the children (see Table 22). Remember that one email could

contain multiple messages, so the total number of coded messages can actually exceed the

amount of emails sent in the study. For example, in this message "This is the house that does the

food. I love you. Could you show this to Jonah?" each sentence would be coded differently.

The first sentence would be coded as describing the picture, the second sentence would be

expressing love, and the third would be asking a question. Each sentence was used for a

different purpose by the child.

Table 22
Message Purpose Across iWrite Activities

	iWrite #1	iWrite #2	iWrite #3	iWrite #4	iWrite #5	Miscellaneous	Total
Express love	3	6	8	7	2	7	33
Describe Product	6	8	17	13	13	7	64
Share information	8	7	16	21	5	7	64
Ask questions	0	0	3	0	0	1	4
Total composed	17	21	41	41	20	22	165

Of the 165 messages, the majority (n=128 messages) generated by children were

classified as informative in that they were either describing products (n=64 messages) or sharing

information (n=64 messages). As children moved through the iWrite activities, the amount of

informative statements increased, from 15 total in the first and second activity combined, to more

than double that (n=37 messages) in the third and fourth iWrite activity. When considering the

purpose of the iWrite activities (make a picture of yourself and label it, tell your parents about

something you like to do in school, pick a photo and make a message), it makes sense that children relied on informative statements because of the nature of the tasks. Even in the first iWrite activity, however, when children were simply asked to create a message for their parents, the majority of messages composed (14 out of 17) were informative in nature.

Expressions of love were used sporadically across the iWrite activities, accounting for only 20% of messages. These types of messages sound like this: "I love you" or "I love my mommy". It is interesting to note that instances were so few, as children had multiple models of using the term "love" in both the classroom Note-writing activities and parents using this language regularly in their emails. When children only used expressions of love, they were used as a place holder. It seemed that children might not know what to say, and used a familiar expression of love to fill the space. For example, Nollie said, "I love you mom so much" in her first iWrite message on September 13. Of the messages coded as expressions of love, about half of them were isolated messages, while the other half were used in combination with other messages types. When with these messages were used with other messages, the word "love" was used more conventionally, such as in a closing like "Dear Dad. Love, Zuri" (iWrite #5, November 9).

Some children relied on these expressions of love early in iWrite activities, and then replaced them over time with more informative messages. This can be seen in Elsbeth's early messages in which both she and her parents relied on expressions of love (see Table 23). The focus shifted, however, to sharing information regarding Elsbeth's wish for a fish and the expressions of love were replaced by focused messages with much more specific content. In her first iWrite email, she simply stated, "I love you mom and dad." (September 14). In her second iWrite email chain, after making a self portrait, she replied to her mother's email by saying "I

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love you mommy and I hope you have a good day at work." (September 26). These expressions

of love disappeared, however, during the third and fourth iWrite activity when Elsbeth began

talking about more specific information that was based on her interests. In the third iWrite

activity, she drew a picture and wrote "IMBEMA" to represent her message of "I like being the

mommy. I was in home living with the veterinary stuff and I like being the mommy." (October

17).

Table 23
Elsbeth's Expressions of Love

Date & Context	Text	Child's Verbal Message
9/14 iWrite 1		"I love you mom and dad"
9/14 Mom response	I love you too, big girl!	
9/14 Dad response	Elsbeth, welcome to email! I love you too. Dad	
9/22 iWrite 2 Self-portrait		"I made myself"
9/22 Mom response	What a beautiful picture, Elsbeth. I love your hairbow! Love, Mama	
9/26 Elsbeth's response to Mom	Ophkjklmbhgvfcrtyedkjnbq	"I love mommy and I hope you have a good dad at work."
9/26 Mom response	Thank you Sweetheart. I love you too. Mommy	
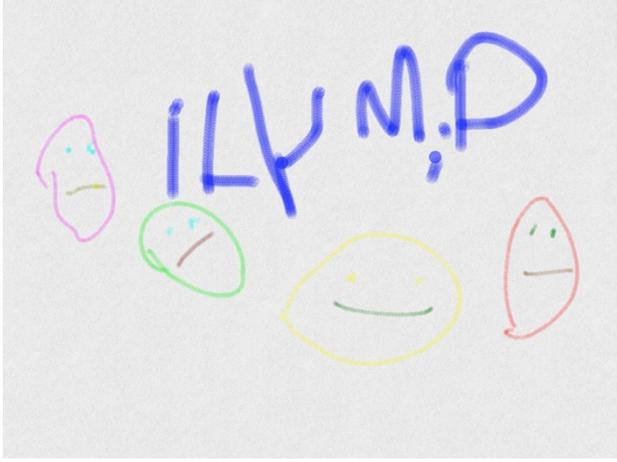
In her last email exchange, for iWrite 4 (see Table 24). Elsbeth selected a picture of herself playing veterinarian to an orange clownfish in home living. Following my directions, Elsbeth typed her message "iyaf" which represented "I want a fish." Both Mom and Dad responded with a suggestion to let Santa know, so when Elsbeth joined me at the iWrite center on November 4 and read the emails, we decided to send an email to Santa Claus with her request with the text "fosh". This email was sent to Santa and cc'd Mom and Dad. Neither parent commented on the fact that we had sent the email to Santa, but did respond with positive, specific responses. When Elsbeth returned on November 10 and read the parent responses, she elected to reply by answering their questions orally to describe the fish she wanted for Christmas, and having me type her responses. (Santa did respond on November 23, but data collection in the classroom had been stopped at this point, so she did not have an opportunity to reply to that email.)

Table 24
Elsbeth, iWrite #4

Date & Context	Text	Child's Verbal Message
11/2 iWrite 4 Photo	 iyaf	"I want a fish."
11/2 Mom response	I know you want a fish. Maybe you should ask Santa! love, Mommy	
11/4 Dad response	Elsbeth, Let's be sure to tell Santa! What color fish would you like? Dad	
11/4 sent to Santa Claus, Mom and Dad		"I want a fish for Christmas."
11/4 Mom response	Do you still want to call her "Snow Princess?" love, Mommy	
11/10 response to Mom and Dad as dictated to researcher		"I want a yellow fish. I will call it snow princess fish."
11/10 Dad response	Elsbeth, I think Snow Princess is a beautiful name! What will you feed her? Love, Dad	
11/10 Mom response	You should ask Santa! love, Mommy	

As Elsbeth became more focused on a very specific (and important) message content, she

stopped using the general expressions of love. While expressions of love to a parent are indeed

important to a child, they tend to be rather generic. I think that Elsbeth, and other children, used

expressions of love when she was not sure what else to say in her messages. When Elsbeth did

have content to share, however, she did not need to rely on those general messages of love.

Saying things such as "I love you", or "I miss you" might be a safe message for children who

don't know what else to say. Most parents responded to this type of message (and most emails)

with similar expressions of love. By doing so, they reinforced the children's initial expressions

of love, and encouraged this type of message for the future. However, as children become

focused on sharing a specific message, these more general messages of love were not seen as

frequently.

It is important to consider the ways that parents responded to these messages. Although

parent responses are not the focus of this study, it is important to consider the impact that a

response may (or may not) have had on a child.   When parents responded to a child's email by

making a direct connection to the content of the email (e.g. "What color fish would you like?",

Elsbeth's Dad, November 4) as opposed to making a generic statement, children were more

likely to respond in more specific ways. Looking again at Elsbeth, the parent response to her

messages of love included general love-based messages such as "I love you too, big girl!"

(Elsbeth's Mom, September 14), "Elsbeth, welcome to email! I love you too." (Elsbeth's Dad,

September 14), and "Thank you Sweetheart. I love you too" (Elsbeth's Mom, September 26).

When Elsbeth initiated an email chain about playing veterinarian and another about wanting a

fish, the parents responses were much more specific, and thus elicited more specific replies from

Elsbeth. When considering children's messages, it is clear that the audience, which in this case

is the parents, plays an important role. As children progressed through the iWrite activities, they

began to understand that these emails were indeed a way to communicate with their parents, and

used the space for important messages such as asking for a pet fish. Elsbeth is an excellent example of a child who responded in such a way.

Summary

When looking at children's messages across iWrite products, children relied the most on informative statements that either described pictures or informed parents. Considering that these purposes matched the iWrite activity purpose, this emphasis on information sharing makes sense. Children relied on expressions of love less than I anticipated, especially considering that many parents included such messages in their emails. It appears that children may have used expressions of love as place holders when they didn't know what else to say. As children had different purposes, however, these expressions of love were replaced by other types of messages.

As children composed messages for their parents, their awareness of the audience was visible. This has been considered by other researchers, especially when considering the immediacy of feedback with email as an opportunity to develop audience awareness (Bowen, 1994; Garner & Gillingham, 1996; Moran, 1991; Reinking, 1992). Because emails were sent, and then children did not have access to the iPads and parent replies until invited again (at the earliest the next day), the possibility of immediate replies was not salient to this group of children as it may have been to children with other types of email experiences (Wollman-Bonilla, 2003). Wollman-Bonilla reports of a young 1st grader, Rosa, who had her own email account at home, and had a strong understanding of the possibility for email to have rapid response rates. This impacted some of her messages, as she encouraged relatives in her message to "check your e mail" in her efforts to encourage quicker replies. In this study, children did not ask about replies (although they did frequently request a turn at the iWrite center), but they were aware that their emails had a specific known audience, their parents. Because this audience was a familiar

one, the children in this study composed messages that resembled conversations as opposed to written communications. In other words, children simply responded to an email or continued a thought from a previous email without offering any context. Wollman-Bonilla (2003) observed similar trends Rosa's email messages, concluding that "the email messages generally reflected an assumption that temporal, situational and physical context for her text was understood" (p. 131). For an example of this in an email chain, see the messages composed by Henry and Liza Nelle (Table 25 and Table 26).

Table 25
Henry, iWrite #4

Date & Context	Text	Child's Verbal Message
10/26	 I wish I was. In. The. Five. Youold. Class. Room. Playing. Out. Sid. With. The. Five Youold. Class. Room. I. Love. You. Mommy. And. Daddy	"I wish I was in the 5 year old classroom. Playing outside with the 5 year old classroom. I love you Mommy and Daddy."
10/26 Mom response	Hope you are having a good day. Are you looking forward to the pumpkin party on Friday?	
10/26 Henry response to Mom	maybe yes or maybe no	"Maybe yes or maybe no."
10/26 Dad response	Awesome spelling Henry. Slow down, you will be there soon! What is your favorite outside activity? Please tell Elsbeth hello and we love you both. Dad	
10/27 Henry response to Dad	dod painting and playing oat outside with my frand doing pumpkin port today with my techer	"Dot markers. Playing outside with my friends. I wish the pumpkin party was today with my teachers."

Table 26

Liza Nelle, iWrite #3

Date & Context	Text	Child's Verbal Message
10/11 iWrite 3, classroom-based message		"Love Mommy. Caterpillars eat leaves."
10/11 Mom response	How fun, Liza Nelle! I love you, too. Mommy	
10/17 Liza Nelle response to Mom	Kerbi	"Caterpillar. Butterfly."
10/17 Mom response	Yes, a caterpillar does turn into a butterfly! Good job, Liza Nelle. Mommy	
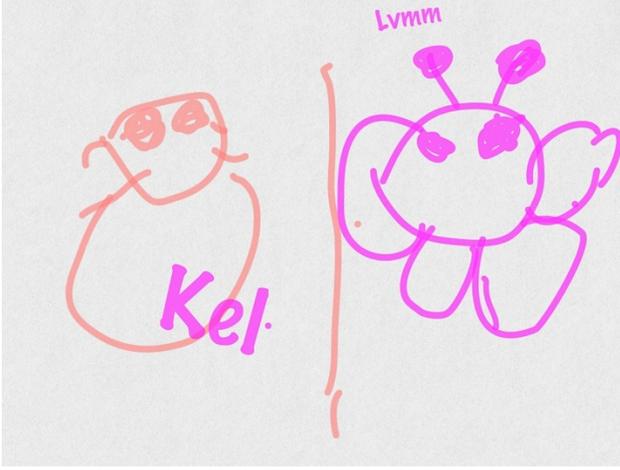
In both of these examples, the children did not offer specific context to explain their messages, but rather moved forward on the assumption that the parents would understand the meaning. In Henry's example, he responds to his mother's question about the pumpkin party as one might in a conversation, "Maybe yes or maybe no", but he doesn't give specific context as to what he is talking about. Without the knowledge of his mother's email, this message would not be clear. As Henry continues in his email exchanges, he refers to the pumpkin party from his mother's email to his father. In this instance, Henry is basing a comment on context from his mother's email in an email to someone else. It is interesting to note that Henry is comfortable interchanging the email content for either parent.

Liza Nelle, on the other hand, does not respond to her mother's expression of love, but rather continues discussing the caterpillars that are turning into the butterflies in the classroom science center. Even a week after her original email, she maintains consistency by continuing to make messages about this topic. In both of these cases, children's assumption that their audience (i.e. parents) will understand their messages can be seen, as well as parents rising to this challenge and responding accordingly. In these situations, children did not need to add context to clarify their response, but rather relied as if having a conversation.

Classroom Practice

Names

Names were used in 63 products across iWrite activities, accounting for 28% of the multimodal and email products. Focusing only on the Sketches2 multimodal products, children typed names (n=25) and printed names (n=10), with one product having both typed and printed names, accounting for 42% of the multimodal products. Children included only their own names in the multimodal products except for Zuri and Xander. Zuri, who typed her name as well as her sister and a friend's name, and Xander who typed my name. Looking at Mail products, children referenced their own names (n=30) and others' names (n=20). In general, other names included family members such as Mommy, Daddy, and siblings' names. A few other times children included the names of grandparents or friends, and my name was referenced on occasion. Remembering that I did invite children to label their self-portraits with their names, these name writing instances were not always child-initiated. Considering name use outside of the iWrite #2 (self-portrait)multimodal products and mail products, there were 48 products with child-generated use of names.

