Collaborative Meaning-Making among Preschoolers:

Developing Emergent Literacy through iPads

Iva Son Li

This thesis is submitted in partial fulfilment of the requirements

for the degree of Doctor of Philosophy

Department of Linguistics and English Language

Lancaster University

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Abstract

This study investigated young children's emergent literacy practices, digital literacy skills, and their developing capacities to collaborate effectively, when supported by a literacy-learning iPad app, Aniland, in a preschool setting. I used a preschooler literacy app called Aniland, which I created with the Anilab team members and with which children can choose their own animal characters, read books, and play games. I also conducted optional, semi-structured interviews with teachers and parents. This study involved 29 children aged 3-4 years old, in a private preschool in Manhattan, New York, over a period of 10 weeks.

With an ethnographic sensibility, I oversaw weekly interactions of 10-15 minutes between the children, as they used their iPads, to enrich my understanding of the cognitive and behavioural changes relevant to learning outcomes. In addition, to understand whether digital content may affect participants' offline learning, I observed the children's literacy activities in the classroom two or three times per week. I also conducted optional, semi-structured interviews with teachers and parents. For the data analysis, I applied a coding protocol to analyse the children's learning outcomes in three dimensions: cognitive processing, social processing, and communication style adapted from the 'analytical framework of peer group interaction'.

The main findings of my study were as follows: (1) Children exhibited some improvements in literacy, including in graphemes, phonological awareness, phoneme-to-grapheme correspondence, and orthographic knowledge, as they performed better over the observed time at selecting correct answers in the activity room; (2) children showed changes in social skills from dominance to collaboration and also showed instances of competition, tutoring, problem-solving, etc. over the observed time; and (3) children showed some connections between online and offline learning through extended play and conversations applying contents of the app in the classroom and, further, at home.

Keywords: emergent literacy, iPad, touch screen, peer interaction, preschool

Declaration

I hereby declare that this thesis is my own work and has not been submitted in substantially the same form for the award of a higher degree elsewhere.

Signature: Iva Son Li

Iva Son Li

Acknowledgement

During the journey of completing my PhD thesis, I received a great deal of support and assistance from many individuals. I hope I am not forgetting anyone.

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I dedicate this work to my brother and my mum who have taught me the importance of pursuing my dreams and have been cheering me up from Korea day and night. Last, I dedicate this work to the loving memory of my dad who, I am certain, would be the proudest to see how far I have come.

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List of abbreviations

AAP	American Academy of Paediatrics
BERA	British Educational Research Association
CEM	Centre for Evaluation and Monitoring
DPF	Digital Play Framework
EECERA	European Early Childhood Education Research Association
ICT	Information and Communication Technology
IRA	International Reading Association
IRB	Institutional Review Board
LEF	Linguistic Ethnography Forum
NAEYC	National Association for the Education of Young Children
NLS	New Literacy Studies
NYCDOE	New York City Department of Education
PLC	The Playful Learning Center
UNCRC	The United Nations Convention on the Rights of the Child

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CHAPTER 1: INTRODUCTION

1.1 Rationale of this thesis

We are in exciting times for education, with a variety of digital devices available as supportive learning and teaching tools. My study began with the belief that digital technology and our lives are intertwined, with many schools now utilising technology to create enhanced learning experiences for children born in the digital age (Agostini, Biase & Loregian, 2010; Flewitt, Messer & Kucirkova, 2014; Merchant, 2009). Preschool-aged children, who will be college-aged by 2030, are immersed in a digital world, surrounded by digital devices such as smartphones, touchscreen tablets, computers, augmented reality toys, and so much more (Guernsey & Levine, 2015; Palaiologou, 2014). Since the release of the first-generation iPad in April 2010 (Apple, 2010), educational games and e-books targeting young children have capitalised on the opportunity enhancing literacy skills using new technology (NPD Group, 2010). In light of these implications for childhood education, researchers have explored how educators and parents can guide children in a relatively new educational setting.

Previous studies have found that multimodal learning tools, such as sound-supported materials, provide good support for emergent literacy learning in early childhood. Children can learn phonics, phonemic awareness, and knowledge skills from such tools (Oliemat, Ihmeideh & Alkhawaldeh, 2018; Hillman & Moore, 2004). I was interested in how novel features, such as the iPad’s touchscreen, affect emergent literacy learning through literacy apps, making the iPad a unique learning tool. The motivation for my study was to investigate collaborative meaning-making activities using digital media—in this case, touchscreen devices, specifically iPads.

My motivation was to investigate the idea that digital media does not always isolate children but can, rather, promote sharing. Previous studies have shown that when young children participate in shared activities using iPads, they are motivated to interact with others and able to experience a meaningful meaning-making process by supporting one another's comprehension processes, while they read and interact with the content of the apps (Christ & Wang, 2014; Flewitt, Messer & Kucirkova, 2015).

Moreover, suggestions for literacy studies with young participants include consideration of how the digital space can affect their offline lives with regard to their social and cultural contexts (Gillen, 2014). Studying young children's individual cognitive processing while using iPads, as well as their expressions and communication with members in the classroom, will contribute to shed light on new forms of literacy and learning practices (Walsh & Simpson, 2014; Wohlwend, 2010). I hope that the findings of this study will highlight the potential for incorporating collaborative learning, playfulness, and a creative curriculum design into classrooms using iPads.

1.2 Objectives and scope of study

The objectives of this study were to understand the growth of children's educational media and how it has led to the popularity of tablets; to examine the iPad's popularity over that of other tablets; to determine the currently popular educational iPad apps, specifically those for emergent literacy skills; to investigate shared tablet use at home and school for literacy learning; and, finally, to discuss the concerns or controversies regarding learning via tablets.

This study investigated how preschoolers developed their understanding of literacy skills using an iPad app and their digital literacy skills and social skills while actively participating with their peers. I took an ethnographic approach, actively participating as a part of the community, rather than looking on as an outsider. I committed myself to interacting with the children, teachers, and parents, as the nature of my study meant observing the children up close and creating a comfortable environment for the teachers and students. The children all began with the same level of familiarity with the Aniland app, which I created with a design team in 2014, as I had released it to the iTunes store just before the study commenced. Although preschoolers comprise a rapidly growing population of mobile device users, relatively little research has been done on their collaborative use of tablets, rather than individual use. I was particularly interested in understanding how groups of children learned using iPads. Despite the tablet's popularity, research on its use for education or as a collaborative tool in school settings has not been as extensive as research focused on computers. This gap is problematic when exploring tablets as useful educational resources in a school setting.

Furthermore, this study explored literacy from a social perspective. According to the Vygotsky (1986) sociocultural theory, children's learning is characterised as social learning when the child is socially engaged and interacting with others (Vygotsky, 1986). I sought to propose useful ways of incorporating technology into emergent literacy education for young children born in the digital age, through exploration of young children's interactions while using the iPads and their expressions and communication with peers in the classroom. I investigated whether the use of iPad apps could promote collaborative meaning-making activities by placing the children into groups of two or three.