Names were used predominantly to label the self-portraits as invited in the second iWrite activity. Looking at the use of names in non-iWrite #2 activities, there are 38 products containing names: 24 Multimodal products and 14 Mail responses. In the Multimodal products the use of names was predominantly typed (n=24), and most often referenced the author (n=21). The typed email responses included the author's name (n=12), but also included family members (n=9). Because some products contained more than one name, the sum may exceed the total number of products stated earlier. In the email responses, children used parents' names frequently to address their audience. Children also included their own names, but not necessarily at the end of message like a traditional signature. Rather, children's names tended to be early in the message.

Note-writing Conventions

The DS4 classroom had special emphasis on note-writing during the afternoon whole group time. Led by a teacher, the students worked together to compose a letter to their parents informing them about the day's happenings. Typically this note had the date, opened with a traditional letter greeting (i.e. Dear Moms and Dads), contained a few sentences of content, and then closed with a traditional letter closing (i.e. Love, DS4 Kids). The text of the letter was printed by the teacher based on dictation from the children. The note was then hung up near the sign in/sign out book for parents to see in the afternoon. The classroom teachers reported that there were often conversations about this note between parents and children at pick up. Because of the parallels that note-writing had with emailing (i.e. similar purpose and audience), I was especially interested to see if children in the classroom applied the note-writing conventions and structure to their emails. It is important to point out that the actual content of the emails did closely parallel that of the classroom note-writing. This is due to the fact that the purpose of the

iWrite task overlapped that of the note-writing activities. Specifically, both the classroom teacher and myself wanted to focus on the children's experiences in the classroom. For the purposes of this discussion, however, note-writing conventions does not include the content of the message, but rather whether or not children applied greetings such as "Dear Mom and Dad" or closings such as "Love, DS4 Kids."

Overall, children did not apply note-writing conventions to their emails. Of the 15 children in the study, only four used note-writing conventions in any of their products. There were 11 products that contained note-writing conventions, eight with greetings such as "Dear Dad" and three with closings such as "Love, Zuri" (Zuri, November 9). In my discussion, I will focus on Zuri, the only child who used note-writing conventions throughout the iWrite activities, and is the only child to reference the posted classroom note as a spelling resource. I have selected her to showcase that it is possible and potentially useful for children to incorporate these conventions in their email practices. Of the twelve emails that she exchanged with her parents, half contained note-writing conventions, and half did not. This was by far the largest amount of note-writing conventions seen in any of the children's emails (see Table 20 for full description of Zuri's emails).

Zuri most frequently used greetings in her emails, beginning messages with "Dear" or her parents names. In half of these products, she included closings, drawing directly from the class note-writing activity as she signed her emails "DS4 Kids". On September 27, I asked Zuri how she wanted to sign the message she was typing in the Mail program. What follows is the portion of the transcript from our conversation:

> Emily: Do you want to sign your letter?
> Zuri: Yes.
> Emily: How do you want to sign your letter?
> Zuri: I want to sign ummm... I want... Ummm... I don't know

Emily: Well how do you... how do you... um... when you do your letters to your parents, what's it called when you do the ending?
Zuri: Um.
Emily: Ms. Grace? What's your ending of your letter? What do you call that?
Ms. Grace: Your signature
Emily: Your signature. I was saying closing. Z, how do you want to do your signature for your email?
Zuri: Day school Four kids
Emily: Are you all of the Day School Four kids?
Zuri: Yes. For my friends.
Emily: Your friends are? Okay so what are you going to write?
Zuri: Ummm.. My
Emily: Hmm??
Zuri: Day School Four kids
Zuri: [Looks over her shoulder at the Classroom Note posted behind her.]
Emily: Alright. Do you know how to do it? Do you want to copy it off the board?
Emily: [Points where Z is looking.]
Zuri: [Nods head.]

(iWrite # 3, September 27)

It appears that when I asked about signing the letter, and then made the connection to the note-writing activity, then Zuri made the same connection herself. Zuri took the suggestion literally, however, as she immediately suggested signing the letter "Day School 4 Kids" as is done during the whole class note-writing activity. As she was talking she was looking at the classroom note that was posted on the wall behind our table. Drawing the teacher in, and using the terminology of "signature" seemed to help Zuri make a connection to the posted class note that other children did not make during the iWrite activities. However, she did not seem to fully understand the purpose of the signature as she used one ("DS4Kids") to represent the whole class, not just herself.

A few weeks later, on October 14, Zuri was making a Sketches2 product about calendar time, when she independently added DS4Kids to the message she read for her text. This addition of text was prompted only when I asked, "Zuri, what words are you typing?". A table with all of Zuri's multimodal and email products referencing note-writing can be seen in Table 27. While

the iWrite activities may have seemed separate from the school-based context of whole class note-writing to the children, when references were made to the actual whole class note-writing activity, classroom teachers or the whole class note can serve as signals for children to use these school-based literacy features.

Table 27
Note-writing Conventions in Zuri's Emails

Date & Activity	Child's Product	Child's Verbal Message	Note-writing Conventions
9/27 iWrite #2 email Respnse to Dad's email	Zuriamirazrwoklsshopopssds4kids	"Zuri. Amira. I made a zero book. We are learning about colors, shapes and opposites."	Closing
10/14 iWrite #3 Sent to Mom and Dad	Zuri Amira Ltr Cdr	"Zuri. Amira. I want to be the line leader and calendar helper. Day school 4 kids."	Closing

In print and screen-based research (Daiute, 1993; Wollman-Bonilla, 2003), children have applied genre-based knowledge in various settings. The discussion of Zuri's emails showcases the possibility that children can use note-writing language in their emails. In fact, it would have made sense for children to have used greetings (such as "Dear Mom and Dad") and closings (such as "Love") in their emails. Also, parents typically used similar greetings and closings in their email messages, so children could have picked up on this language and applied it to their email exchanges later in the iWrite activities. However, in this study, most participants did not

apply their knowledge of print-based note-writing to the digital email activities. One reason for this could be that the practice of note-writing and emailing was not similar enough for the children to consider applying the known note-writing structure. The classroom note-writing activities were led by a teacher in the afternoon on a rug using a dry erase marker and a sheet of laminated posterboard. The email writing activities were led by myself in the morning at a center table with iPads. These were very different contexts.

Summary

In this chapter, the digital products composed by young children were discussed. Specifically, the visual properties of the products will be reviewed in addition to the connection to both classroom practice and children's names. The digital products created over the course of the iWrite study were varied.   The children in this study were able to differentiate between writing marks and drawing marks by using their finger to draw and the pop-up keyboard to type messages. This is much like reports of children in paper-based research (Harste et al, 1984). It is interesting to note the heavy reliance on the keyboard to create printed text as the majority of the messages were composed with typed text. Similar to emergent writing research, different children drew from different modes over tasks. Elsbeth, for example, relied on print and mutli-colored drawings, while other children, like Katie, incorporated drawings, stamps and text into her products.

Secondly, there were two areas of classroom practice, names and note-writing conventions, that I investigated with relation to children's multimodal and mail products. As in other emergent literacy research, (Bloodgood, 1999; Ferreiro & Teberosky, 1982; Levin & Aram, 2004; Treiman & Broderick, 1998) children used familiar names frequently in both multimodal and typed mail products. On the other hand, while children were exposed to note-writing

conventions on daily basis, the majority of children did not apply these conventions to their own emails. It would appear that teachers need to make direct connections for young children between some print and digital activities in order to bring practices over from one context to another. Specifically, it would seem that activities where children have less control (i.e. whole group note-writing activities) need more support for children to transfer this knowledge base over to digital activities. On the other hand, name writing, which children did independently in the classroom, was more frequently transferred to the iWrite activities.

As discussed in the literature review, names are an important part of emergent writer's understandings about literacy (Bloodgood, 1999; Ferreiro & Teberosky, 1982; Levin & Aram, 2004; Treiman & Broderick, 1998), therefore it makes sense that this analysis reveals such a heavy use of names throughout the iWrite activities. Names have a place in the DS4 classroom in that children sign in every morning and are often asked to label papers with their names. Seeing connections to print based research reinforces the notion that children are able to apply existing print literacy knowledge to screen-based digital activities.

In general, the children printed or typed their own names independently, only asking support to find specific keys. There is an area of research that has considered children and printing abilities in connection to their names. For example, Treiman & Broderick (1998) found that children are better at printing the initial letter of their own first name than other letters. Shifting to typing one's name, it would be interesting to see if children become better at locating the letter key of the initial letter of their first name in future studies.

CHAPTER 8

CONCLUSION

In this chapter, I will provide a summary of this study and revisit the research questions that have guided this research into young children's digital message making practices. I will discuss the findings from each of the research questions, drawing across all findings to make conclusions. In addition, I will discuss limitations of this study. Lastly, I will draw from this study overall as I highlight implications for future research and practice.

Summary

Fifteen children in Parsons Preschool, a NAEYC accredited preschool in a large city in a southern state, took part in the iWrite study in their classroom between August and November. At the iWrite center, 4 year-old children were invited to take on the role of digital composer as they used an open-ended drawing app, Sketches2, and an email program, Mail, on iPads to send emails to parents. For each activity, children were first invited to compose a multimodal product using the Sketches2 program. In order to email the Sketches2 products, children then used the Mail program to send the Sketches2 multimodal products as an attachment. When parent responses were received in the Mail program, children were invited to type an email product response.

Overall, there were 83 multimodal products created by children in Sketches2 and 140 email products created by children in Mail. During the course of this study, 140 emails were sent and 139 emails were received. On average, children composed four multimodal products and seven emails over the first four iWrite activities. The number of multimodal products

produced by each child ranged from three to five, and the number of emails ranged from four to 11. In addition to the iWrite activities, other forms of data were collected including: 14 parent surveys, 12 parent interviews, and 11 home visits. I also observed in the classroom with a focus on literacy practices, and I interviewed both of the classroom teachers.

Research Question Summary

Four research questions guided my analysis of the data with the ultimate goal of describing young children as digital composers. I will now report on the overall findings for each research question.

Research Question 1: What Do Young Children Understand About Email?

At the beginning of this study, as 4 year olds with limited involvement with email, children's understandings appeared to be surface level, with only a general understanding of emailing. In this study, while most children were aware of the term email, their understandings were fairly non-specific. In general, children understood that emails were something that adults engaged in (sometimes for work), and that they were most often sent somewhere. However, through their involvement with the iWrite activities, children readily engaged in and began to understand more about email, its purposes and how it works.

Research has shown that young children have out of school experiences with digital technology that are typically not replicated in preschools (Grunwald Associates, 2009; Lynch & Warner, 2004; Marsh et al, 2005; Wohlwend, 2010; Zevenbergen & Logan, 2008). Taking this into consideration, I have reported on children's understandings about email. Drawing mainly from a question-answer session about email at the beginning of the study, I discovered that children's concepts about email drew from experiences out of school, and then continued to build on experiences in the iWrite study. As has been seen in emergent literacy work (Clay,

1975; Harste et al., 1985; Sulzby, 1985), children's participation in literacy-based events greatly impact their understandings of literacy. In this study, children had developing understandings of email based on their own specific experiences.

Research Question 2: How Do Adults Interact with Children to Support the Joint Construction of Email Messages?

When asked to compose messages using Sketches2 and Mail, children jointly constructed messages with me. Children needed little encouragement to compose digitally, but often needed support to describe or "read" their compositions, as it was not something they were used to doing. My behaviors throughout the study centered on supporting children as they composed messages to send to their families. Specifically, I was especially concerned with children's generation of a verbal message to go along with their digital products. My actions, as describe in Table 13 included: demonstration, invite, encourage, prompt, co-author, author, re-direct, comment and ask.

Children tended to followed my lead, generating messages to accompany their digital products before, during and after composing. While my focus was on encouraging children to generate products that matched the purpose of the iWrite activity, some children had other purposes, and the messages constructed reflected this.

An underlying concept for this study is the idea that digital composing, much like print writing, is a social practice which has specific ways of being done in a particular community (Barton & Hamilton, 2000; Gee, 1999). In this study, because children had very little exposure to email, I modeled and guided children through these experiences, and thus greatly impacted the way that this social practice was shaped. Children were exposed to, and picked up on procedures, message generation, composing processes and ways of doing email in ways that were valued by

myself and their parents (Barton & Hamilton, 2000; Street, 1995). Because of this, many messages composed in this study were jointly constructed between myself and the child.

Throughout the study, I scaffolded children's participation in the procedural aspects of the iWrite activities in addition to the generation of messages. My actions, as described in Table 13 included: demonstration, invite, answer question, technical support, verbal prompt, physical prompt, teacher led, and comment. Research has also found that teachers took a similar role in when guiding digital activities, offering assistance to one child at a time as needed in a more subdued manner not typically associated with teacher-led activities (McManis & Gunnewig, 2012; Sandvik et al., 2012).

Research Question 3: How Do Young Children Interact with iPads During the Digital Composing Process?

Digital technology such as iPads offer different ways to interact with literacy than pen and paper. There were four key patterns that emerged from the data regarding children's interactions with iPads.

First, children were quick to adopt the physical skills needed to interact with the iPads in order to compose digital messages. Specifically, navigating within both Sketches2 and the Mail apps was easily undertaken by these young children. Children engaged in on-screen interactions that included tapping, swiping, drawing, pinching, knuckle dragging, typing with two hands and typing with one finger. These interactions resulted in a variety of on-screen actions including deleting, drawing, printing, typing, stamping, undoing, changing color, and changing thickness. Children turned to me for support when they needed help with specific issues related to procedure or technology support. These request for support included queries focused on technical support, spelling, procedures and button finding.

Second, there appears to be a connection between the way that children type and the certainty of their message. Various typing styles were observed with the pop-up keyboard, including a two-handed grown-up style and a one-handed hunt-and-peck style. These typing styles have previously been recorded in research as being prevalent among preschool and kindergarten-aged children (Labbo, 1996; Merchant, 2005). Children seemed to enjoyed the embodied action of typing, as they felt the pressure of the keys, hear the clickety-clack and produced long strings of text (Labbo, 1995; Merchant, 2005). After typing long strings of letters, some children would comment, "I can't read it." This is similar to findings in emergent literacy in which children print strings of letters and then ask, "What did I write?" (Clay, 1975). When children did focus on the message when typing, the typing was typically slower, and children made connections with letters and sounds, often sounding out words as they typed. At times, children asked for help spelling when typing in this manner.

Third, there was much exploration of the materials within the confines of the Sketches2 program. This focus on the explorative process, as opposed to the final product is important, especially when considering suggestions for practice. Much like reports of children at print-based writing centers who explore the tools available (Rowe, 1994, 2008b), these children experimented with various aspects of the digital program. There were exploratory instances with the pop-up keyboard, the resize button and the undo tool. In these instances, children were seen exploring the available digital tools and how they worked. Both print-based and digital research has also reported that young children who explore tools when writing tend to focus more on the composing process than the actual product (Labbo, 1996; Rowe, 1994; 2008a).

Fourth, children focused on their iPad screen, paying little attention to other children, and only interacting with the adult when necessary, except with photographs were involved. In

general, children commented on their own work, others work and on photos. The most comments were made on their own work, followed by photos and then others work. This finding is very different from prior research reporting high levels of engagement between two children composing using one computer station (Daiute, 1989; Daiute & Dalton, 1988; Dickinson, 1986; Jones, 1998, 2003; Lomangino et al., 1999), and even research on the interactions between children using paper-based tools at writing centers (Larson, 1995; Rowe, 1994; Wiseman, 2003; Wollman-Bonilla & Werchadlo, 1999). It would appear that having access to one's own iPad encourages children to focus on the screen.

Research Question 4: What Kinds of Digital Products Do Young Children Create on iPads When Using Sketches2 and Mail?

With regards to the visual modes of these compositions, while there was much variability across use of modes including color, stamps, letter format and combinations of these modes, seven key findings were observed. First, visual patterns found in emergent writing research (Harste et al., 1984; Gardner, 1980) (e.g. use of multiple colors when drawing, and one color when writing; and variability among children's products) were also seen in these digital products. Second, children selected typing most often, but seemed comfortable writing letters by hand, and used often relied on handwritten print for known activities such as name writing. Third, stamping seemed to be a distracting option, with children focusing on holiday-specific stamps as opposed to using stamps to support the original content of the message. Overall, however, much like children who make print marks are able to distinguish between writing marks and drawing marks (Harste et al, 1984), the children in this study differentiated between the two by using their finger to draw and the pop-up keyboard to type messages. It is interesting to note that patterns found in emergent writing research (Harste et al., 1984; Gardner, 1980) (i.e. use of multiple

colors when drawing, and one color when writing; and variability among children's products) were also seen in these digital products.

Fourth, when looking at children's message content across iWrite products, children relied the most on informative statements that either described pictures or informed parents. Considering that these purposes matched the iWrite activity purpose, this emphasis on information sharing makes sense. Children relied on expressions of love less than I anticipated, especially considering that many parents included such messages in their emails. It appears that children may have used expressions of love as place holders when they didn't know what else to say. As children had different purposes, however, these expressions of love were replaced by other types of messages.

Fifth, as children composed messages for their parents, their awareness of the audience was visible. Because emails were sent, and then children did not have access to the iPads and parent replies until invited again (at the earliest the next day), the possibility of immediate replies was not salient to this group of children as it may have been to children with other types of email experiences (Wollman-Bonilla, 2003). Perhaps because parents were a familiar audience with whom children shared many experiences, the children in this study composed messages that resembled conversations as opposed to written communications. In other words, children simply responded to an email or continued a thought from a previous email without offering any context. The message content was embedded within the larger email chain, and did not always make sense as one isolated email message.

Sixth, as in other emergent literacy research, (Bloodgood, 1999; Bloodgood, 1999; Ferreiro & Teberosky, 1982; Levin & Aram, 2004; Treiman & Broderick, 1998) children used familiar names frequently in both multimodal and typed mail products. As discussed in the

literature review, names are an important part of an emergent writer's understandings about literacy (Bloodgood, 1999; Ferreiro & Teberosky, 1982; Levin & Aram, 2004; Treiman & Broderick, 1998), therefore it makes sense that this analysis reveals such a heavy use of names throughout the iWrite activities. Names have a place in the DS4 classroom in that children sign in every morning and are often asked to label papers with their names. Seeing connections to print based research reinforces the notion that children are able to apply existing print literacy knowledge to screen-based digital activities.

In general, the children printed or typed their own names independently, only asking support to find specific keys. There is an area of research that has considered children and printing abilities in connection to their names. For example, Treiman & Broderick (1998) found that children are better at printing the initial letter of their own first name than other letters. Shifting to typing one's name, it would be interesting to see if children become better at locating the letter key of the initial letter of their first name in future studies.

Seventh, while children were exposed to note-writing conventions on daily basis, the majority of children did not apply these conventions to their own emails.

Limitations

There were several limitations to this study, including issues around sampling, observations, timing, structure of iWrite activities, and the issue of my presence at the research site.

This study focused on the digital composing practices of 15 preschool children. While this small sample size was intentional for the scope of this study, only having access to one classroom of children may have limited the types of digital literacy practices that were observed. Because of this, the observed behaviors may not be representative of other preschool children.

This group of children is not representative of all young iPad users. Rather, this study reports on one group of white, middle class preschool children as they interacted with iPads with my guidance. In addition, these children had average to above average access to technology at home. These findings do not necessarily represent the average child, but only these children in this context. While not representative of all iPad users, this group is an excellent place to begin in an area that is under-represented in research.

Timing was also a limitation of the study in several ways. First, the study was conducted over a relatively short amount of time, which may have limited my ability to see changes in children's digital composing practices over time. While I was in the classroom for a total of 38 days, this did not give me many opportunities to work with all 15 children. This was enough time to observe children participating in at least four iWrite activities, but more time would be needed to explore change over time. Because each activity built on the last, children were observed interacting with various tools over the course of the study. More time using all of the tools would be necessary to be able to make comments about children's change over time.

Also, my presence as a researcher influenced children's digital composing in important ways. As discussed, I guided children's interactions at the iWrite table, thus shaping digital composing opportunities in this classroom. I attempted to address this factor through a thorough discussion of the role that I played in the iWrite activities in chapter 5.

In addition, children were asked to complete specific activities when using the iPads at the iWrite center. While this was done intentionally, as I was interested in encouraging children to generate messages to send to parents, it also limited the scope of activities observed. The conclusions reached in this study are limited to children's digital message making practices when using iPads to send emails to parents.

Finally, it was difficult to fully record all of the activity that happened on the child's screen with one video camera. In many sessions, while the video camera was focused on the iPad screens, children moved in their seats, blocking the view of the screen, making it difficult to accurately record the actions on the iPad screen. Therefore, my analysis was limited to what I was able to capture using one screen. For future research, I would suggest two cameras, one recording from the front and the other from the back. I woud also suggest using screen capture software.

Research has shown that children's home and school experiences impacted their understandings of literacy in general, and digital literacy in particular. A strength of this study is the inclusion of data from both home and school. While I have attempted to document classroom and home practices through observations, parent surveys, interviews and home visits, the most intensive data collection occurred at school. Future research could increase the intensity of home observations.

Directions for Future Research

Existing research on young children's digital composing practices is limited. This study adds to it by describing young children's digital composing practices when sending emails with parents. More research in this area is needed.

The current study is significant in that it shows that preschool children are capable of interacting with digital technology to compose emails. This has been done through my description of children's digital products as well as their interactions with the iPad during the composing process. These descriptions will be useful for future research to use as a basis from work from.

There are many similarities in the findings from this study to what we know about emergent writers in print-based research. It is worth noting that the digital products created here show some of the same patterns seen previously in print based emergent literacy research shows. This suggests that children can pull across print and digital literacy knowledge. However, this also raises questions because some of the opportunities found in digital composing are not found in print-based composing. Future research should consider these aspects of digital technology and how young children engage with them.

While this study made strides in furthering understanding of young children's digital talk, products and general interactions with composing practices, it also raised new questions. Though I examined children's talk, products and general interactions with the iPads, I did not collect data in such a way that fine-grained physical analyses were possible. Now that I have described children's behaviors during the digital composing process, it would be of interest to look more specifically at physical actions such finger motions during composing, gaze and placement of body during composing. Future research could begin with the on-screen interaction categories of children's behaviors (see Table 18) that I have generated as a starting point for analyzing children's on-screen actions.

The limited amount of time that I was able to spend observing children composing was a limitation of this study, as noted above. While I saw ways that children adopted tools and strategies to interact with the iPad, I was not able to observe this over a lengthy period of time. The following question remains to be addressed: How do children's composing practices change (or remain the same) over time? This is especially important in light of the fact that children were found to explore the digital tools. If these levels of exploration decrease over time (as seen in Rowe's (2008a) research), then it would have been beneficial to have a longer period for data

collection. Future research could build on the on-screen action categories of children's behaviors (see Table 18), and track these observed behaviors over time when children compose digitally.

The iWrite activities selected for this study allowed me to focus on the ways that children engaged in specific digital message making practices. I was not able to observe the ways that children engaged with other types of apps (e.g. ebooks or games). In addition, because the apps offered to the children were limited to Sketches2 and Mail, I was not able to observe the ways in which children selected and moved between various programs. Questions still needing to be answered about children's engagement with digital technology include: How do children engage in digital literacy practices with games or ebooks? How do children navigate between programs when offered multiple choices?

Also, because I encouraged students to follow the procedure and purpose of the iWrite activities, I did not have many observations of children engaging with the Sketeches2 or Mail programs freely. While adult guidance is needed due to the design of both programs, future research offering more unstructured time to explore the apps would be of interest to better describe young children's engagement with this type of digital technology.

In addition, I have described young children's digital composing practices based on their interactions at the iWrite table. I did not, however, interview children after the composing process to learn about their understanding of the actual process. It could be useful to also consider children's narration of the activities with a focus on what choices they made and why. This could be done through a stimulated recall session with the children after a composing session in which the children are asked to describe their actions as they watch themselves compose on a video monitor.

Finally, the children who participated in this study were primarily from White, middle-

class families; to understand how children from other backgrounds might interact differently, future research should explore a wide variety of populations. The iWrite activities are structured in a way that would allow them to be implemented in a variety of classroom or group settings with young children. It would be important to continue to incorporate data regarding children's interactions with digital literacies in the home.

Implications for Future Practice

Email is a digital literacy practice that is widely used by adults to communicate, and also incorporates many literacy skills that are focused on in early childhood classroom. Because of this, it is an ideal activity to be incorporated into preschool classrooms. This study reported on the ease with which children used the iPads, and were able to quickly learn how to use two different apps to compose emails. Future classroom practice should look to incorporate opportunities for children to engage in email exchanges with their families.

In order to make emailing successful with children and parents, there are some practical considerations. First, this study has reported that children enjoy using the pop-up keyboard for typing, and that unconventional messages are often generated. In order to allow for children's unconventional products, all auto-formatting tools should be turned off. Children in this study used their names throughout the study. Children's names should be prominently displayed in the classroom for those needing support to spell their name.

The iWrite email activities offered a way for this classroom to have a home-school connection during the day. Moving beyond the class generated note, email offers both parent and child a specific opportunity to connect with one another while apart. Creating opportunities that continue to offer this type of home-school connection in classrooms is an important aspect of this classroom practice.

Parent response had an impact on children, as was seen in the ways that they responded to parent emails. Specifically, when parents offered more specific messages that connected to a child's content (or pushed a child to have content beyond expressions of love), children composed products with more specific messages. Therefore, when incorporating email into a classroom, parents should be encouraged to write messages and questions that connect to the existing content of their child's email products when possible.

This study has offered specific, structured activities that could be used in many early childhood classrooms. An adult presence is necessary, however, in order to provide the types of supports necessary for children to be successful in the email process. Parents, older students, or other mentors could be used at the iWrite table in order to assist children as needed. In particular, the teacher scaffolding behaviors discussed in Table 13 could be used in a training for the volunteers to showcase the various ways that children can be supported during their composing process.

There are many paper-based literacy skills that transfer to the digital practice of emailing. For example, spelling words, audience consideration, and message generation. Incorporating these skills into whole class lessons with direct connections to the practice of email could be useful. This study had very little modeling, and no whole class discussion about the email process. In the future, if teachers could make connections to classroom activities (e.g. sounding out words) to emailing activities, I believe that children would transfer these literacy skills.

Finally, this study reports on the exploratory nature of some children's composing processes when engaging with the Sketches2 app. Children enjoyed playing with the pop-up keyboard, the undo button and the resizing tool. Building on this, it would make sense to offer more unstructured time for children to play and explore within an app before asking students to

complete specific tasks.

Conclusion

This study has reported on young children's digital composing practices when offered opportunities to use iPads to compose emails to send to parents. Building on an emergent literacy perspective combined with the view that interactive technology affords positive opportunities, children were observed as confident and capable users of this technology, adopting the physical skills needed to compose digital products within the Sketches2 and Mail apps. Adult support was most prevalent in supporting message generation during the composing process. Finally, a variety of digital products were observed throughout the iWrite activities, many of which exhibited characteristics reported in print-based emergent literacy research.