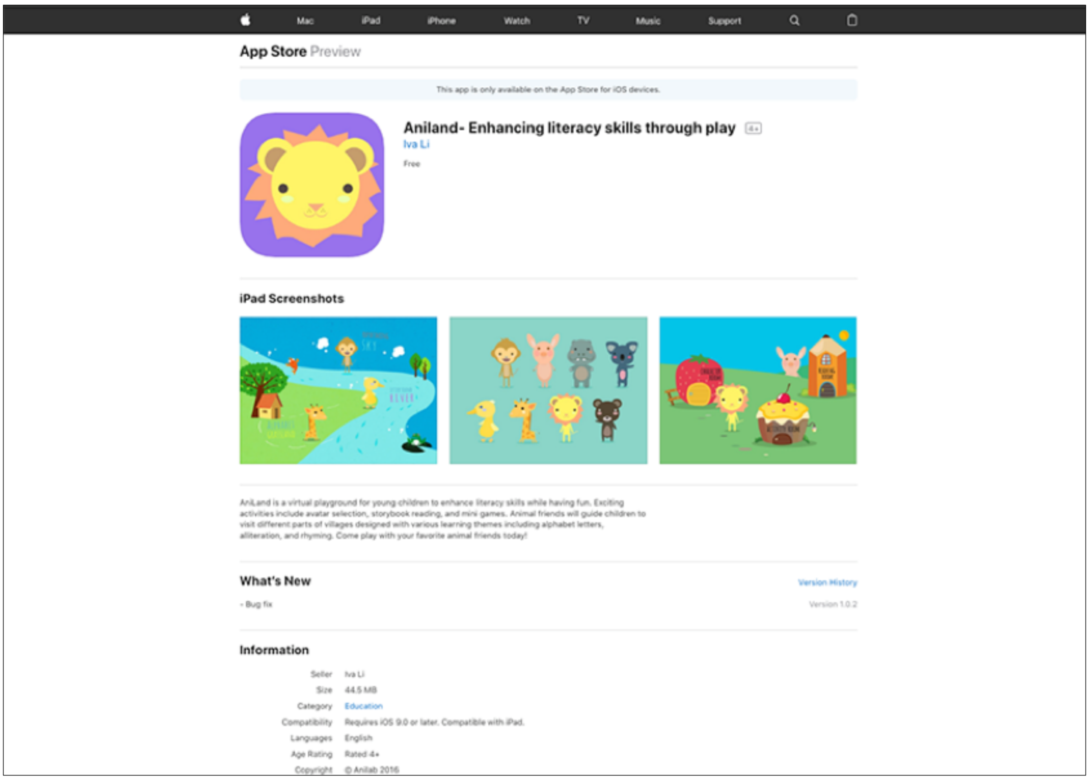
1.3 Creation of Aniland

I used the literacy-learning iPad app Aniland to explore its potential for assisting young children's emergent literacy and social skills. The purpose of this thesis was not to test the Aniland app or use it for commercial purposes. At the beginning of the study, when I was searching for a site on which to observe children's use of Aniland, the New York City Department of Education (NYCDOE)'s Institutional Review Board (IRB) requested that I revise my proposal, as it could possibly be seen as a way to test the app. In a revised proposal, I made clear that Aniland was created for free distribution, without advertisements, to be used by anyone, and I did not plan to make any profit from it. After contacting seven institutions, I finally received permission to work with a private preschool in Manhattan, New York.

I have been working as a developer and researcher for children's educational media since 2010. A year before I began my PhD study, I decided to create a free educational app for preschoolers' literacy development. I formed a small team in New York called Anilab to build the app, enlisting Leecy Li, Ziqu Zou, and Amy Tai as a graphic designer, developer, and narrator, respectively. My main role as the director of this team was to write scripts, create storyboards, produce the background music and sound effects, record voiceovers with Amy, oversee the coding and graphic art and most importantly, to ensure the quality of the literacy content by receiving feedback from teachers and parents.

With many iterations of design and content, we first published Aniland as a web app to be used on computers, later conducting a pilot study and developing the iPad app for a private preschool in Queens, New York. I observed children's interactions with the app and made changes such as altering image and button sizes, adapting the sensitivity, and correcting typos.

Finally, upon submission and after waiting a week and a half for acceptance, the first version of the app was released on iTunes in March 2015. It is categorised under children's education and it is available free, with no advertisements.



This app is only available on the App Store for iOS devices.

Aniland- Enhancing literacy skills through play

Iva Li

Free

AniLand is a virtual playground for young children to enhance literacy skills while having fun. Exciting activities include avatar selection, storybook reading, and mini games. Animal friends will guide children to visit different parts of villages designed with various learning themes including alphabet letters, alliteration, and rhyming. Come play with your favorite animal friends today!

What's New

- Bug fix

Version 1.0.2

Information

Seller: Iva Li
Size: 44.5 MB
Category: Education
Compatibility: Requires iOS 9.0 or later. Compatible with iPad.
Languages: English
Age Rating: Rated 4+
Copyright: © Anilab 2016

Figure 1.1. Screenshot of Aniland on iTunes store

After fixing minor technical bugs, like button response and sound volume, the final version of the app was released in February 2016 (Figure 1.1) before this study initiated in April 2016. Explanations of the app's features and structure are provided in Chapter 4.

1.4 Research questions

The aim of this study was to explore the possibility of supporting young children's learning of literacy, digital literacy and social skills with an iPad, as they collaborated in a preschool setting, using the Aniland app. In addition, I investigated the pedagogical connection between the app's contents in online and offline spaces.

With regard to young children in particular, who comprise a rapidly growing segment of mobile device users, relatively little research has been done on the collaborative use of tablets, rather than individual use. Ultimately, I intended to analyse how preschoolers developed their understanding of literacy through the app to better understand how children generally develop digital literacy skills over time, as well as exploring the potential of digital media to enhance children's communication and social skills (e.g., collaboration, negotiation) in group activities and produce enjoyment when the iPad is used in the classroom on a regular basis.

My study examined digital meaning-making practices in a school setting, and the above frameworks supported the investigation of the role of meaning-making in multimodal interactions, as the students interacted with emergent literacy apps on touchscreen devices. To investigate how preschoolers develop their understanding of literacy using an iPad app and develop emergent literacy skills and social skills while actively participating with their peers over a period of time, the following three research questions were formed:

> RQ1: In what ways do preschoolers engage in meaning-making processes and practise emergent literacy skills when using iPads in the classroom?

Children may learn to play, socialise, seek mutual expectations, form meanings, and repeat and imitate one another when working in groups on the iPad app. I analysed changes in cognitive processing using the following coded responses: *exploratory* (coded as EXPO), meaning navigation with reflective analysis and problem-solving, and *procedural* (coded as PROC), meaning random navigation without reflective analysis. An explanation of the rationale and the coding system appears in section 4.6.3. I determined how the children interacted with the app, made meaning out of their experiences, practised new literacy information, and even attempted to engage in extended play.

> RQ2: What changes in peer group interaction were displayed over time when the children played with the app with their peers?

Peer relations are complicated, as interest levels, social and cultural backgrounds, knowledge, and closeness vary between individuals. Over time, I examined the children's literacy skills and children promoted meaning-making process. To examine collaborative meaning-making practices in the classroom, I explored the role of peer interactions and environments in learning literacy skills, as the students engaged with Aniland on their iPads. More specifically, I analysed types of social processing, including collaboration, non-collaboration, off-task, confusion, domination, argumentative, conflict, tutoring, and problem-solving. The categories of communication style included affectional, agreement/disagreement, informative, interrogative, experiential, responsive, reading, and repetition.

> RQ3: Are there any literacy practices with Aniland that later reappear in the classroom context?

In conjunction with the weekly iPad sessions, I sought to understand how children might apply the information and practices acquired from the activity to the classroom (and possibly outside of the classroom). Furthermore, it was important to learn how the environment and teachers affected the children's everyday learning. In addition to analysing cognitive processing, as in RQ1, I explored the connection between online and offline spaces—the iPad activity and regular classroom activities, respectively.

I then discussed the implications of the findings in relation to RQ1-3 for pedagogic practice with young children. This synthesised all three questions and fleshed out their implications, while drawing out recommendations for future research.

1.5 The chapters of this thesis

This thesis comprises nine chapters. Chapter 2 reviews the theoretical frameworks and perspectives that informed my study. I explain the definitions and concepts of literacies, giving a constructive view of children's sociocultural development, emergent literacy, learning, and the Digital Play Framework (DPF), which emphasises social interactions and cultural knowledge.

The third chapter provides a review of the extant literature. From this review emerged the set of tools and concepts used throughout the study. This sets the trajectory for the background of this research and its academic context.

The fourth chapter describes the methodology and design of this study. It gives a detailed explanation of how the Aniland app was created, and explains the methodological approaches taken to conduct this research.

The fifth, sixth and seventh chapters present relevant examples as well as results and analysis in response to the corresponding research questions 1, 2, and 3. The examples are excerpts from episodes selected from 30 transcribed files and are displayed in a chronological order.

The eighth chapter summarises the findings of the study and inquires about the issues addressed in the earlier chapters. I particularly reflect on the study's methodology, the key contributions of this research to the field, and implications for practice.

Finally, the ninth chapter concludes and discusses the limitations of this study. I also make suggestions for future research.

CHAPTER 2: FRAMEWORK OF UNDERSTANDING

2.0 Introduction

My study was influenced by various theories and frameworks. It began with an assumption that children’s literacy learning occurs when they are interacting in a social environment. In this chapter, I describe the foundational concepts of my study, that entail a constructive view of young children’s sociocultural dynamics in children’s development and emergent literacy learning. My study explored how learning and literacy are socially constructed. Humans are born with an inclination to learning in a local context (Vygotsky, 1978). In particularly, the cognitive development of young children – including learning language – occurs through social interaction and conversation with others (Vygotsky, 1978). As children’s use of digital technologies advances, it is important to study how this affects everyday literacy learning.

This chapter comprises five sections. To begin, I clarify the definitions and concepts of New Literacy Studies (NLS), new literacies, digital literacies, and emergent literacies. Second, I discuss the concept of learning and literacy from a social perspective, then present debates around Presnky’s controversial but influential digital natives/immigrants metaphor. Third, I describe Vygotsky’s sociocultural theory to support my thesis that children’s learning may come from their surroundings and their interactions with others. I then explain the frameworks and perspectives that informed my study. Fourth, I illustrate the framework of dynamic peer group interaction in literacy learning in early childhood. Fifth, I describe how playful learning and Digital Play Framework (DPF) can enhance children’s learning time with enjoyment.