This study contributes to the small body of research focused on the ways that young children engage with digital literacies. Specifically, this study offers implications for both practice and research. With regards to classroom practice, the structured iWrite activities give teachers a guide for planning email opportunities for young children with regards to the content of activities, examples of possible student outcomes as well as various ways for adults to support the children's composing process. Future research can build on the descriptions of child behavior, teacher scaffolds and products in order to learn more about children as digital composers.

PARENT SURVEY

The purpose of this questionnaire is to gather information about the ways in which young children interact with various forms of literacy to make messages using digital technology and print, both in and outside of school. If a question is unclear or a category is not specific enough, please write a comment to clarify your response.   If you have any questions, you may call me, Emily Bigelow, at 615-504-4621 or email me at emily.bigelow@vanderbilt.edu.

1. Name of Parent or Guardian

_____

2. Name of Child

_____

3. Age of Child _____

                         Years   Months

4. What is your relationship to the child?
□ Parent   □ Guardian

5. Do you have other children? Please circle gender and list age.

Boy or Girl (age)_____ Boy or Girl (age)_____ Boy or Girl (age)_____

6. What is the highest level of education that you have completed?
□ Less than High School

□ High School or GED

□ Some College

□ College Degree

□ Master's Degree

□ Professional Degree (MD, JD)

□ Doctoral Degree

7. What is your current occupation?
_____

8. What is your child's ethnicity?

☐ American Indian or Alaska Native   ☐ Asian

☐ Black or African American   ☐ Hispanic or Latino

☐ Native Hawaiian or Other Pacific Islander   ☐ White

Other _____

9. What is your native language?

_____

10. What language(s) are spoken in your home?

_____

11. I use digital technology and media primarily for
☐ Personal   ☐ Work   ☐ Both

12. When you use digital technology, what activities do you engage in? Check all that apply.
Circle those that you engage in the most.

☐ Email	☐ Search for Information
☐ Use Social Network Sites	☐ Professional Websites
☐ Buy a Product	☐ Instant Messaging (IM)
☐ Listen to Music	☐ Online Banking
☐ Watch Videos	☐ Travel Reservations
☐ Online Classifieds	☐ Government Websites
☐ Read News	

13. Overall, how would you describe your technology and media use?
☐ Infrequent   ☐ Average   ☐ Heavy

14. What are the titles of your child's favorite things to read or to have read to them? (e.g. books, book series, comic books, magazines)

15. If your child visits websites, which are his/her favorite(s)?

16. Do you have the following in your home? In your child's bedroom? Check both columns, if needed. Please check the box that best matches the main purpose of the device. For example, a cell phone that includes a digital camera should be marked as a cell phone.

	IN YOUR HOME (NOT IN CHILD'S BEDROOM)	IN CHILD'S BEDROOM
COMPUTER		
TELEVISION		
DVD OR VIDEO PLAYER		
DIGITAL CAMERA		
VIDEO CAMERA		
CELL PHONE		
SMARTPHONE (e.g. DROID, iPHONE)		
iPOD TOUCH		
iPAD		
GAMES CONSOLE (e.g. Wii)		
E-READER (e.g. KINDLE, NOOK)		
KID COMPUTER (e.g. VTECH PRODUCTS)		
INTERACTIVE TECHNOLOGY BOOKS (e.g. LEAPFROG)		
CD OR TAPE PLAYER		
RADIO		
iPOD		
AUDIO RECORDER		
PRINT BOOKS		
COMIC BOOKS & MAGAZINES		
ABC MANIPULATIVES (MAGNETS, TILES, BLOCK)		
CHALKBOARD OR DRY ERASE BOARD		
COLORING TOOLS (MARKERS, CRAYONS, etc.)		
ART SUPPLIES (PAINTS, CLAY, SCISSORS, etc.)		

17. Approximately how many of the following belong to your child (or are shared with a sibling)?

	0	1-2	3-5	5-15	15-30	30+
COMPUTER						
TELEVISION						
DVD OR VIDEO PLAYER						
DIGITAL CAMERA						
VIDEO CAMERA						
CELL PHONE						
SMARTPHONE (e.g. DROID, iPHONE)						
iPOD TOUCH						
iPAD						
GAMES CONSOLE (e.g. Wii)						
E-READER (e.g. KINDLE, NOOK)						
KID COMPUTER (e.g. VTECH PRODUCTS)						
INTERACTIVE TECHNOLOGY BOOKS (e.g. LEAPFROG)						
CD OR TAPE PLAYER						
RADIO						
iPOD						
AUDIO RECORDER						
PRINT BOOKS						
COMIC BOOKS & MAGAZINES						
ABC MANIPULATIVES (MAGNETS, TILES, BLOCK)						
CHALKBOARD OR DRY ERASE BOARD						
COLORING TOOLS (MARKERS, CRAYONS, etc.)						
ART SUPPLIES (PAINTS, CLAY, SCISSORS, etc.)						

18. During a typical week, please check the estimated amount of time your child spends on the following activities.

ACTIVITIES	NEVER	LESS THAN 1 HOUR	1 – 3 HOURS	3 – 5 HOURS	5 – 10 HOURS	MORE THAN 10 HOURS
WATCHING TV						
WATCHING A VIDEO OR DVD						
LISTENING TO MUSIC (INCLUDING IN THE CAR)						
READING OR 'PRETENDING' TO READ						
BEING READ TO BY SOMEONE ELSE						
PLAYING INSIDE WITH TOYS						
DRAWING OR COLORING						
BUILDING WITH BLOCKS, LEGOS, etc.						
ART PROJECTS (e.g. PAINTING, CLAY, CUTTING AND GLUING)						
WRITING						
TALKING ON THE PHONE						
VIDEO PHONE CALLING (e.g. SKYPE)						
USING A COMPUTER						
PLAYING VIDEO GAMES						
PLAYING WITH MOBILE HANDHELD DEVICES (e.g. iPHONE)						
EMAILING						
TEXTING						

19. With whom does your child do the following? Check all columns that apply.
Circle the check that reflects the primary way your child engages in this activity.
A sample response is provided in the first line.

ACTIVITIES	ON OWN	ON OWN, BUT HAS HELP OCCASIONALLY	WITH ANOTHER CHILD	WITH AN ADULT	RARELY OR NEVER
SAMPLE: Talking on Phone	✓		✓	☑	
WATCHING TV					
WATCHING A VIDEO OR DVD					
LISTENING TO MUSIC (INCLUDING IN THE CAR)					
READING OR 'PRETENDING' TO READ					
BEING READ TO BY SOMEONE ELSE					
PLAYING INSIDE WITH TOYS					
DRAWING OR COLORING					
BUILDING WITH BLOCKS, LEGOS, etc.					
ART PROJECTS (e.g. PAINTING, CLAY, CUTTING AND GLUING)					
WRITING					
TALKING ON THE PHONE					
VIDEO PHONE CALLING (e.g. SKYPE)					
USING A COMPUTER					
PLAYING VIDEO GAMES					
PLAYING WITH MOBILE HANDHELD DEVICES (e.g. iPHONE)					
EMAILING					
TEXTING					

20. What types of messages do you create or receive in your home?
Check all that apply in the PARENT COMPOSES and PARENT RECEIVES column.
Then also check any that your child compose or receives. It may be that your child creates some independently, and some with help. Both instances would be checked as CHILD COMPOSES.

MESSAGES	PARENT COMPOSES	PARENT RECEIVES	CHILD COMPOSES	CHILD RECEIVES
GROCERY LIST				
TO DO LIST				
THANK YOU NOTES				
BIRTHDAY CARDS				
GET WELL CARDS				
LETTERS TO RELATIVES				
NOTES TO TEACHERS				
EMAILS				
TEXTS				
SIGNS				
OTHER (PLEASE LIST)				

21. If you Skype or video call with your child, explain your child's usage.
□ To talk to parent when traveling

□ To talk to relatives

□ Other

_____

22. Check any learning software you have purchased to help your child develop as a reader or writer.
□ KidPix

□ Reading Rabbit

□ Jump Start

□ Dr. Seuss

□ Other

_____

23. If you use apps (purchased or free), list any apps that you have that your child uses. Circle the ones that are favorites.

24. If you own a smartphone and your child uses it, explain the child's usage.

a) What types of activities does your child do with it?

b) When does your child use it?

c) Where does your child use it?

25. Check other mobile technology that you own.
If your child uses it, explain the child's usage.

☐ iPod Touch   ☐ iPad   ☐ Kindle or Nook   ☐
Other_____

a) What types of activities does your child do with it?

b) When does your child use it?

c) Where does your child use it?

26. There are software programs available on computers and other devices like smartphones that allow your child to draw, paint, or compose with stickers and objects. Does your child use any of these programs?
☐ Never

☐ Sometimes

☐ Frequently

27. If your child uses these programs, describe what they like to do with it.

28. Does your child have a personal email account?   Yes ☐   No ☐

29. If yes, with whom do they exchange emails? _____

Think about your child's knowledge of creating messages using digital technology through their interactions with technology and observations of adults using these tools. Check the box that best represents their exposure and development with regards to emails, texts and digital photography.

30.

EMAILS	NO EXPOSURE	EXPOSED TO, BUT NOT AWARE	EXPOSED TO AND DEVELOPING UNDERSTANDING	EXPOSED TO AND DEFINITELY DOES THIS
My child is aware of a family (or parent) email account.				
My child understands that a message can be sent via email.				
My child understands that an email is sent to someone.				
My child understands that someone can send him/her a message via email.				
My child tells me what to type in an email.				
My child types emails independently.				
My child knows how to hit SEND to send an email.				
My child knows when new emails arrive (based on sounds, bolded font, etc.)				
My child understands that pictures can be sent via email.				

31.

TEXTS	No Exposure	Exposed to, but not aware	Exposed to and Developing understanding	Exposed to and Definitely does this
My child is aware that family members text.				
My child understands that a text contains a message.				
My child understands that the text message is being sent to someone.				
My child understands that someone can send him/her a message via text.				
My child tells me what to type in a text.				
My child types texts independently.				
My child knows how to hit SEND for a text.				
My child understands that a buzz/chime is a signal for a received new text message				
My child understands that pictures can be sent via text.				

32.

DIGITAL PHOTOGRAPHY	NO EXPOSURE	EXPOSED TO, BUT NOT AWARE	EXPOSED TO AND DEVELOPING UNDERSTANDING	EXPOSED TO AND DEFINITELY DOES THIS
My child knows how to turn on the camera.				
My child knows how to zoom with the camera.				
My child knows how to push the button to take a picture.				
My child asks to see pictures after they have been taken.				
My child knows how to view pictures on the camera.				
My child knows how to delete pictures on the camera.				

33. If you have any additional comments regarding your child's exposure, development or use of digital technology, please share them here.

Please return in your child's school bag
 or to the iWrite envelope at Ms. Margaret's desk.

Thank you for taking the time to complete this questionnaire!

iWrite!

APPENDIX B

PILOT PARENT SURVEY

You are being asked to take this questionnaire to help determine if the questions are clear. Eventually, this survey will be used to gather information about the ways in which young children interact with various forms of literacy to make messages using digital technology and print, both in and outside of school. If a question is unclear or a category is not specific enough, please write a comment to clarify your response.   If you have any questions, you may call me, Emily Bigelow, at 615-504-4621 or email me at emily.bigelow@vanderbilt.edu.

1. Name of Parent or Guardian

_____

2. Name of Child

_____

3. Age of Child _____

                       Years   Months

4. What is your relationship to the child?
□ Parent   □ Guardian

5. Do you have other children? Please circle gender and list age.

Boy or Girl (age)_____ Boy or Girl (age)_____ Boy or Girl (age)_____

6. What is the highest level of education that you have completed?
□ Less than High School

□ High School or GED

□ Some College

□ College Degree

□ Master's Degree

□ Professional Degree (MD, JD)

□ Doctoral Degree

7. What is your current occupation?
_____

8. What is your child's ethnicity?

☐ American Indian or Alaska Native ☐ Asian

☐ Black or African American ☐ Hispanic or Latino

☐ Native Hawaiian or Other Pacific Islander ☐ White

Other _____

9. What is your native language?

_____

10. What language(s) are spoken in your home?

_____

11. I use digital technology and media primarily for
☐ Personal ☐ Work ☐ Both

12. When you use digital technology, what activities do you engage in? Check all that apply. Circle those that you engage in the most.

☐ Email ☐ Search for Information

☐ Use Social Network Sites ☐ Professional Websites

☐ Buy a Product ☐ Instant Messaging (IM)

☐ Listen to Music ☐ Online Banking

☐ Watch Videos ☐ Travel Reservations

☐ Online Classifieds ☐ Government Websites

☐ Read News

13. Overall, how would you describe your technology and media use?
☐ Infrequent ☐ Average ☐ Heavy

14. What are the titles of your child's favorite things to read or to have read to them? (e.g. books, book series, comic books, magazines)

15. If your child visits websites, which are his/her favorite(s)?

16. Do you have the following in your home? In your child's bedroom? Check both columns, if needed. Please check the box that best matches the main purpose of the device. For example, a cell phone that includes a digital camera should be marked as a cell phone.