The purpose of this chapter is to illustrate the theories and beliefs that motivated my study. I clarify that NLS is a broadly defined term, which is not limited to technologies to be understood within the social context.

Then, I discuss emergent literacy which is traditionally the precursor to reading and writing ability, such as letter name, phonological awareness, print concepts, early writing, etc. (Bowman & Treiman, 2004; Whitehurst & Lonigan, 1998).

I focus on literacy as a social practice in the next section, depicting Vygotsky (1986) sociocultural theory, which implies that children's learning is social, thus it makes sense to focus on interactions. In addition, peer interaction within similar age groups in the early years is crucial for building knowledge and expanding skills (Rogoff, 1994).

In the final section, I explain Digital Play Framework (DPF) that provide ways of evaluating efficient and playful use of digital tools and incorporating digital technology into literacy education for young children born in the digital age.

2.1 Understanding definitions and concepts of literacies

2.1.1 New Literacy Studies (NLS)

My study is rooted in a sociocultural theory of literacy and languages expressed by (new) literacy studies (NLS) (Barton, 2001; Gee, 1996; Street, 1995). This – and new literacy – were confusing to me at first, and I want to clarify the two concepts in this chapter. The former, NLS, refers to the practice of reading and writing, paying attention to situations in which text occurs. The 'new' in parentheses reflects that, at the time of its inception, this concept was regarded as a fairly radical shift (Gillen & Merchant, 2013).

While it has existed for around 30 years. NLS's holistic and ecological approaches to literacy do not necessarily concur with new technologies (Barton, 2007; Gillen, 2013). It represents a new tradition in considering the nature of literacy, understanding it as a social practice (Street, 1984). Researchers have investigated NLS for its sociocultural approaches to literacy, suggesting that literary practices are embedded in wider social contexts (Barton, 2007; Barton & Hamilton, 2012; Gee, 1996; Gillen, 2013).

In summary, NLS can be seen as a new paradigm for theoretical research that took a turn towards literacy, away from the prevailing psycholinguistic dominance. The association between NLS and the concept of 'new' happens in two key ways, *paradigmatic* and *ontological* (Lankshear & Knobel, 2003). The 'new' here is similar to that involved with opportunities to change or to make moves. For example, "the New School of Social Research, the New Science, and the New Criticism" are distinct from existent or predominant paradigms (Lankshear & Knobel, 2006, p. 24). The *paradigmatic* sense of 'new' arises in the case of the NLS as a sociocultural perspective to comprehend and research literacy (Gee 1996, 2000; Street, 1993). The *ontological* sense of 'new' refers to activities defined by "post-typographic" texts (e.g., hyperlinks, sounds, videos, etc.) and from text messaging, digital semiotic languages such as emojis, to uploading/downloading images from digital cameras or mobile devices to the Internet (Lankshear & Knobel, 2006, p. 25). The 'new' in the NLS refers to new forms of text that include social and cultural interactions of different types: these emerge from various values and beliefs, etc. (Lankshear & Knobel, 2006).

NLS views language and literacy as tied closely to the ideologies of the culture (Street, 1995). Literacy is intrinsically associated with the historical, cultural, and social values that form around the children. In my study, NLS particularly articulated the social and cultural practices related to iPad use in the classroom.

2.1.2 New literacies

The term “new literacies” continues to evolve (Kinzer & Leu, 2016). In the sense in which I use the term in this thesis, new literacies are not limited to online texts, but are connected to “the cultural logic of contemporary practice with its emphasis on collaborative creativity and re-mixing” (Davies & Merchant, 2009, p. 12). New literacies are more “participatory”, “collaborative”, and “distributed” and less “published” and “author-centric” than traditional literacies (Lankshear & Knobel, 2006, p. 29). More specifically, new literacies include both “technical stuff,” or the knowledge of the technological resources that facilitate the generation, communication, and negotiation of encoded meanings, and “ethos stuff,” which refers to “participation, collaboration, distribution and dispersion of expertise, and relatedness” (Knobel & Lankshear, 2011, p. 11). If any case is missing one of the two, it is not considered a new literacy. New technology is primarily concerned with how people can build and participate in a variety of literacy practices—including the values, senses, norms, and procedures that characterise existing literacy (Knobel & Lankshear, 2007).

Using fast-changing digital technologies to read, to write and to interact changes the dynamics of literacy (Leu & Kinzer, 2000). New literacies are often regarded in education as, above all, concerning new digital technologies (Coiro, Knobel, Lankshear & Leu, 2008; Kucirkova, 2013). New literacy skills include techniques for refreshing the ways that children understand the content on the screen and literacies (Lankshear & Knobel, 2003; Kucirkova, 2013). Hence, reading, writing, and communicating using the Web and new digital technology devices requires new literacies—techniques, adaptations, and adjustments for acquiring information and communication technology (ICT; Leu, 2000).

Considering their importance for becoming fully literate, and the potential impact of technology on children's emerging conceptions of literacy, it is valuable to explore the integration of technology in literacy learning in preschool education. In relation to my study, the evaluation of how individual cognitive processing occurs in young children using iPads, as well as their expressions and communication with other members of the class, sought to contribute to new literacy and learning practice knowledge.

2.1.3 Emergent literacy

My study explored children's emergent literacy over time while using an iPad. Emergent literacy comprises the skills, knowledge, and attitudes that prepare children for the development of reading and writing before they enter primary school (Whitehurst & Lonigan, 1998). Traditionally, emergent literacy (including, for example, the growth of letter name and sound knowledge, phonological awareness, early writing, and print concepts) was considered as a significant forerunner to read and write in the future (Bowman & Treiman, 2004; Cohen & Cowen, 2011; Snow et al., 1998). These emergent literacy skills are preliminary to children's success in academic reading and writing (Sulzby and Teale, 1991).

In categorising the components of emergent literacy, I have adapted the influential framework of Whitehurst and Lonigan (1998, pp. 854-855). These components can be divided into "outside-in processes" and "inside-out processes". See Table 2.1 "Outside-in processes" depict "children's understanding of the context in which the writing they are trying to read or write occurs" (p. 854). "Inside-out processes" portray "children's knowledge of the rules for translating the particular writing they are trying to read into sounds" (p. 855).

Table 2.1 *Components of emergent literacy adapted from Whitehurst & Lonigan (1998)*

Component		Brief Definition
outside-in processes	Language	Semantic, syntactic, and conceptual knowledge
	Narrative	Understanding and producing narrative
	Conventions of print	Knowledge of standard print format (e.g., left-to-right, front-to-back orientation)
	Emergent reading	Pretending to read
inside-out processes	Knowledge of graphemes	Letter-name knowledge
	Phonological awareness	Detection of rhyme; manipulation of syllables; manipulation of individual phonemes (e.g., count, delete)
	Syntactic awareness	Repair grammatical errors
	Phoneme-grapheme correspondence	Letter-sound knowledge; pseudoword decoding
	Emergent writing	Phonetic spelling
	Phonological memory	Short-term memory for phonologically coded information (e.g., numbers, nonwords, sentences)
	Rapid naming	Rapid naming of serial lists of letters, numbers, or colours
	Print motivation	Interest in print shared reading

In relation to the listed components above, for reasons of scope and feasibility, I decided to focus on these “inside-out processes”: knowledge of graphemes, phonological awareness, orthographic knowledge, and print motivation tied to the literacy contents in Aniland.

The app invited the children to practise graphemes by reading letter sound books and playing letter-matching games. Through these rhyming games and books, the children engaged in phonological awareness exercises. For orthographic knowledge requiring the ability to read and spell words, children practised phoneme-to-grapheme correspondences and spelling through the use of letter sound books and games and then, practised ability to process (Bosse, 2015). For print motivation, I recreated in print the books that the children saw in the reading rooms of the iPad app and placed these on the classroom bookshelves, with permission from the teachers.

Research on how young children's digital environment may have impact on emergent literacy that compares different digital technologies supports that children between 3-5 years old. They can develop emergent literacy skills along with joyful experiences (Blanchard & Moore, 2010). Therefore, earlier enjoyable experiences of emergent literacy skills may have a positive impact on literacy skills in the future.

In general, new literacies are built on foundational literacies, and reading and writing are considered ever more important in the information age. Therefore, it is often argued that competence in "phonemic awareness, word recognition, decoding knowledge, vocabulary knowledge, comprehension, knowledge of the writing process, spelling," and so on (Leu, Kinzer, Coiro & Cammack, 2004, p. 1590) remains the basis of new literacies.

2.1.4 Digital literacy

My study is situated on the belief that the roots of literacy (Goodman, 1986), in which children may develop the understanding that literacy makes sense as they explore their literate environment, can be digital media for children born in the 21st century. Digital literacy has become one of the most popular subjects in the field literacies, as digital media—defined as any content that includes digital text, graphics, audio, and video—becomes an unavoidable part of children's lives, coexisting with analogue and printed media (Vera, 2011). As Web 2.0 brings advanced software and hardware technologies that enable reading and writing on the web (Richardson, 2006; Lankshear & Knobel, 2012), young children in developed societies are increasingly exposed to computers and the internet. In this new era, young children's communication practices are multimodal; in other words, they communicate via still and moving images, gestures and animation, and sounds (Marsh, 2012).

One definition of digital literacy is “the constantly changing practices through which people make traceable meanings using digital technologies” (Gillen & Barton, 2010, p. 9). Digital literacy skills are the ability to speak, listen, read, and write via digital media (Blanchard & Moore, 2010). Learning and teaching have become far easier, assisted by this growing multimodality. As new technology evolves, it becomes increasingly beneficial for literacy practices, with young children using these tools to read, write, and communicate (Bechorner & Hutchison, 2013).

The positive outcomes of digital literacy have become apparent since the early 2000s, and children’s websites promoting educational content have proliferated. One study shows that preschoolers’ interactions with computers allow them to acquire verbal, problem-solving, abstraction, intelligence, and long-term memory skills (Haugland, 2000). The internet has the potential to help children communicate with others on the other side of world, which heightens levels of spoken communication (Wartella, O’Keefe & Scantlin, 2002; Glaubke, 2007). Researchers have observed that children gain oral language skills by interacting with computer-assisted story reading and writing. Online learning tools, such as voice-supported materials, provide strong support for early literacy learning, enabling users to develop phonics, phonemic awareness, and fluency skills (Hillman & Moore, 2004). Online activities are also growing, with websites as virtual playgrounds. With ubiquitous digital resources, preschoolers can go online to play video games, watch videos, and practise literacy skills (e.g., writing and reading).

To become a digitally-literate person, one must learn how to use the Internet properly and moreover, how to use it critically (Glister, 1997). Laham (1995) argued that “literacy has extended its semantic reach from meaning ‘the ability to read and write' to now meaning 'the ability to understand information however presented'" (p. 198). He also stressed that digital information is multifaceted and claimed that a digitally literate person must be capable of interpreting dynamic images, sounds and texts. From a literacy point of view, the "dynamic nature of digital literacy in action and the ways in which 'digital' literacies are necessarily interwoven with other literacies" (Gillen 2014, p. 31).

In recent decades, there has been a strong interest in emerging digital literacy in the NLS field. This is what Mills (2010) calls a "digital turn" in the field. Diverse practices and domains: schools, external environments, practices. Not only digital literacy is an investigation of online practice, but it is also available at home and throughout the school. Rather than focusing on literacy alone—which is understood as a letter-related practice—the NLS tradition allows for a wider range of symbolic formats and a multidimensional view of literacy (Kress & Van Leeuwen, 1996; Kress, 2003).

2.2 The debate around "digital natives" and "digital immigrants"

In the Prensky's (2001) digital natives/digital immigrants metaphor, the two groups are deemed fundamentally different, with only "digital natives" being capable of learning to use digital tools. However, Pemble (2018) have argued that, regardless of age, anyone can advance in the use of digital technology. Nevertheless, it has been observed that some teachers are unwilling to integrate digital technologies into their classrooms because they are not familiar with these tools. During my study, I worked with teachers who had taught for three decades to a couple years, they all showed a positive attitude to the use of tablets and many used them in their daily lives.

According to Prensky (2001), digital natives are young, native speakers of the digital languages of computers, video games, and the Internet. The Pew Research Center (2014) swapped the generational term "millennials" for digital natives:

> Millennials are at the leading edge of this social phenomenon. They have also taken the lead in seizing on the new platforms of the digital era—the Internet, mobile technology, social media—to construct personalized networks of friends, colleagues, and affinity groups. They are 'digital natives'—the only generation for which these new technologies are not something they've had to adapt to. (para 8)

Some researchers claim that this generation should be taught differently because their systematic ways of thinking fundamentally differ from those of previous generations; in effect, they use technology for social, education, and communication purposes (Prensky, 2001; Günther, 2007). Prensky's digital native/immigrant metaphor has received much attention from educational researchers. He proposes that declines in US education are due to a lack of understanding of digital natives, who are growing up with ubiquitous digital tools. Furthermore, Presnky (2001) asserts that the brains of young students who are considered to be digital natives are physically altered and are distinct from those of older generations. However, his simple metaphor struggles to adequately represent the divisions between digital natives and digital immigrants.

Prensky's "digital immigrant" metaphor has been criticized as racist, with its negative connotations clearly visible (Bayne & Ross, 2007). An immigrant, according to Prensky's understanding of the metaphor, seeks to adapt to the environment but always retains an "accent" (Prensky, 2001, p. 2). Additionally, Prensky (2001) indicates that the accent of the digital immigrant's first language will never go away, and he implies that they are fundamentally different to digital natives.

Not all digital natives, as defined by Prensky, are advanced and skilled in manipulating technologies. Kvavik (2005) illustrated that, although US college students had a strong foundation in computer skills, this did not typically translate to academic success. In another study in the UK, students enrolled in e-learning universities had varying levels of competency in technology use (Margaryan, Littlejohn & Vojt, 2011). This demonstrates that not all so-called digital natives are proficient in this area. This type of generational division is simplistic, as the level of the digital use varies between individuals, not by age or generation (Nygard, 2015).

Everyone is able to think critically about the opportunities and challenges of the digital world and to use technology responsibly to learn, create, and participate (Common Sense Media, 2017), regardless of age or year of birth. It is important to reduce tension between digital natives and digital immigrants. Anyone who has an experience or is able to manipulate digital tools can become a 'digital citizen'. Later in this paper, I discuss how young children are able to learn from both traditional and digital technologies and observe how teachers were able to enjoy the use of tablets as a learning resource in the classroom. I argue that relying on stereotypes and categorisations can only narrow our vision.

2.3 Literacy as a social practice

For my study, it is necessary to understand young children's learning and language in a social context. From the sociocultural point of view, learning is a process of participation, from peripheral to central engagers, in collective activities (Lave & Wenger, 1991). Bruner (1983) describes children between the ages of two and five years old making huge advancements in cognitive development, including mind and emotional development, along with social interaction and conversation with others in their environment. Rogoff (2003) emphasises shared learning: "Learning is a process of transforming participation in shared sociocultural endeavors" (p. 210). Learning is, therefore, a social process, to which peers and context are fundamental.

Children’s experiences and perceptions play an important role in this process, in particular in their literacy development. Furthermore, literacy practices are related to social, cultural, historical, and material contexts (Barton & Hamilton, 1998; Gee et al., 1996; Street, 1995).

Literacy has long been a focus of educators and a means of socialisation. It is important to understand literacy as a matter of social practice, from a sociocultural perspective. Literacy, as described by Papen (2005), partially determines relationships between people. It remains embedded in a broader social context. It includes values, ideas, conventions, identities, and world views that shape the events of which it is a part. Also, literacy practices are culturally constructed; they are rooted in the past and are as “fluid, dynamic, and changing as lives and societies” (Barton, Hamilton & IvaniÚc, 2000, p. 13). These points are key to my study, as they underline that literacy necessarily involves communication between people.

I want to step back at this point to mention some important ideas of Vygotsky’s, which underlie other theories that provide the foundation to my own perspective. In particular, my study is rooted in the Vygotsky (1986) sociocultural theory, which deems children’s learning intrinsically social and thus argues that any investigation of it should focus on interaction. From the socio-cultural perspective, learning occurs when a child is socially engaged and able to interact with others (Vygotsky, 1986). In Vygotsky’s sociocultural theory, working in others, is beneficial for children’s cognitive development:

> Every function in the child’s cultural development appears twice: first on the social level, and later on the individual level; first between people and inside the child (Vygotsky, 1978, p. 57).

Children gather new knowledge and skills by interacting with their environment and absorbing the material as their own. Sociocultural theory focuses on tools and personal interaction with others in the learner environment (Lim, 2002). Vygotsky’s view is important in that it unites the cognitive and the social, insisting that the cognitive development of the individual must first be understood as a social process. Children learn through interaction and gradually internalise the new information. Thus, this sociocultural perspective emphasizes the importance of the environment around children (i.e., peers, teachers, and classroom settings).