	IN YOUR HOME (NOT IN CHILD'S BEDROOM)	IN CHILD'S BEDROOM
COMPUTER		
TELEVISION		
DVD OR VIDEO PLAYER		
DIGITAL CAMERA		
VIDEO CAMERA		
CELL PHONE		
SMARTPHONE (e.g. DROID, iPHONE)		
iPOD TOUCH		
iPAD		
GAMES CONSOLE (e.g. Wii)		
E-READER (e.g. KINDLE, NOOK)		
KID COMPUTER (e.g. VTECH PRODUCTS)		
INTERACTIVE TECHNOLOGY BOOKS (e.g. LEAPFROG)		
CD OR TAPE PLAYER		
RADIO		
iPOD		
AUDIO RECORDER		
PRINT BOOKS		
COMIC BOOKS & MAGAZINES		
ABC MANIPULATIVES (MAGNETS, TILES, BLOCK)		
CHALKBOARD OR DRY ERASE BOARD		
COLORING TOOLS (MARKERS, CRAYONS, etc.)		
ART SUPPLIES (PAINTS, CLAY, SCISSORS, etc.)		

17. Approximately how many of the following belong to your child (or are shared with a sibling)?

	0	1-2	3-5	5-15	15-30	30+
COMPUTER						
TELEVISION						
DVD OR VIDEO PLAYER						
DIGITAL CAMERA						
VIDEO CAMERA						
CELL PHONE						
SMARTPHONE (e.g. DROID, iPHONE)						
iPOD TOUCH						
iPAD						
GAMES CONSOLE (e.g. Wii)						
E-READER (e.g. KINDLE, NOOK)						
KID COMPUTER (e.g. VTECH PRODUCTS)						
INTERACTIVE TECHNOLOGY BOOKS (e.g. LEAPFROG)						
CD OR TAPE PLAYER						
RADIO						
iPOD						
AUDIO RECORDER						
PRINT BOOKS						
COMIC BOOKS & MAGAZINES						
ABC MANIPULATIVES (MAGNETS, TILES, BLOCK)						
CHALKBOARD OR DRY ERASE BOARD						
COLORING TOOLS (MARKERS, CRAYONS, etc.)						
ART SUPPLIES (PAINTS, CLAY, SCISSORS, etc.)						

18. During a typical week, please check the estimated amount of time your child spends on the following activities.

ACTIVITIES	NEVER	LESS THAN 1 HOUR	1 – 3 HOURS	3 – 5 HOURS	5 – 10 HOURS	MORE THAN 10 HOURS
WATCHING TV						
WATCHING A VIDEO OR DVD						
LISTENING TO MUSIC (INCLUDING IN THE CAR)						
READING OR 'PRETENDING' TO READ						
BEING READ TO BY SOMEONE ELSE						
PLAYING INSIDE WITH TOYS						
DRAWING OR COLORING						
BUILDING WITH BLOCKS, LEGOS, etc.						
ART PROJECTS (e.g. PAINTING, CLAY, CUTTING AND GLUING)						
WRITING						
TALKING ON THE PHONE						
VIDEO PHONE CALLING (e.g. SKYPE)						
USING A COMPUTER						
PLAYING VIDEO GAMES						
PLAYING WITH MOBILE HANDHELD DEVICES (e.g. iPHONE)						
EMAILING						
TEXTING						

19. With whom does your child do the following? Check all columns that apply.
Circle the check that reflects the primary way your child engages in this activity.
A sample response is provided in the first line.

ACTIVITIES	ON OWN	ON OWN, BUT HAS HELP OCCASIONALLY	WITH ANOTHER CHILD	WITH AN ADULT	RARELY OR NEVER
SAMPLE: *Talking on Phone*	✓		✓	☑	
WATCHING TV					
WATCHING A VIDEO OR DVD					
LISTENING TO MUSIC (INCLUDING IN THE CAR)					
READING OR 'PRETENDING' TO READ					
BEING READ TO BY SOMEONE ELSE					
PLAYING INSIDE WITH TOYS					
DRAWING OR COLORING					
BUILDING WITH BLOCKS, LEGOS, etc.					
ART PROJECTS (e.g. PAINTING, CLAY, CUTTING AND GLUING)					
WRITING					
TALKING ON THE PHONE					
VIDEO PHONE CALLING (e.g. SKYPE)					
USING A COMPUTER					
PLAYING VIDEO GAMES					
PLAYING WITH MOBILE HANDHELD DEVICES (e.g. iPHONE)					
EMAILING					
TEXTING					

20. What types of messages do you create or receive in your home?
Check all that apply in the PARENT COMPOSES and PARENT RECEIVES column.
Then also check any that your child compose or receives. It may be that your child creates some independently, and some with help. Both instances would be checked as CHILD COMPOSES.

MESSAGES	PARENT COMPOSES	PARENT RECEIVES	CHILD COMPOSES	CHILD RECEIVES
GROCERY LIST				
TO DO LIST				
THANK YOU NOTES				
BIRTHDAY CARDS				
GET WELL CARDS				
LETTERS TO RELATIVES				
NOTES TO TEACHERS				
EMAILS				
TEXTS				
SIGNS				
OTHER (PLEASE LIST)				

21. If you Skype or video call with your child, explain your child's usage.
□ To talk to parent when traveling

□ To talk to relatives

□ Other

_____

22. Check any learning software you have purchased to help your child develop as a reader or writer.
□ KidPix

□ Reading Rabbit

□ Jump Start

□ Dr. Seuss

□ Other

_____

23. If you use apps (purchased or free), list any apps that you have that your child uses. Circle the ones that are favorites.

24. If you own a smartphone and your child uses it, explain the child's usage.

a) What types of activities does your child do with it?

b) When does your child use it?

c) Where does your child use it?

25. Check other mobile technology that you own.
If your child uses it, explain the child's usage.

☐ iPod Touch   ☐ iPad   ☐ Kindle or Nook   ☐
Other_____

a) What types of activities does your child do with it?

b) When does your child use it?

c) Where does your child use it?

26. There are software programs available on computers and other devices like smartphones that allow your child to draw, paint, or compose with stickers and objects. Does your child use any of these programs?
☐ Never

☐ Sometimes

☐ Frequently

27. If your child uses these programs, describe what they like to do with it.

28. Does your child have a personal email account?   Yes ☐   No ☐

29. If yes, with whom do they exchange emails? _____

Think about your child's knowledge of creating messages using digital technology through their interactions with technology and observations of adults using these tools. Check the box that best represents their exposure and development with regards to emails, texts and digital photography.

30.

EMAILS	NO EXPOSURE	EXPOSED TO, BUT NOT AWARE	EXPOSED TO AND DEVELOPING UNDERSTANDING	EXPOSED TO AND DEFINITELY DOES THIS
My child is aware of a family (or parent) email account.				
My child understands that a message can be sent via email.				
My child understands that an email is sent to someone.				
My child understands that someone can send him/her a message via email.				
My child tells me what to type in an email.				
My child types emails independently.				
My child knows how to hit SEND to send an email.				
My child knows when new emails arrive (based on sounds, bolded font, etc.)				
My child understands that pictures can be sent via email.				

31.

TEXTS	No Exposure	Exposed to, but not aware	Exposed to and Developing understanding	Exposed to and Definitely does this
My child is aware that family members text.				
My child understands that a text contains a message.				
My child understands that the text message is being sent to someone.				
My child understands that someone can send him/her a message via text.				
My child tells me what to type in a text.				
My child types texts independently.				
My child knows how to hit SEND for a text.				
My child understands that a buzz/chime is a signal for a received new text message				
My child understands that pictures can be sent via text.				

32.

DIGITAL PHOTOGRAPHY	NO EXPOSURE	EXPOSED TO, BUT NOT AWARE	EXPOSED TO AND DEVELOPING UNDERSTANDING	EXPOSED TO AND DEFINITELY DOES THIS
My child knows how to turn on the camera.				
My child knows how to zoom with the camera.				
My child knows how to push the button to take a picture.				
My child asks to see pictures after they have been taken.				
My child knows how to view pictures on the camera.				
My child knows how to delete pictures on the camera.				

33. If you have any additional comments regarding your child's exposure, development or use of digital technology, please share them here.

Please return in your child's school bag
 or to the iWrite envelope at Ms. Margaret's desk.

Thank you for taking the time to complete this questionnaire!

iWrite!

APPENDIX C

PILOT PARENT INTERVIEW GUIDE FOR PARENT QUESTIONNAIRE

Procedure:
The interview will be conducted at the school. This interview session will take place before

August 15, and last approximately 5 minutes. Parents of West End Play School children will

be approached during drop off or pick up, and asked to participate in piloting this

questionnaire. Parents of Play School students will be targeted by soliciting survey takers

during Play School drop off and pick up times (9:00 am and 2:30 pm), ensuring that there

will not be overlap with students in the targeted DS 4's classroom. If necessary, the Parent

Questionnaire may be modified to better reflect existing practices or to make it more

accessible to parents. The purpose of the questionnaire, which is to collect data about

children's literacy and technology practices at home, will not change.

Follow Up Questions

Were there any confusing questions? What was unclear?

Did you feel that choices offered on the tables were appropriate and matched your child's
activities?

Is there any information about the way that your child interacts with technology that this
survey did not address?

Do you have any other comments about this survey?

APPENDIX D

TEACHER INTERVIEW GUIDE

Procedure:
The two interviews will be conducted at the school in a location chosen by the teacher.

Both interview sessions will take approximately 30 – 40 minutes. Each teacher will be

interviewed separately during the second week of the study, and again during the last week

of the study.

These interviews will follow a discussion about the purpose of this research. A semi-

structured, in-depth interview format will be used to obtain teacher views about: 1)

message making practices by 4 year old children, 2) the use of technology in the classroom,

and 3) children's interest in both making messages and technology. The questions

provided below will be used to initiate conversation on the bolded topics, with follow-up

questions used to probe further on the topics/examples provided by the teachers. All

follow-up questions will apply to the three broad topics listed above. For the second

interview, teachers will be asked to bring examples of children's written message making

products.

Interview #1
Tell me about the written products that children create in your classroom. What do they
look like?

How are they created? What are the ways that you see children composing in your
classroom? Do you see children writing? Describe this. Do you see children drawing?
Describe this.

What types of written message making activities do you see children engaging in most
often?

What do you hope the students will leave your classroom being able to do with regards to
written message making?

Tell me about your whole group letter writing activity. What do you do as the teacher? What do the children do? Do they hold the pen? Dictate content?

Are there certain children who seem more interested in writing? In letter writing? In creating products? In drawing?

How do you use the class laptop? When do you use it? For what purposes? Do children ever see you using it? Are they aware of your usage?

How do you use the digital camera? When do you use? For what purposes? Do children ever use it?

Are there ways that you would like to see technology being used in your classroom?

What types of technology experiences do you hear children engaging in or talking about?

Interview 2

Can you tell me about the products that you brought with you? How were they created? By whom? Why did you pick them? Is this typical of this child? This class? How so?

What types of written message making activities do you see children engaging in most often?

How has the inclusion of email on iPads impacted your activity in your classroom? What changes have you noticed?

What changes have seen over the last 3 months with regards to children's written message making practices? Can you give specific examples?

PARENT INTERVIEW GUIDE

Procedure:
The interview will be conducted at the school or in a location chosen by the parent or

primary caregiver. This interview session will take place during week 9 through week 12,

and last approximately 30 - 40 minutes.

A semi-structured, in-depth interview format will be used to obtain information about

children's use of print resources and digital technologies. The questions provided below

will be based on information gathered from the Parent Questionnaire, and will be used to

initiate conversation, with follow-up questions used to probe further.

Interview Questions

Your child has been sending you email messages. How has that been going at home? Tell
me about your experiences.

Have you seen a change in your child's interest in written message making at home? With
print products? Using technology? Tell me about this.

Talk to me about your child's exposure and knowledge of email. Prior to this study, have
they ever emailed? Do you talk about emailing or email in front of your child? What do you
think your child knows about sending messages via email?

How would you categorize your child's use of print materials for making written messages?
Is this something that he/she chooses to do on a regular basis for fun? Something that you
encourage your child to do?

Tell me about your child's interest in using technology? What has been your response?

Clarification questions:
If the teacher-researcher has any clarification questions regarding the Parent
Questionnaire, these will be asked first. For example, I see that you wrote ___. Does this
mean ___?

Questions based on Parent Questionnaire:

Ask if the parent checked boxes on Question 20.
Question 20: What types of messages do you create or receive in your home? Check all that apply in the "Parent Composes" and "Parent Receives" column. Then also check any that your child helps compose or receives. It may be that your child creates some things independently, and some things with help. Both instances would be considered "Child Composes".

Tell me more about how you and your child compose messages. On the Parent Questionnaire you said that you _____ (insert appropriate statement). Can you tell me what this looks like.   How is your child involved?

Ask if the parent answered either Question 21 or 22.
Question 21: If you own a smartphone and your child uses it, explain the child's usage. What types of activities does your child do with it?, When does your child use it?, Where does your child use it?
Question 22: Check off other mobile technology that you own. If your child uses it, explain the child's usage. What types of activities does your child do with it?, When does your child use it?, Where does your child use it?

Tell me more about your child's use of _____ (insert appropriate technology). What does a typical interaction look like?

Ask if the parent checked boxes on questions 30, 31 and 32.
Questions 30, 31, & 32: Think about your child's knowledge of creating messages using technology through their interactions with technology and observations of adults using these tools. Check the box that best represents their exposure and development with regards to emails, texts and digital photography.

Tell me more about how you and your child use technology to send messages. What does it look like? How is your child involved?

Ask if the parent checked boxes on question 24.
Question 24: Check any learning software you have purchased to help your child develop as a reader or writer.

Tell me about the ways that your child engages with learning software. What programs does your child use? How is your child involved with these activities?

Ask if the parent answered Question 26 or 27.
Question 26: There are software programs available on computers and other devices like smartphones that allow your child to draw, paint, or compose with stickers and objects. Does your child use any of these programs?
Question 27: If your child uses these programs, describe what they like to do with it.

What composing programs does your children use? What does a typical interaction look like?