2.4 Peer group interaction

My study focused on children’s interactions in the classroom. Rogoff (2003) asserts that humans are born as social and cultural creatures and suggests that they learn as a group and develop through their use of cultural tools. She also emphasises the relationship between children and their environment for learning:

> The routine arrangements and interactions between children and their caregiver and companions provide children with thousands of opportunities to observe and participate in the skilled activities of their activities of their culture. Through repeated and varied experience in supported routine and challenging situations, children become skilled practitioners in the specific cognitive activities in their communities (Rogoff, 1991, p. 351).

To better build knowledge and expand their skills, children need to be provided with a routine setting and people with whom to interact, with the emphasis on routine (Rogoff, 1991). In this sense, the classroom provides children with the opportunity to negotiate and express their ideas, to establish shared learning, and to promote understanding of one another (Rogoff, 1994).

Group learning is considered an important opportunity for children to adopt one another's perceptions and exchange ideas, while being introduced to new information and activities (Rogoff, 1990). Through the cognitive and social processes within the interactions, children reach cooperative understanding (Rogoff, 1993). Therefore, the quality of the settings—in the sense of their facilitation of children's learning—is important for children's social and cognitive learning.

The notion of horizontal friendship was useful to my study. "Horizontal friendship" refers to an equal relationship, wherein individual autonomy and decision-making are valued (Dewald, 1993, p. 108). Being in similar developmental stages, preschool-aged children's horizontal friendships revolve around play and socialising and seeking mutual expectation, forming meanings, and repeating and imitating one another (Hartup, 1992).

In terms of peer-related learning, Damon and Phelps (1989) studied mutuality and equality to examine quality of collaboration. "Peer collaboration" describes children with similar skills working together on a task, with the novices engaging in activities and working to resolve problems (Damon & Phelps, 1989, p. 13). This practice is high in both "equality" and "mutuality"; in other words, participating children are reciprocating instructions and engaging in highly motivated interactions (Damon & Phelps, 1989, pp. 12-13). The peer-learning dynamic emphasises that their near-equal negotiating positions are important factors in learning interaction through language in social contexts (Philip, Adams & Iwashita, 2014; Storch, 2005). A previous study found that when children participated in shared activities using iPads, they were motivated to interact with others and able to undergo a meaningful meaning-making process (Christ & Wang, 2014). For this study, it was important to observe how children's learning and social skills (i.e., collaboration, negotiation, etc.) were related when the children were collaborating in the school setting.

Kumpulainen and Mutanen (1999) proposed a descriptive system of analytic peer groups for interpreting young learners' moment-to-moment interaction processes, such as sociocognitive processing, child-talk mode, emotions, and nonverbal communication. As this system is so important to my study, I describe it here in depth. The three dimensions of the dynamics of peer group interaction (Kumpulainen & Mutanen, 1999) are as follows:

> 1) *Functional analysis* is focussed on the character and purpose of student utterances in peer group interaction. It characterises the communicative strategies used by participants in social interaction.
>
> 2) *Cognitive processing* examines the ways in which students approach and process learning tasks during their social interactions. It highlights students' working strategies and situated positions towards learning, knowledge, and themselves as problem-solvers.
>
> 3) *Social processing* focuses on the nature of the social relationships developed during the students' social activities. This includes examining the types and forms of student participation in social interaction (pp. 456-459).

In this sense, the peer interactions can be considered an important part of children's development in the three dimensions. When young children participate in shared activities, they are motivated to interact with others and experience a significant meaning-making process (Christ & Wang, 2014; Reese, Cox, Harte & McAnally, 2003). The meaning-making processes can be considered social practice, based on past theoretical work that considers the use of touch screen tablets as a new way of literacy education method. I address this position further in Chapter 5.

2.5 Play-based learning

Since the focus of my study was partially on play-based learning, I provide here an overview of my view of 'play' and its relationship to learning. Some psychologists and biologists have attempted to define 'play' by listing the essential criteria by which play behaviour can be perceived (Burghardt, 2005; Fagen, 1981). Vygotsky (1967) states, "Play is the leading activity of development in preschool years" (p. 6). He also insists that play must involve children creating an imaginary setting, taking on roles, following rules and norms related to those roles, and assigning to objects and tools new features that do not exist outside of the play.

Bruner (1972) argues that play is an important opportunity to design environments that enable learning and to take risks without fear of failure. Another influential author notes how important it is in early childhood to teach resilience and to create opportunities to try, fail, and try again to support the development of learning dispositions (Carr, 2012). This suggests that creativity and play activities are closely related. In other words, when children explore and experiment through play, the possibility of creative outcomes is greatly improved, without a fear of failure. Moreover, playfulness makes learning rewarding for its own sake and produces an enjoyment of learning. As I explain further in the context of my study, play is important for generating fun, supporting social relationships, and enhancing well-being.

It was essential, in my study, to connect play and learning. The Playful Learning Center (PLC) at the Faculty of Educational Sciences, University of Helsinki, Finland, set a good example promoting playful learning for children and young people. While learning tends to have a connotation of seriousness, the PLC approaches learning with play in new, curious, humorous, and engaging ways (Sefton-Green, et al, 2015). Although digital technologies are often stereotyped as more entertaining and playful than learning-oriented, play and learning do not need to be separated during the early years (Samuelsson, 2008). Game designers Salen and Zimmerman (2003) suggest, "Play is free movement within a more rigid structure" (p. 304), which presents the possibility of bringing digital technology to playful, curriculum-based activities in school settings. Digital technology can be applied in fun ways, within the academic boundaries of any subject (e.g., literacy, mathematics, history, science, etc.); and by integrating technology-oriented activities into classroom discussions, children can continue to engage with academic content outside of the classroom (Salen & Zimmerman, 2003). This is in line with the suggestions for literacy studies with young participants, including consideration of how the digital space can connect with their offline lives in social and cultural contexts (Gillen, 2014). However, concerns have been raised that digital tools are inappropriate for young children, because this does not involve the interaction with real-life objects employed in traditional play (Brown, 2009; Frost, Wortham & Reifel, 2008). The positive impact of bridging the content of digital technology and real-life learning was the focus of my study.

2.6 Digital play framework (DPF)

Finally, my study was influenced by the DPF (Edwards & Bird, 2015) that provides an indicator of how children use technology as a cultural tool. Digital play is defined as activities involving digital technologies, in which children engage in a playful way (Marsh, 2010; Stephen & Plowman, 2014). The role of context and culture in children's learning and development has been emphasized. However, pedagogical frameworks suitable for assessing children's digital play did not exist until recently (Marsh et al., 2016), despite the use of technology in early childhood becoming ubiquitous.

The DPF describes the behaviours that children exhibit as they learn to use different digital technologies through play (Bird & Edwards, 2014). The framework combines the Hutt (1966) understanding of play, that children learn an item's functions before using it for imaginative play, and the Vygotsky (1978) theory on the use of tools, which argues that what people can do with a tool changes when they learn to use it.

The DPF assists in observing and evaluating social interactions and cultural knowledge (Edwards & Bird, 2015). First, it enables exploration of the function of technology through epistemic activity; and second, it enables the creation of new content through ludic activity (Edwards & Bird, 2015). Hutt (1979) defines epistemic play as *exploratory play* in which the knowledge of things (i.e., exploration, problem-solving, and skill development) is acquired and *ludic play* as that which draws on past experiences (i.e., repetitive behaviour) and includes symbolic and fantasy play. For example, children learn the functions of the technology, thus mastering it as a tool, and then extending this to their imaginative play. When someone is learning to use an iPad, they begin with random pressing and asking for help, later realising what the images on the screen mean, and ultimately sharing their learned behaviours with their peers.

More specific types of iPad behavioural indicators were used in Bird's (2007) DPF handouts initially developed by Bird and Edwards (2014). As shown in Table 2.2, I slightly adapted these from the original iPad observation document, as items such as "pressing the home button to select a different app", "using the inbuilt camera to create an image to use in an app", and "recording footage of imaginary scenario" were not applicable to my study (Bird, 2017, n.p.). Although I did not use this format in my study, the indicators inspired greater awareness and sensitivity in observations of children's activities.

Table 2.2. *Digital play framework (DPF)—iPad observations slightly adapted from Bird (2017)*

Date: ______________ Child's name:____________________ Child's age:_____________

Type of Play	Type of indicators: iPad	Observations
Epistemic Play (learning skills, solving problems, exploring the device)	Seemingly random pressing	
	Seeking assistance for desired outcome	
	Tilting the iPad for desired outcome	
	Deliberately adjust iPad settings	
	Scrolling through Apps	
	Intentional sequential pressing to locate desired App or function	
	Deliberate finger movements to move or resize items	
	Sharing learned actions with others	
Ludic Play (creative and symbolic)	Deliberate actions to create an imaginary scenario	
	Repeating observed imaginary scenario	
	Creating own imaginary scenario	

Furthermore, I was able to relate some of the indicators to codes I used for analysis. For instance, "seemingly random pressing" under epistemic play could relate to the procedural mode whereby the children were randomly navigating the app without any reflective analysis, and "creating own imaginary scenario" under ludic play could relate to the code "innovation" under the cognitive processing when children used the app to an extended play or a pretend play. Details of the final codes in *revised analytical framework of peer group interaction*, adapted from Kumpulainen and Mutanen (1999), are provided in Chapter 4.