IWRITE ACTIVITY PLANS

iWrite Activity #1
Exploration

Purpose:
To assess children's knowledge about and ability to use touchscreen technology.
To assess children's knowledge about and ability to use the Sketches2 software.
To explore the Sketches2 app.
To send product via email to a parent.

Materials:
iPads (one per child) with Sketches2 application.

Procedures:
Gather a small group of student. Ask students, "What is an email?" Accept responses from students. Students will then be shown an iPad. Students will be asked if they have ever seen these item. Ask students, *"What do you do with them? How do they work?"* Explain that it is an iPad, and that we will be using an iPad at the center sometimes this year to make and send messages. Demonstrate the center button and how to navigate touchscreen by swiping finger through think aloud. Select Sketches2 app and showcase different backgrounds and tools (including drawing, typing, printing, adding stickers, and erasing). Once complete, demonstrate emailing product to iWriteAtSchool@gmail.com. Example of talking points:

"To use this, you just use the pad of your finger and slide or tap, like this. I want to use the Sketches2 program, so I will tap on this picture right here. It has a star in the middle of it. I will click the plus up at the top to get a new screen, so I can begin to work. There are different choices you can make. If you click on the crayon, you can see different colors, different sizes, different brushes and more. I will pick red, and then decide how thick I want my line to be. Then I can click the brush icon to pick the type of brush I want. I want to thick line, so I'll pick this one. The others are lighter. See that pink picture? That's an eraser, we can use that later. Now I can try out my line and see if I like it. Oops I made a mistake. Let me tap on the pink eraser to fix that. Then I can tap on the T to choose from letters. I think I'll try to type my favorite letter, E. I just tap where I want the letters to be and then I can tap on whatever letters I want. After I'm done I can move it if I'd like, or even spin it around. One more thing that I can do is add pictures. I just tap on the circle and square right here. Then I pick the category of shapes I am interested, there are basic shapes, sports, and more. It's my mom's birthday soon, so I think I'll pick a birthday cake from the party section so I can make her a message. That's a big cake, I'll squeeze it like this with two fingers to make it smaller. Now I think I'm going to draw some candles on the cake. Her name is Nancy, so I will put a "N" here for her name. Great, I think I am all done. When I'm done I can tap on this arrow to email it. Then I tap on the envelope, and I'll get an email message. I have to tell the computer where to send the email, so I am going to type in my name E-M-I. . look, it says "Emily Mom", that's her!

I can tap on it and then I'll send this button that says "Send". Now I have emailed it to my mom. When you are finished with your work, you can send it to your mom or dad if you'd like. I'm sure they would enjoy seeing what you made."

When children express interest in emailing, researcher will oversee process so that correct email address is selected. Researcher will ask student to read message, and will type child's dictation into the body of the email message. The first email sent to parents will have an automatic message at the end that says: "*This email was generated by your child through the iWrite project. Your response is greatly appreciated. If you respond to this email, it will be received at school where your child can read the email with the help of the iWrite researcher, Emily Bigelow.*" Once email responses have been received, children will be issued an invitation to respond. Future emails will have an automatic message at the end that says "*This message was generated by your children through the iWrite project. Your response is appreciated.*"

Invitation to Respond
Gather a student or a small group of students who has received an email response. Explain that they have an email. *"Sometimes when you send emails, people respond by writing an email back to you. Look, my mom wrote me an email back. Remember how I sent her a birthday message? The email she sent says, "Thank you for the birthday card. Love, Mom." Now, if I want to, I could write her a message back. You have received an email. I would like to show you your email, and then invite you to write back."* Help each child find their email response, and read aloud to them. Then invite them to write an email back. "*If you would like to, you can write an email back to your parent. To do that, you click this button here, that means "reply" and then you can push the buttons to type a message. When you are all finished, you should press this button that means "send", and it will be sent to your parent's computer."*

iWrite Activity #2
Self Portrait
Purpose:
To assess children's knowledge about and ability to use touchscreen technology.
To assess children's knowledge about and ability to use the Sketches2 software.
To make a self-portrait and write name with Sketches2 app.
To send product via email to a parent.

Materials:
iPads (one per child) with Sketches2 application.

Procedures:

Pass out iPads to students for exploring in Sketches2 application. After students have created and emailed a product, ask them to draw a picture of themselves, and then write or type (or both) their names. Again, make sure to email these products.

"Now that you have an idea about how Sketches2 works, I'd like you to draw a picture of yourself. Think about what you look like, and use different colors and shapes." I think it would be fun to send this to your parents, would you like to do that?

When children express interest in emailing, researcher will oversee process so that correct email address is selected. Researcher will ask student to read message, and will type child's dictation into the body of the email message. Each email will have an automatic message at the end that says "*This message was generated by your children through the iWrite project. Your response is appreciated.*" Once email responses have been received, children will be issued an invitation to respond.

Invitation to Respond
As responses are received from family members, individual students will be invited to reply either through the creation of a new Sketches2 product, or through typing a response in the Mail program.

iWrite Activity #3
Classroom Message

Purpose:
To compose message using Sketches2 software.
To send product via email to a parent.

Materials:
iPads (one per child) with Sketches2 application

Procedures:
Gather a small group of students. Remind students about the last time they used the iPad. *"Last time we learned how to use the Sketches2 app to draw self-portraits. And then we emailed them to your parents. I was thinking that maybe today we could think about writing messages to them. Remember yesterday when we (insert observed classroom activity). I am going to email my mom to tell her about that. What would you say to your parents in a message?"* Discuss potential messages to parents.

Hand out iPads, remind students procedures as necessary for composing and emailing. Students should be offered the opportunity to create at least one message and email to a parent.

When children express interest in emailing, researcher will oversee process so that correct email address is selected. Researcher will ask student to read message, and will type child's dictation into the body of the email message. Each email will have an automatic message at the end that says "*This message was generated by your children through the iWrite project. Your response is appreciated.*" Once email responses have been received, children will be issued an invitation to respond.

Invitation to Respond

As responses are received from family members, individual students will be invited to reply either through the creation of a new Sketches2 product, or through typing a response in the Mail program.

iWrite Activity #4
Classroom Message with Photos

Purpose:
To take a picture of a classroom activity.
To compose a message either based on a photograph (typing on the Mail program) or incorporating the photograph (composing using the Sketches2 application).
To send product via email to parent.

Materials:
iPads (one per child) with Sketches2 application and Mail program.
Digital camera

Procedures:
Day #1
During whole group time, introduce the idea of taking pictures of important events to help remember things we want to write in our daily letter or things we want to write letters or send emails about. Explain the way the digital camera works and classroom rules for camera use. *"The digital camera has a small computer inside of it, so it can keep many pictures at once. When you see something that you might want to write about later, ask your teacher if you can use the camera to take the picture. Yesterday I took a picture of (insert classroom activity observed) because I wanted to remember it."* Encourage camera use that day, and in the following days.

Day #2
Gather a small group of students who have taken pictures with the camera. Introduce the two ways to write a message about the photo. *"There are two ways that we can share messages with our photos. First, you can use Sketches2 and import the photo into your writing. (Model this method.) Or, you can use the mail program, and type a message like this and then attach the picture to your typing. (Model this method.)"* Allow students to select one method and send a message about their picture to a parent. Model sending a message to my mom regarding the picture I took.

When children express interest in emailing, researcher will oversee process so that correct email address is selected. Researcher will ask student to read message, and will type child's dictation into the body of the email message. Each email will have an automatic message at the end that says "This message was generated by your children through the iWrite project. Your response is appreciated." Once email responses have been received, children will be issued an invitation to respond.

Invitation to Respond

As responses are received from family members, individual students will be invited to reply either through the creation of a new Sketches2 product, or through typing a response in the Mail program.

PRODUCT CODES

Final Product Codes

Code	Description	Example
Visual Codes		
Color – single color	When one color is used in a document for drawing, typing or writing (excluding photo colors)	
Color – multicolor	When more than one color is used for drawing, typing or writing (excluding photo colors)	
Images – Hand drawn	When child draws with finger (can be "drawing" or scribbles)	
Images – Stamps	Stamps used from stamping tool in Sketches2	
Images – Photograph	Photograph	
Print – Handwritten	When the print is handwritten	
Print – Typed	When the print is typed	
Writing – Generating	A finite number of symbols are used to generate new meanings	
Writing – Inventory	Lists the letters or words that are known	
Writing – Flexibility		
Writing – Contrastive		
Writing – Copying	When a child copies text in the writing	
Writing – Space		
Message Content Codes		
Purpose: Ask a Question	When a child poses a question in the message.	"Can you show this to Jonah?"
Purpose: Describe a Picture	When a child describes the product (either a photo or a multimodal product)	"I made a house."

Purpose: Express Love	When a child expresses love	"I love you mom so much."
Purpose: Share Information	When a child makes a statement that shares information.	"I am building a spaceship with Xander."
Message: None	No message attached to the product	
Message: General	Message assigned to the product is general, could be for a wide audience.	"I hope you have a good day at work."
Message: Specific	Message assigned to the product is specific, intended for a certain audience or with specific details.	"It is a racetrack from Sam and Lightning."
Model: Follows	When there is a model, the child's product has similar elements (e.g. the product has a birthday cake)	
Model: Does Not Follow	When there is a model, the child's product has no similar elements (e.g. the picture has a birthday cake)	
Classroom Practice		
Note Language	When child uses note-writing conventions typically used in classroom note-writing time (e.g. Dear Mom and Dad, DS 4 Kids)	"Dear Mom and Dad"
Names	When a name is used (can be the child's, a sibling, parent, teacher, friend, etc)	"Avery."

APPENDIX H

PROCESS CODES

Final Process Codes

Code	Description	Example of Comments or Actions
Screen Interactions		
Changing Colors	When child asks for help or talks about changing colors	"I can't get pink." Or "I want green."
Drawing	When a child draws on the screen	Ben draws a green line on the screen.
How to use your fingers	Discussion about using fingers properly on the screen	Using pad of your finger instead of knuckles or fingernails.
Photos	Discussion about or time spent looking at photos.	"Look, I found me!" or Child slides through photos.
Repetitive Play	When a child is repeating an action in a playful manner.	Ben colored over the whole screen, and then pressed undo to clear it. Then he did this again and again.
Resizing/pinching	When a child resizes an image and/or talks about it by pinching it.	"I am using my pinchers." Or child pinches image on screen.
Stamp	When children stamp or talk about stamping.	"I need the Easter egg." Or child puts pumpkin stamps on screen.
Undo	When a child presses the undo button or talks about it.	"How do I make that go away?" or Child presses undo button over and over.
Typing: One hand	When child types using 1 hand.	
Typing: Two hands	When child types using 2 hands	
Typing: Hold down keys	When child holds down keys resulting in a string of repeated letters	
Typing: Talking while typing	When a child talks about letters/sounds as he/she types	
Typing: Grown Up	When a child places 2 hands on the keyboard and types quickly	
Typing: Hunt and peck	When a child uses one finger and looks for specific letters.	

Child Generated

Support: How do I?	When a child asks a question regarding how to do something.	"How do I change color?"
Support: Spelling	When a child asks a question about how to spell a word.	"How do you spell alien?"
Support: Tech support	When a child asks for tech support.	"The button doesn't work" or "My page went away."
Support: Button	When a child needs help finding a button or is curious about an existing button.	"Where is the N?" or "What does this black button do?"
Comments on drawing	When child comments on drawing	"Look! I made me!"
Comments on letters	When child comments on produced letters	"Look! I wrote Zuri and Amira."

Researcher Generated

What is email?	Discussion based on the question, "What is email?"	
What is iPad?	Discussion based on the question, "What is an iPad?"	
Birthday Model	When I model sending a birthday message to my mother	"It's almost my mom's birthday, so I am going to make a birthday message for her."
Message generation	Discussion that supports generation of messages.	"What message would you like to put on your email?" or "Can you read me what you typed?"
Modeling	When I show a child how do to something and I am the only one interacting with the screen.	"Can I show you how to do something?"
Encouragement	Encouraging comments made regarding child's process	"You are doing a great job typing."
Inquiring about a child's work	Asking a child to talk about writing, typing or drawing	"Tell me about what you made."
Invitation	Invitation to compose a message for a specific iWrite activity.	"I was thinking it would be fun if you drew a picture of yourself and we could email it to your parents."
Talking it through	When I verbally guide a child through the steps, occasionally pointing to the screen as needed.	"Do you remember how to send the email? First you need to press that white envelope."

General Conventions

General Conversations		
About Parents	Discussion about the child's parents	"I want to send this to my mom." or "Your mom will love this!"
Classroom practice	When comment is made connecting to classroom practice	"You found an L just like Ms. J talked about in circle time."
Name talk	Comments about the child (or other's) names	"I am going to write my name?" or "I need an N for my name."
Peer interaction	Instances when the children at the center look at each other's iPads or comment on each other's work	Zuri leans over to look at Larkin's screen. Or "I have pink, too!"
Unexpected event	When an unanticipated event occurs.	"Can you send this email to my pets?"

REFERENCES

Aimonetti, J. (2012). San Diego schools spend $10M on iPads for students [web log post]. Retrieved from http://reviews.cnet.com/8301-31747_7-57460699-243/san-diego-schools-spend-$10m-on-ipads-for-students/

Albers, P., Frederick, T., & Cowan, K. (2009). Features of gender: An analysis of the visual texts of third grade children. *Journal of Early Childhood Literacy*, 9(2), 234-260.

Banister, S. (2010). Integrating the iPod Touch in k-12 education: Visions and vices. *Computers in the Schools*, 27(2), 121-131.

Barton, D. & Hamilton, M. (1998). *Local Literacies: Reading and Writing in One Community*. New York: Routledge.