The framework was appropriate for my study because it shares this understanding of play. It provides directions for educators in how to use the technology and expand play-based technology learning. Referring to the framework, this indicates how children can use the tablets effectively to enhance their digital literacy skills, as well as expanding their learning to their imaginative play.

2.7 Summary

This chapter illustrates the primary concepts and beliefs that motivated my study. I provide evidence here that NLS is a widely defined term and not limited to digital technologies that must be understood in the social context. New literacies must feature both “technical stuff”, meaning knowledge of the technological resources that enable the generating, communicating, and negotiating of encoded meanings; and “ethos stuff”, meaning the acts of participating, cooperating, sharing and disseminating knowledge (Knobel & Lankshear, 2011, p. 25).

Emergent literacy is traditionally the precursor to reading and writing ability, such as knowledge of letter names and sounds, early writing, print concepts, and phonological awareness. However, as the ways of learning and teaching have expanded, researchers, educators, and policymakers have sought to incorporate digital technology into literacy education for children born in the digital age. Moreover, digital literacy has emerged as an essential skill, defined as the ability to understand the information presented via digital media and tools.

Humans are born with an inclination to learn within a local context. Cognitive development—including language learning—in children aged 2-5 years old emerges through social interaction and conversation with others in the children's environments. This development relates to the Vygotsky (1986) sociocultural theory, which argues that children's learning is social; thus, investigation of it should focus on interaction. Peer interaction within similar age groups in the early years is crucial for building knowledge and expanding skills (Rogoff, 1994).

According to the Prensky's (2001) digital natives/immigrants metaphor, they are two fundamentally different groups and only digital natives are capable of learning to use digital tools. However, many researchers have argued that digital natives are not necessarily more advanced in technology than older generations; therefore, dividing generations in this way has limited usefulness.

In the previous section, I explain the DPF used to evaluate how to use digital tools efficiently and to incorporate digital technology into literacy education for children born in the digital age. In the next chapter, I present a review of the literature on how young children develop emergent literacy using digital technology, including an overview of the use of touchscreen tablets (particularly iPads) in the school setting, and I discuss the existing research on collaborative literacy learning using iPads in early childhood as significant contributions to my study.

CHAPTER 3: LITERATURE REVIEW

3.0 Introduction

Continuing from the theoretical framework presented in the previous chapter, I now review the literature on the current issues and concepts relating to the field of my study. Digital technologies are entwined with everyday life and are therefore involved in young children's educational experiences, in both formal and informal settings (Flewitt, Messer & Kucirkova, 2014; Agostini, Biase & Loregian, 2010; Merchant, 2009). Studies have shown that using digital platforms for various activities, such as reading books, listening to songs, watching videos, and playing games, has become common even for young children. While this is true for most developed countries, I have focused on empirical literature from European countries, North America, and Australia (Burnett & Merchant, 2012; Chaudron et al., 2015; Guernsey & Levine, 2015), where English is the primary language.

Today's preschool-aged children, who are immersed in a digital world and surrounded by devices such as televisions, DVD players, MP3 players, smartphones, touch-screen tablets, computers, cameras, digital toys, and so much more, will be of college age by the year 2030 (Guernsey & Levine, 2015; Palaiologou, 2014; Critcher, 2008; Drotner & Livingston, 2008). Learning and teaching with digital technology is evolving, and it would be beneficial to utilise these tools to support literacy practices for young children, who already use these tools to read, write, and communicate (Beschorner & Hutchison, 2013). In particular, the popularity of touch-screen tablet devices, or tablets, has grown tremendously over the past nine years since the appearance of the iPad in 2010.

Various studies have shown the positive use of iPads as a supplementary resource for children, enhancing their emergent literacy skills e.g., knowledge of letter names and sounds, print concepts, phonological awareness and early writing skills (Cohen & Cowen, 2011, Whitehurst & Lonigan, 1998). Despite the popularity of tablets for children, often present in their out of school lives, some teachers have expressed difficulties or reluctance in incorporating them into classrooms (Gasparini & Culen, 2013).

Also, concerns have been raised regarding the health, wellbeing, and sociality implications of tablet use. Flewitt, Messer and Kucirkova (2014) reported that some educators expressed anxieties as to whether some digital technologies could result in delayed language learning, diminished attention spans, and physical harm to children from sitting too long while being exposed to "addictive" and "over-stimulating" objects (p. 10). Mangen and Kuiken (2014), comparing the affordances of reading experiences between booklets and e-books, pointed out the tactile, multisensory feeling of being able to hold and flip through printed books and asserted that as tablet devices are "intangible" and "virtual" (p. 151), readers may need to alter the ways they read printed books, resulting in confusion in reading comprehension.

This chapter focuses on the literature related to my study, and it is divided into three sections. The first section covers the historical context of educational technology, mobile devices, and tablets in young children's lives. The second section reviews how young children develop emergent literacy skills with digital technology; it provides an overview of tablets, particularly the didactic use of iPads in early childhood literacy education; it highlights some limitations of the studies on these topics; and it reviews the latest suggestions for screen time suggested by the American Academy of Pediatrics (AAP) in 2016. In the third section, I examine empirical studies on the potential of iPads as social, cognitive, and communicative tools, especially in school settings. Also, I review relevant research on connections between online and offline spaces, which is a fast-growing area of research and the most relevant to the focus of my study.

Owing to the growing amount of research on this topical area, I thoroughly reviewed literature published until December 2017. Since then I have taken account of major reviews and a small number of studies that have reported any different findings.

3.1 Educational digital technology for young children

3.1.1 Changes in young children's media use

To understand how tablets have become one of the most prevailing digital technologies among young children's media, the recent changes in the use of media can be examined in North America and other locations in the Global North. Common Sense Media (2013), a non-profit organisation specialising in the study of the effect of media and digital technology on young children, surveyed 1,463 parents in the United States. Results indicated a change in the use of digital media from 2011 to 2013: the television viewing rate decreased from 65% to 58% for children 0 to 8 years old, mobile device use increased from 8% to 17%, console video game use declined from 9% to 6%, and computer use stayed the same at 14%.

More interestingly, young children's use of tablets greatly increased over the same two years, with the percentage of those with access to smart mobile devices jumping from 52% to 75% (Rideout, 2014). According to a survey on children's media possession conducted among 1,511 parents of 0- to 8-year-old children in the UK, more than 90% of 3- to 5-year-old children had access to a tablet (Clark, 2014). Moreover, parents and children read an interactive e-book (58%) or simple e-book (40%) at least two to three times a week. Another recent UK survey was conducted by the University of Sheffield among 2,000 families. Results showed that 31% of children aged under 5 owned tablets and engaged in tablet activities, such as playing games, viewing videos, and browsing the Internet, for an average of 1 hour and 19 minutes on weekdays, and 1 hour and 23 minutes on weekends (Marsh et al., 2015). By all means, young children can read a book, listen to music, and play games with or without adults; hence, they are considered active users of tablets (Wohlwend, 2010).

However, young children's ability is sometimes exceedingly underestimated by app and game makers. A computer-human interaction study showed that 100 educational children's apps only required simple tapping, while 40-60% of children between 2 and 3 years old could successfully perform more complicated gestures, such as a double tap, long press, and two-finger rotation (Nacher et al., 2015). Given the immensely increasing number of young children using tablets, I want to contribute to knowledge on how they may utilise those tools effectively for social and educational purposes.

3.1.2 Young children increased access to tablets

Tablets are especially attractive to young children because of the lightweight, portability and intuitive touchscreen interface (Merchant, 2015; Burden et al., 2012; O'Mara & Laidlaw, 2011). In the US, 78% of families with young children owned touch-screen tablets at home in 2017, compared to just 40% in 2011 (Common Sense Media, 2017). In the UK, the Office of Communications (Ofcom, 2015) found that 65% of 3- to 7-year-olds lived in a household with a touch-screen tablet, using it for 8 hours and 30 minutes per week on average. Furthermore, the ownership of tablets has grown among lower-income and minority families, who possess more digital devices as the cost of electronics falls in the UK (Livingston et al., 2014). Tablets have also provided support and opportunities for children from low-income families to learn literacy skills (McManis & Gunnewig, 2012). Indeed, touch-screen devices are pervasive in lower income homes: in Purcell et al.'s (2013) study, 86% of U.S.

households with an income under $30k owned smartphones and 28% of them owned tablets, including an iPad, Samsung Galaxy Tab, Google Nexus, or Kindle Fire. The increasing possession of tablets in households in all socioeconomic groups emphasises the need to further investigate young children's engagement with tablets, as they spend a large portion of their daily activities using them. This can serve to make better suggestions for their use for education.

The first portable tablet arguably dates back to 1989: GRiDPad. However, it had no wireless capability, a black and white screen, a lack of supporting apps, and a high price beyond the common consumer's budget at the time ($500-1,000 USD) (Walker, 2012). Multiple others followed, including Walkabout Hammerhead (1997), Viewsonic Smart Display (2001), Comdex2000 (2001), and Ultra Mobile PC (2006), (Walker, 2012) but none were designed specifically for children's use. Finally, young children's use of tablets was propagated in the home and early childhood settings following April 3, 2010 with the launch of the iPad, which sold more than 300,000 that day (Panzarino, 2012). The tablet had a huge impact on the mobile device market and gained popularity with technology enthusiasts. In the beginning, there was confusion regarding its direction; however, as time progressed, consumers discovered how the iPad and other tablets could be used for educational and business purposes (*The Economist*, 2010; Toomer, 2010). In particular, the market for children's tablets and apps has been growing, resulting in more competitors.

Children are also attracted by these "new" and "shiny" objects (Burnett et al., 2017, p. 7). Today, young children are not only exposed to tablets because they are surrounded by adults who own them: indeed, children possess their own. It is important here to note what is available at the moment. Hugely influenced by the hype surrounding the iPad, other advanced children's tablets have been released. At the time of writing (June 2016), there are many from which to choose, such as LeapFrog's

LeapPad, Kindle Fire for Kids, Fisher Price's iXL, Nabi's 2S, Kurio's 7S, VTech's InnoTab, Tabeo's Kids Tablet, Ematic's Fun Tab Pro, and many more, as the demand is increasing and parents feel safer with kid-friendly tablets having age-appropriate content that is both entertaining and educational (Common Sense Media, 2016). This market research clearly demonstrates that children are target audiences for the tablet market. Hence, more research is necessary on how to use them to benefit children.

3.1.3 Understanding the affordances of tablets

Norman (1988) defines affordances as "the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used" (p. 9). One of the advantages of using a tablet is that it offers huge amounts of information at children's fingertips. Furthermore, being able to use fingers on a multi-touch screen leads to higher motivation for students and longer concentration on content. What makes tablets distinct from the old technologies is the 'dynamic materiality' with which users can touch, tab, or slide to move objects or text on the screen or jump to other pages on the screen where the text and images are transferred (Walsh & Simpson, 2013). In their exploratory study, Walsh and Simpson (2013) found that there was a good chance of stimulating children's motivation and concentration as well as social and communication skills when engaging in tablet activities.

Regarding the iPad in particular, its physical affordances stem from its intuitive interface and customisable touch screen (Common Sense Media, 2013). The tablet has an easy-to-use interface and customisable, intuitive touch screen (Common Sense Media, 2013) in comparison to PCs or laptops, which are relatively heavier and require more complicated manipulation of a touchpad or mouse and an off-screen keyboard for children (Davis, 2015). Therefore, the tablets' portability and ease of operation, so that users can move around and learn (Leichtenstern & Vogt, 2007), for example, when they are waiting in the doctor's office or sitting in a car (Guernsey & Levine, 2015). Thus, tablets have more potential for young learners to improve a variety of skills, e.g. literacy, math, art etc., than other media, since these learners can take the device everywhere and have access to a vast store of information. Researchers have hence initiated investigations of children's use of tablets at school (e.g., Hutchison, Beschorner & Schmidt-Crawford, 2012; Flewitt et al., 2014).

3.1.4 The current guidelines on "screen time"

Before starting my study, I sought research-based suggestions or guidelines for young children to properly plan and execute my research. The use of tablets among young children had been discussed in the literature, but there were ongoing arguments regarding whether it was too early for this use. The stakeholders in this context are those who give permission to children to access tablets, such as teachers and parents. For them to trust that children are unharmed from engaging with tablets, detailed guidelines by a legitimate institution like the AAP are useful to refer to when advising children according to the current data.

The AAP guidelines had not been updated since 1999 until the preliminary revision in October 2015, when the AAP Media Committee group announced, "In a world where 'screen time' is becoming simply 'time', our policies must evolve or become obsolete" (Brown, Shifrin & Hill, 2015, p. 54). The earlier recommendations strongly prohibited any use of digital technology and interactive media in programmes for children younger than 2. They encouraged the strengthening of adult-child relationships and discouraged passive and non-interactive uses of media with children ages 2 through 5 (AAP, 2013; NAEYC, 2012). Parents had not been able to follow these recommendations. Furthermore, the latter were unclear, only mentioning the absolute absence of screen time for children under 2.

The revised AAP (2016) recommendations regarding children and screen time were released in November 2016. Prior to release, the AAP Media Committee group emphasised one of these was to consider media as another environment, in that "[c]hildren do the same things they have always done, only virtually" (Brown, Shifrin & Hill, 2015, p. 54). The following are the key recommendations from the 2016 revision regarding screen time for preschool-aged children. These are the most relevant to my study.

> - For children ages 2 to 5 years, limit screen use to 1 hour per day of high-quality programmes. Parents should co-view media with children to help them understand what they are seeing and apply it to the world around them.
>
> - Designate media-free times together, such as dinner or driving, as well as media-free locations at home, such as bedrooms.
>
> - Monitor children's media content and what apps are used or downloaded. Test apps before the child uses them, play together, and ask the child what he or she thinks about the app. (AAP, 2016, p. 3-4)

The major roles of adults have not changed much, such as interacting and talking with children often, setting limits on the use of digital media, co-viewing the media, and creating a tech-free zone. Prior to my study, I discussed the wellbeing of the children during the study and the AAP's guidelines with their teachers, and we determined that 15 minutes per session was safe and permittable (section 4.2.4). It was essential for me to learn that this is the current recommendation for young children. I carefully considered this while conducting my study. Teachers and caregivers need to keep these recommendations in mind when they use tablets with children. To create a safe atmosphere for children to use tablets, I believe that there is a vital need for recommendations or guidance for educators, parents, and paediatricians, as well as developers. I hope that my study can contribute in this regard by having adults exercise the limited time and proper supervision in the classroom setting.

3.2 Young children’s literacy learning with iPads

3.2.1 Overview of literacy apps for young children

Educational apps designed for children have existed since the iPad 1 was released on April 3, 2010. Already by May 2013, more than 350,000 iPad apps were available, 80,000 of which were categorised as educational, representing 16% of all apps in the iTunes app store (Avtar, 2014; Purcell et al., 2013). However, there are no official criteria to judge whether educational apps’ contents are really didactic for young children. Cohen et al. (2010) made the valuable point that there were few well-designed or proven educational or literacy apps for young children during the first year following the iPad’s launch. Soon, however, a wide range of such apps were made specifically for the device, including modified stories and texts about TV characters, books, and games. Examples of typical activities were puzzles, quizzes, matching, labelling, and tracing, and some included highlighted text options and songs (Guernsey & Levine, 2015).

Concerning the increase in children’s engagement with iPads and literacy learning, a recent study on children’s app use in the UK found that 24% of children between the ages of 3 and 5 could look for apps, and 15% of them could download them onto their tablets (Marsh et al., 2015). Educators and app designers should research the motor skills and knowledge of young children and utilise appropriate content to challenge and heighten their interest. One of the most important roles for adults should be understanding apps’ suitability based on children’s age. In a study conducted by Merchant (2014), young children explored the materiality of the iPad with others, such as a parent or a sibling, swiping through popular story apps like The Lion King and Peppa Pig’s Party. The author found that children were clearly interested in learning via tablets and listening to storytelling.

As the ownership of iPads has substantially increased, notably in the US, UK, and Australia (Harrold, 2012), so has researchers' interest in the educational possibilities of these devices (Bannister, 2010; Merchant, 2012). A study on literacy development using iPads showed that the children using them had consistently greater improvements in literacy skills than those not using them. Furthermore, the authors found notably strong effects on obtaining knowledge of phonemic awareness and letter sounds via iPad applications (Bebell, Dorris & Muir, 2012).