Battenberg, J. & Mebler, J. (1989). TouchScreen versus keyboard: A comparison of task performance of young children. *Journal of Special Education Technology*, 10(1), 34-28.

Bearne, E. (2009). Multimodality, literacy and texts: Developing a discourse. *Journal of Early Childhood Litearcy*, 9(2), 156-187.

Bearne, E., Clark, C., Johnson, A., Manford, P., Motteram, M. & Wolstencroft, H. (2007). *Reading on screen*. Leicester: UKLA.

Becker, H. (1993). How computers are used in the United States schools: Basic data from the IEA computers in education survey. *Journal of Educational Computing Research*, 7(4), 385-406.

Berson, I. R., & Berson, M. J. (Eds.). (2010). *High-tech tots: Childhood in a digital world*. Charlotte, NC: Information Age Publishing.

Bigum, C. (2002). The knowledge producing school: Beyond IT for IT's sake in schools. *Professional Voice*, 2(2).

Bissex, G. (1980). *Gnys at wrk: A child learns to read and write*. Cambridge, MA: Harvard University Press.

Björkvall, A. & Englom, C. (2010). Young children's exploration of semiotic resources during unofficial computer activities in the classroom. *Journal of Early Childhood Education*, 10(3), 271-293.

Bloodgood, J. W. (1999). What's in a name? Children's name writing and literacy acquisition. *Reading Research Quarterly*, 34(3), 342-367.

Bloom, P. (2000). *How children learn the meaning of words*. Cambridge, MA: MIT Press.

Bowen, B. A. (1994). Telecommunications networks: Expanding the contexts for literacy. In C. L. Selfe & S. Hilligoss (Eds.), *Literacy and computers: The complications of teaching and learning with technology* (pp. 113-129). New York: Modern Language Association.

Brenneman, K., Massey, C. & Machado, S. (1996). Young children's plans differ for writing and drawing. *Cognitive Development*, 11(3), 397-419.

Brenner, J. (2012). Pew Internet: Mobile. Retrieved from Pew Internet & American Life Project: http://pewinternet.org/Commentary/2012/February/Pew-Internet-Mobile.aspx

Buckleitner, W. (2009). What should a peschooler know about technology? *Early Childhood Today*. Retrieved from: www2.scholastic.com/browse/article.jsp?id=3751484.

Calvert, S. L., Rideout, V. J., Woolard, J. L., Barr, R. F. & Strouse, G. A. (2005). Age, ethnicity, and socioeconomic patterns in early computer use: A national survey. *American Behavioral Scientist*, 48(5), 590-607.

Carey, A. R. & Worthington, K. (1997, November 6). Elementary computing. *USA Today*, p. 4D.

Cappello, M. & Hollingsworth, S. (2008). Literacy inquiry and pedagogy through a photographic lens. *Language Arts*, 85(6), 442-449.

Carrington, V. (2005a) New textual landscapes, information and early literacy. In J. Marsh (Ed.) *Popular culture, new media and digital literacy in early childhood*, pp. 13–27. London, England: Routledge Falmer.

Carrington, V. (2005b). The uncanny, digital texts and literacy. *Language and Education*, 19(6), 467-482.

Cazden, C. (1988). *Classroom discourse: The language of teaching and learning*. Portsmouth, NH: Heinemann.

Chaplin, D., & Puma, M. J. (2003). *What "extras" do we get with extracurriculars? Technical research considerations*. Retrieved from Urban Institute website: http://www.urban.org/publications/410862.html.

Ching, C. C., Wang, X. C., Shih, M., & Kedem, Y. (2006). Digital photography and journals in a kindergarten-first-grade classroom: Toward meaningful technology integration in early childhood education. *Early Education and Development*, 17(3), 347-371

Chiong, C. & Shuler, C. (2010). *Learning: Is there an app for that? Investigations of young children's usage and learning with mobile devices and apps*. New York: The Joan Ganz Cooney Center at Sesame Workshop.

Chung, Y. & Walsh, D. J. (2006). Constructing a joint story-writing space: The dynamics of young children's collaboration at computers. *Early Education and Development*, 17(3), 373-420.

Clay, M. (1969). Reading errors and self-correction behaviour. *British Journal of Educational Psychology*, 39, 47-56.

Clay, M. (1971). Research on language and reading in Pakeha and Polynesian groups. In D. K. Brachen & E. Malmquist (Eds.), *Improving reading ability around the world*. Newark, DE: International Reading Association.

Clay, M. (1975). *What did I write?* London, England: Heinemann.

Cohen, R. (2005). An early literacy telecommunication exchange pilot project: the MMM project. *Educational Media International*, 42(2), 109-115.

Common Sense Media. (2011). *Zero to 8: Children's media use in America. A Common Sense Media research study*. Retrieved from Common Sense Media website: www.commonsensemedia.org/research/zero-eight-childrens-media-use-america

Couse, L. J. & Chen D. W. (2010). A tablet computer for young children: Exploring its viability for early childhood education. *Journal of Research on Technology in Education*, 43(1), 75-98.

Christakis, D. A., & M. M. Garrison. (2009). Preschool-aged children's television viewing in child care settings. *Pediatrics,* 124(6), 1627–1632.

Coppe, C. & Bredekamp, B. (Eds.). (2009). *Developmentally Appropriate Practice in Early Childhood Programs*. Washington, DC: National Association for the Education of Young Children.

Crafton, L. K., Brennan, M., Silvers, P. (2007). Critical inquiry and multiliteracies in a first-grade classroom. *Language Arts*, 84(6), 510-518.

Daiute, C. (1989). Play as thought: Thinking strategies of young writers. *Harvard Educational Review*, 59(1), 1-23.

Daiute, C. (1993). Youth genres and literacy: Links between sociocultural and developmental theories*. Language Arts*, 70, 402-416.

Daiute, C. & Dalton, B. (1993). Collaboration between children learning to write: Can novices be masters? *Cognition and Instruction*, 10(4), 281-333.

Dalrymple, J. (2012, February 17). iPad improves Kindergartners literacy scores [Web log post]. Retrieved from http://www.loopinsight.com/2012/02/17/ipad-improves-kindergartners-literacy-scores/

Davidson, C. (2011). Seeking the green basilisk lizard: Acquiring digital literacy practices in the home. *Journal of Early Childhood Literacy*, 12(24), 24-45.

Dickinson, D. K. (1986). Cooperation, collaboration, and a computer: Integrating a computer into a first-second grade writing program. *Research in the Teaching of English*, 20(4), 357-378.

Dodge, D. T. (2010). *The Creative Curriculum for Preschool*. New York: Teaching Strategies.

Dodge, D. T., Heroman, C. Colker, L. J. (2002). *The Creative Curriculum for Preschool, 4th edition*. New York: Teaching Strategies.

Dresang, E. T., & McClelland, K. (1999). Radical change: Digital age literature and learning. *Theory Into Practice*, 38(3), 160-167.

Dyson, A. H. (1985). Research currents: Writing and the social lives of children. *Language Arts*, 62, 632-639.

Dyson, A. H. (1989). *Multiple worlds of child writers: Friends learning to write*. New York, NY: Teachers College Press.

Dyson, A. H. (2003). *The brothers and sisters learn to write: Popular literacies in childhood and school culture*. New York, NY: Teachers College Press.

Eisner, E. W. (2004). *The arts and the creation of mind*. Harrisonburg, VA: Yale University Press.

Ferreiro, E. (1986). The interplay between information and assimilation in beginning literacy. In W. H. Teale & E. Sulzby (Eds.) *Emergent literacy: Writing and reading*. Norwood, NJ: Ablex.

Ferreiro E., & Teberosky, A. (1982). *Literacy before schooling: Educational anthropology in action*. New York, NY: Holt, Rinehart and Winston.

Flewitt, R. (2011). Bringing ethnography to a multimodal investigation of early literacy in a digital age. *Qualitative Research*, 11(3), 293–310.

Gardner, H. (1980). *Artful scribbles: The significance of children's drawings*. New York: Basic Books.

Garner, R. & Gillinahm, M. G. (1996). *Internet communication in six classrooms: Conversations across time, space and culture*. Mahwah, NJ: Lawrence Erlbaum.

Gee, J. P. (1991). What is Literacy? In C. Mitchell and K. Weiler (Eds.) *Rewriting literacy: Culture and the discourse of the other* (pp. 3–11). New York, NY: Bergin and Garvey.

Gelfond, H. S. & Salonius-Paternak, D. E. (2005). The play's the thing: A clinical-developmental perspective on video games. *Child and Adolescent Psychiatric Clinics of North America*, 14(3), 491-508.

Gillen, J. & Hall, N. (2003). The emergence of early childhood literacy. In N. Hall, J. Larson & J. Marsh (Eds.) *Handbook of early childhood literacy* (pp 3-12). London, England: SAGE Publications.

Goodman, K. (1976). Miscellaneousue analysis: Theory and reality in reading. In J. Merritt (Ed.), *New horizons in reading.* Newark, DE: International Reading Association.

Graves, D. (1978). *Balance in the basics: Let them write*. New York, NY: The Ford Foundation.

Grunwald Associates. (2009). *Digitally Inclined*. Retrieved from Corporation for Public Broadcasting website: http://www.pbs.org/aboutpbs/news/20100105_grunwaldpbs.html.

Gutnick, A. L., Robb, M., Takeuchi, L., Koller, J.(2010). *Always connected: The new digital media habits of young children*. New York: The Joan Ganz Cooney Center at Sesame Workshop.

Harste, J., Woodward, V., & Burke, C. (1984). *Language stories and literacy lessons*. Portsmouth, NH: Heinemann.

Heath, S. B. (1983). *Ways with words: Language, life, and work in communities and classrooms*. Cambridge, England: Cambridge University Press.

Honan, E. (2008). Barriers to teachers using digital texts in literacy classrooms. *Literacy*, 42, 36-43.

Hu, W. (2011). Math that moves: Schools embrace the iPad. *The New York Times*. Retrieved from http://www.nytimes.com/2011/01/05/education/05tablets.html

Hyun, E. & Davis, G. (2005). Kindergartners' conversations in a computer-based technology classroom. *Communication Education*, 54(2), 118-135.

International Society for Technology in Education (ISTE). 2007. *NETS for Students 2007 Profiles*. Washington, DC: Author. www.iste.org/standards/nets-for-students/nets-for-students-2007-profiles.aspx#PK-2

Jewitt, C. (2002). The move from page to screen: The multimodal reshaping of school English. *Visual Communication*, 30(1), 47-63.

Jewitt, C. (ed.) (2009). *The Routledge handbook of multimodal analysis*. New York: Routledge.

Jewitt, C. (2008). *Technology, literacy, learning: A multimodality approach*. New York: Routledge.

Jones, I. (1998). Peer relationships and writing development: A microgenetic analysis. *British Journal of Educational Psychology*, 68(2), 229-241.

Jones, I. (2003). Collaborative writing and children's use of literature language: A sequential analysis of social interaction. *Journal of Early Childhood Literacy*, 3(2), 165-168.

Kaufman, M. (2012). iPad invading the classroom [web log post]. Retrieved from http://www.ipadinschools.com/

Kerawalla, L. & Crook, C. (2002). Children's computer use at home and at school: Context and continuity. *British Educational Research Journal.* 28(6), 751-771.

Kellog, R. (1970). *Analyzing Children's Art*. Palo Alto, CA: Mayfield Publishing.

Kress, G. (1997). *Before writing: Rethinking the paths to literacy*. London, England: Routledge.

Kress, G. (1998). Visual and verbal modes of representation in electronically mediated communication: The potentials of new forms of text. In I. Snyder (Ed.), *Page to screen: Taking literacy into the electronic era*. (pp. 55-79). New York, NY: Routledge.

Kress, G. (2000). Multimodality. In B. Cope & M. Kalantiz (Eds.), *Multiliteracies: Literacy learning and the design of social futures* (pp. 182-202). London, England: Macmillan.

Kress, G. (2003). *Literacy in the new media age*. London, England: Routledge.

Kress, G. (2010). *Multimodality: A social semiotic approach to contemporary communication*. London, England: Routledge.

Kress, G., & van Leeuwen, T. (1996). *Reading images: A grammar of visual design*. London, England: Routledge.

Kress, G., Jewitt, C., Ogborn, J., & Tsatasarelis, C. (2001). *Multimodal teaching and learning: Rhetorics of the science classroom*. London: Continuum.

Kurcirkova, N., Messer, D., Sheehy, K., & Flewitt, R. (2013). Sharing personalized stories on iPads: a close look at one parent-child interaction. *Literacy*.

Labbo, L. D. (1996). A semiotic analysis of young children's symbol making in a classroom computer center. *Reading Research Quarterly*, 31(4), 356-385.

Labbo, L. D., Montero, M. K., & Eakle, A. J. (2002). Digital Language Experience Approach (D-LEA): Using digital photographs and creativity software as a Language Experience Approach (LEA) innovation. *Reading Online*, 5(8). Retrieved from http://www.readingonline.org/electronic/labbo2/

Labbo, L. D., Reinking, D., & McKenna, M. C. (1998). Technology and literacy education in the next century: Exploring the connection between work and schooling. *Technology And Literacy*, 73(3&4), 273-289.

Lancaster, L. (2001). Staring at the page: The function of gaze in a young child's interpretation of symbolic forms. *Journal of Childhood Literacy*, 1, 131-152.

Lankshear, C., & Knobel, M. (2003). New technologies in early childhood research: A review of research. *Journal of Early Childhood Literacy*, 3, 59-82.

Larson, J. (1995). Talk matters: The role of pivot in the distribution of knowledge among novice writers. *Linguistics and Education*, 7(4), 277-302.

Levin, D. E., & Rosenquest, B. (2001). The increasing role of electronic toys in the lives of infants and toddlers: Should we be concerned? *Contemporary Issues in Early Childhood*, 2(2), 242-246.

Levin, I. & Aram, D. (2004). Children's names contribute to early literacy: A linguistic and social perspective. In D. Ravid & H. Bat-Zeev Shyldkrot (Eds.), *Perspectives on language and language development* (pp. 219-239). Dordrecht, The Netherlands: Kluwer.

Levy, R. (2009). 'You have to understand words. . . but not read them': Young children becoming readers in a digital age. *Journal of Research in Reading*, 32(1), 75-91.

Levy, R. (2011). Young children, digital technology, and interactiong with text. In M. Thomas (Ed.), *Deconstructing digital natives* (pp. 151-166). New York: Routledge.

Lieberman, D. A., Fisk, M. C., & Biely, E. (2009). Digital games for young children ages three to six: From research to design. *Computers in the Schools*, 26(4), 299-313.

Lindahl, M. G. & Folkesson, A. (2012). Can we let computers change practice? Educators' interpretations of preschool tradition. *Computers in Human Behavior*, 28(5), 1728-1737.

Lisenbee, P. (2009). Whiteboards and websites: Digital tools for the early childhood curriculum. *Young Children* 64(6), 92-95.

Lomangino, A. G., Nicholson, J., & Sulzby, E. (1999). The influence of power relations and social goals on children's collaborative interactions while composing on computer. *Early Childhood Research Quarterly*, 14(2), 197-228.

Lynch, S. A., & Warner, L. (2004). Computer use in preschools: Directors' reports of the state of the practice. *Early Childhood Research & Practice*, 6(2). Retrieved from http://ecrp.uiuc.edu/v6n2/lynch.html

McManus, C. (2011). Selling super fast for holidays: LeapPad Explorer. Retrieved from http://news.cnet.com/8301-17938_105-57339667-1/selling-super-fast-for-holidays-leappad-explorer/

Marsh, J. (2006). Emergent media literacy: Digital animation in early childhood. *Language and Education*, 20(6), 493-506.

Marsh, J., Brooks, G., Hughes, J., Ritchie, L., Roberts, S., & Wright, K. (2005). *Digital beginnings: Young children's use of popular culture, media and new technologies.* University of Sheffield, Literacy Research Centre.

Martens, P. A. (1999). "Mommy, how do you write Sarah?" The role of name writing in one child's literacy. *Journal of Research on Childhood Education*, 14(1), 5-15.

Matthews, J. & Seow, P. (2007). Electronic paint: Understanding children's representation through their interactions with digital paint. *Journal of Art Design*, 26(3), 251-263.

Mavers, D. (2007). Semiotic analysis: A young child's email exchange as design. *Journal of Early Childhood Literacy*, 7(2), 155-176.

Mavers, D. (2009). Student text-making as semiotic work. *Journal of Early Childhood Literacy*, 9(2), 141-155.

McKenna, M. C., Labbo, L. D., & Reinking, D. (2006*). International handbook of literacy and technology (Volume II)*. Mahwah, NJ: Lawrence Erlbaum Associates.

McManis, L.D. (2012). *Achieving School Readiness & Success Using Tablets and Content: iStartSmart Mobile by Hatch Research Basis*. Retrieved from Hatch Innvocations website: http://hatchearlylearning.com/research/publications/early-childhood-field/

McManis, L. D. & Gunnewig, S. B. (2012). Finding the education in educational technology with early learners. *Young Children*, 67(3), 14-24.

McTavish, M. (2009). "I get my facts from the internet": A case study of the teaching and learning of information literacy in in-school and out-of-school contexts. *Journal of Early Childhood Literacy*, 9(1), 3-28.

Merchant, G. (2005). Barbie meets Bob the Builder at the workstation: Learning to write on screen. In J. Marsh (Ed.). *Popular culture, new media and digital literacy in early childhood* (pp. 183-200). New York, NY: Routledge.

Merchant, G. (2008). Digital writing in the early years. In: Coiro, J, Knobel, M, Lankshear, C, and Leu, D (Eds.), *Handbook of Research on New Literacies*. New York: Lawrence Erlbaum.

Michael Cohen Group & USDOE (2011). *Young Children, Apps & iPad*. New York, NY: Michael Cohen Group.

Milman, N. B., Carlson-Bancroft, A., Boogart, A. V. (2012). *iPads in a PreK-4th Independent School – Year 1-Enhancing Engagement, Collaboration, and Differentiation across Content Areas*. Paper presented at the International Society for Technology in Education Conference, San Diego, CA.

Moje, E. B. (2009). A call for new research on new and multi-literacies. *Research on the Teaching of English*, 43(4), 348-362.

Moran, C. (1991). We write, but do we read? *Computers and Composition*, 8, 51-61.

Murray, C., & Sloan, J. (2008). *iPod touch research report*. Retrieved from the Victoria Department of Education and Early Childhood Development website: http:// https://www.eduweb.vic.gov.au/edulibrary

National Association for the Education of Young Children (NAEYC) & The Fred Rogers Center for Early Learning and Media. (2011). *Technology and Interactive Media As Tools in Early Childhood Programs Serving Children from Birth through Age 8*. Washington, DC: NAEYC.

National Center for Educational Statistics (NCES). (2005). *Internet access in U.S. public schools and classrooms*. 1994-2005. Retrieved August 6, 2008 from nces.ed.ov/pubs2007/2007020.pdf.

National Early Literacy Panel. (2008). *Developing early literacy: Report of the National Early Literacy Panel.* Washington, DC: National Institute for Literacy.

New London Group. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review*, 66(1), 60-92.

No Child Left Behind Act of 2001. (2002). PL No. 107-110, 115 Stat. 1425.

Pasnik, S. & Llorente, C. (2011). *A report to the ready to learn initiative: Year one context studies*. Washington, DC: Education Development Center/SRI International.

Pastor, E., & Kerns, E. (1997). A digital snapshot of an early childhood classroom. *Educational Leadership*, 55(3), 42-25.

Pelletier, J., Halewood, C., & Reeve, R. (2006). Young children's knowledge-building and literacy development through Knowledge Forum®. *Early Education and Development,* 17(3), 323–346.

Plowman, L., McPake, J., & Stephen, C. (2010). The technologisation of childhood? Young children and technology in the home. *Children and Society*, 24(1), 63-74.

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon*, 9(5), 1-6.

Read, C. (1975). *Children's categorization of speech sounds in English*. Urbana, IL: National Council of Teachers on English.

Reinking, D. (1994). Me and my hypertext: A multiple digression analysis of technology and literacy. *The Reading Teacher*, 50, 626-643.

Reinking, D. (1992). Differences between electronic and printed texts: An agenda for research. *Journal of Educational Multimedia and Hypermedia.* 1(1), 11-24.

Reinking, D. (2008). Instant messaging, literacies, and social identities: A review commentary. In J. Coiro, M. Knobel, C. Lankshear, & D. Leu (Eds.), *Handbook of research on new literacies* (pp. 1175-1186). Mahwah, NJ: Lawrence Erlbaum Associates.

Rideout, V. J., & Hamel, E. (2006). *The media family: Electronic media in the lives of infants, toddlers, preschoolers, and their parents*. Menlo Park, CA: The Henry J. Kaiser Family Foundation.

Rideout, V. J., Vanderwater, E. A., & Wartella, E. A. (2004). *Zero to six: Electronic media in the lives of infants, toddlers and preschoolers*. Menlo Park, CA: The Henry J. Kaiser Family Foundation.

Rowe, D. W. (1994). *Preschoolers as authors: Literacy learning in the social world of the classroom.* Cresskill, NJ: Hampton Press.

Rowe, D. W. (2008a). Social contracts for writing: Negotiating shared understandings about text in the preschool years. *Reading Research Quarterly*, 43(1), 66-95.

Rowe, D. W. (2008b). The social construction of intentionality: Two-year-olds' and adults' participation at a preschool writing center. *Research in the Teaching of English*, 42(4), 387-434.

Sandvik, M., Smordal, O., Østerud, S. (2012). Exploring iPads in practitioners' repertoires for language learning and literacy practices in kindergarten. *Nordic Journal of Digital Literacy*, 7(3), 204-220.

Sesame Workshop. (2007). *The media utilization study*. New York: Sesame Workshop.

Scaife, M. & Bond, R. (1991). Developmental changes in children's use of computer input devices. *Early Childhood Development and Care*, 69, 19-38.

Schickedanz, J. A. (1990). *Adam's Righting Revolution*. Portsmouth, NH: Heinemann

Schramm, M. (2012). Study: iPads improve kindergarten literacy scores [web log post]. Retrieved from http://www.tuaw.com/2012/02/20/study-ipads-improve-kindergarten-literacy-scores/

Shuler, C. (2009). *iLearn: A content analysis of the iTunes App Store's Education Section.* New York, NY: The Joan Ganz Cooney Center at Sesame Workshop.

Shuler, C. (2011). *Top Trends from KidSummit 2011* [Web log post]. Retrieved from http://www.joanganzcooneycenter.org/Cooney-Center-Blog-132.html

Siegel, M. (2006). Rereading the signs: Multimodal transformations in the field of literacy education. *Language Arts*, 84(1), 65-77.

Strauss, A. & Corbin, J. (1998). *Basics of Qualitative Research* (2nd edition). Thousand Oaks, California: SAGE Publications, Inc.

Street, B. V. (1984). *Literacy in theory and practice*. Cambridge, England: Cambridge University Press.

Street, B. V. (1995). *Social literacies: Critical approaches to literacy in development, ethnography, and education*. London: Longman.

Suhor, C. (1984). Towards a semiotic-based curriculum. *Journal of Curriculum Studies*, 16, 247-257.

Sulzby, E. (1989). Assessment of writing and of children's language while writing. In Morrow & Smith (Eds.), *Role of assessment and measurement in early literacy instruction* (pp. 83-109). Englewood Cliffs, NJ: Prentice-Hall.

Takeuchi, L. (2012). *Parent co-reading survey*. Retrieved from The Joan Ganz Cooney Center: http://www.joanganzcooneycenter.org/wp-content/uploads/2012/11/jgcc_ereader_parentsurvey_quickreport.pdf

Takeuchi, L. (2011). *Families matter: Designing media for a digital age*. New York: The Joan Ganz Cooney Center at Sesame Workshop.

Tandon, P. S., C. Zhou, P. Lozano, & D. A. Christakis. (2011). Preschoolers' total daily screen time at home and by type of child care. *Journal of Pediatrics,* 158(2), 297–300.

Teale, W., & Sulzby, E. (1986). Introduction: emergent literacy as a perspective for examining how young children become writers and readers. In W. Teale and E. Sulzby (Eds.), *Emergent Literacy* (pp. vii-xxv). Norwood, NJ: Ablex.

Tennessee Department of Education, (2004). *Tennessee Early Childhood Education Early Learning Development Standards* (TN-ELDS). Retrieved from http://www.tennessee.gov/education/ci/earlychildhood/

Treiman, R. & Broderick, V. (1998). What's in a name: Children's knowledge about the letters in their own names. *Journal of Experimental Child Psychology*, 70, 97-116.

U.S. Congress, Office of Congressional Assessment. (1995). *Teachers and technology: Making the connection*. Washington, DC: U.S. Government Printing Office.

Vasquez, V.M. & Felderman, C.B. (2013). *Technology and critical literacy in early childhood*. New York: Routledge

Verenikina, I. & Kervin, L. (2011). iPads, digital play and pre-schoolers. *He Kupu*, 2(5), 4-19.

Vygotsky, L. S. (1978). *L.S. Vygotsky, collected works: Volume 1, Problems of general psychology*. New York, NY: Plenum Books.

Walsh, M. (2008). Worlds have collided and modes have merged: Classroom evidence of changed literacy practices. *Literacy*, 42 (2), 101-108.

Wartella, E., & Richert, R. A. (2009). Special audience, special concerns: Children and the media. In. A. G. Bus & S. B. Neuman (Eds.), *Multimedia and literacy development: Improving achievement for young learners* (pp. 15-27). New York, NY: Routledge, Taylor and Francis.

West, J., Denton, K., & Germino-Hausken, E. (2000). *America's kindergarteners. Findings from the Early Childhood Longitudinal Study, kindergarten class of 1998-1999*. Washington, DC: National Center for Education Statistics.

Wilson, B. (1979). Types of child art and alternative developmental accounts: Interpreting the interpreters. *Human Development*, 40, 155-168.

Wiseman, A. M. (2003). The social construction of stories in a kindergarten classroom. *The Reading Teacher*, 56(8), 802-810.

Wohlwend, K. E. (2009). Early adopters: Playing new literacies and pretending new technologies in print-centric classrooms. *Journal of Early Childhood Literacy*, 9, 117-140.

Wohlwend, K. E. (2010). A is for avatar: Young children in literacy 2.0 worlds and literacy 1.0 schools. *Language Arts,* 88(2), 144-152.

Wollman-Bonilla, J. E. (2003). Email as genre: A beginner writer learns the conventions. *Language Arts*, 81(2), 126-134.

Wollman-Bonilla, J. E. & Werchadlo, B. (1999). Teacher and peer roles in scaffolding first graders responses to literature. *The Reading Teacher*, 52(6), 598-607.

Yost, N. (2003). *Computers, kids, and crayons: A comparative study of emergent writing behaviors*. Presented at IFIP Working Group 3.5 Conference: Young Children and Learning Technologies, held at UWS Parramatta July 2003.

Zevenbergen, R., & Logan, H. (2008). Computer use by preschool children: Rethinking practice as digital natives come to preschool. *Early Childhood Australia*, 33(1), 37-44.