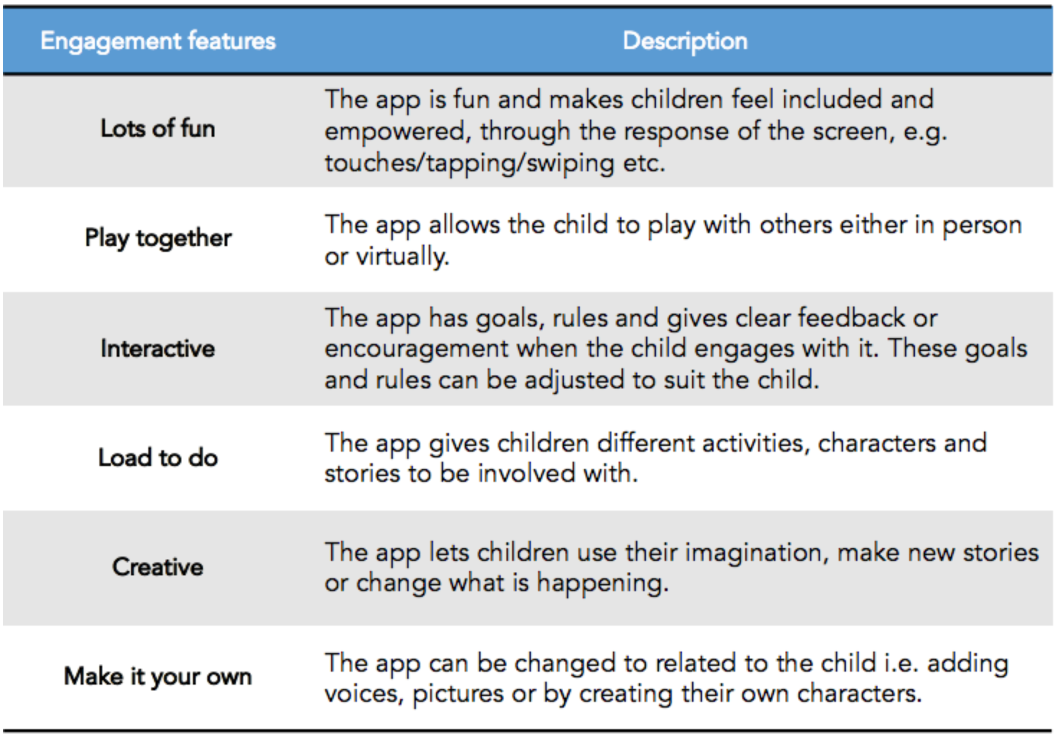
In addition, digital literacy is needed for users to learn the mechanical features of iPads; this ultimately prepares young children to become digital citizens. Control movements, such as operating apps by swiping, tapping, and dragging, and movements like finding hot spots besides stabilising movements (Merchant, 2015), can support children's cognition through practicing hand-eye coordination. According to Cohen, Hadley, and Frank (2010), children are attracted to iPads due to their fascination with digital technology.

Authors of recent studies have emphasised that iPads are engaging and motivating tools that have the potential to provide children with early literacy experiences (Flewitt, Messer & Kucirkova, 2014; Neumann, 2014). According to a Knowledge Transfer Partnership project between BookTrust and the Open University, Kucirkova, Littleton, and Cremin (2016) suggested six key engagement components embedded in Craft's (2011) "4Ps of digital childhood" for designing quality literacy apps to support children's "reading for pleasure" (RfP; p. 33).

These six engagements of reading digital books are divided into four key dimensions (Craft, 2011). First, playfulness includes affective engagement, concerning children's emotions (pleasure, joy, belongingness, etc.) related to positive attitudes and motivation for reading and interactive engagement that requires readers' active participation to create a supportive environment for social and individual interactivity. Second, participation involves shared engagement where reader's reading pleasure possibly increases when undertaken as a joint experience and sustained engagement where readers are given uninterrupted reading time to engage with the texts. Third, possibility awareness requires creative engagement, allowing the readers to express creativity and innovative thinking. Fourth, plurality of identities allows readers to relate themselves or others to the texts presented in digital books.

Based on this research and partnership (Kurcikova et al., 2016), the National Literacy Trust (2017), which is dedicated to raising literacy proficiency in the UK, published an online guide on how to choose the right literacy apps for children, as shown in Table 3.1. The guide suggests that at least of two of the following features must be included: loads of fun, collaborative play functionality, interactive feedback or encouragement, plenty of activities, promotion of creativity, and customisability.

Table 3.1. Engagement features to choose quality literacy apps (National Literacy Trust)



Engagement features	Description
Lots of fun	The app is fun and makes children feel included and empowered, through the response of the screen, e.g. touches/tapping/swiping etc.
Play together	The app allows the child to play with others either in person or virtually.
Interactive	The app has goals, rules and gives clear feedback or encouragement when the child engages with it. These goals and rules can be adjusted to suit the child.
Load to do	The app gives children different activities, characters and stories to be involved with.
Creative	The app lets children use their imagination, make new stories or change what is happening.
Make it your own	The app can be changed to related to the child i.e. adding voices, pictures or by creating their own characters.

Note. Adapted from *How to Choose Apps*, *by National Literacy Trust*, retrieved from http://literacyapps.literacytrust.org.uk/how-to-choose-apps/ Copyright 2017 by The National Literacy Trust.

A few of the most popular language/literacy apps are Busytown Mysteries, Elmo Loves ABC, Endless Reader, Endless Alphabet, Letter School, and Monkey Word School Adventure websites (Guernsey & Levine, 2015). They focus on skills such as alphabet letter sounds, vocabulary, phoneme awareness, and spelling. Interestingly, a study shows that paid apps are downloaded more than free apps because parents were able to find more information about the paid apps on the developers' websites (Guernsey & Levine, 2015). The range of app choices has resulted in stakeholders considering the best way for young children to select the best applications. The iPad is seen as a useful tool for promoting children's reading and writing development across a multitude of interconnected aspects, from oral to visual representation (Woloshyn, Grierson & Lane, 2017). More importantly, children can build self-confidence and an identity as skilled readers and writers (Beschorner & Hutchison, 2013), leading to positive literacy development in the future.

3.2.2 Integrating Literacy Apps into the Classroom

Even though digital technologies are ubiquitous in children's lives, more research is needed to integrate them into schools for children's social, cognitive, and language learning. Particularly in schools, teachers' views and understanding of digital technology use in learning can hugely impact students' learning processes (Ertmer, 2005). The rise of online pedagogical practices in preschools and growing knowledge of how mobile devices create new cultural and social conditions for the development of children has become increasingly important (Marsh et al., 2016; Arnott, 2017).

Yet, there is still a barrier to integrating digital technology into education: a number of early practitioners have no experience with digital technology, no time to familiarise themselves with it, and no support. Therefore, they lack the confidence and knowledge to integrate tablets into a curriculum (Carrington, 2010). In support of educators' technology integration, IRA (2009) has issued the following statement of position:

> To become fully literate in today's world, students must become proficient in the new literacies of 21st-century technologies. IRA believes that literacy educators have a responsibility to integrate ICTs into the curriculum, to prepare students for the futures they deserve. (para 1)

Researchers have shown that when used correctly by trained teachers, iPad applications and other mobile devices can be powerful teaching resources (Beschorner & Schmidt-Crawford, 2012).

To successfully employ iPads in educational activities, teachers must be advocates of the process. In response to this discourse, a study (Beschorner et al., 2012) explored the use of iPads to support children's literacy activities. For example, pairs of students were given a portion of a printed book and used Doodle Buddy to visually express parts of the story and communicate with others by using sticky notes for future readers. The authors identified helpful aspects of iPad instruction (e.g., students could apply prior knowledge of other digital literacy tools to best find the navigation, students collaborated with others when facing obstacles, iPads could easily be programmed in many languages, etc.) as well as special considerations for using iPads (e.g. some options such as resizing text were cumbersome, teachers had to resolve technological difficulties, the sensitive touch screen tended to activate unintended responses, etc.) (Beschorner et al., 2012). This suggests an open-ended option for educators to consider the use of tablets as having both advantages and disadvantages. In my study, I also wish to convey the possibility of incorporating literacy apps on iPads for fruitful literacy instruction in the school setting.

3.3 Pedagogic use of iPads in literacy education

3.3.1 iPads as cognitive and communication tools

Previous research has indicated the developmentally suitable use of technology to promote young children's cognitive and social development and the iPad’s features can provide opportunities for children’s comprehension of early literacy, reading, writing and communication in a variety of context (Beschorner & Hutchison, 2013). Other studies have examined how young children’s individual cognitive processing occurs while using iPads, and how their expressions and communications with members in the classroom dynamics contribute to new literacies and learning practices (Walsh & Simpson, 2014; Wohlwend, 2010).

Hutchison, Beschorner, and Schmidt-Crawford (2012) explored how iPads assisted children’s reading and responses to text in elementary classrooms. Various apps were used, including three book-making apps: iBooks, Strip Designer, and Popplet. The teachers and investigators’ reports and observations revealed that iBooks was mainly used to read independently in the classroom, whereas Strip Designer and Popplet were used to compose creative stories. The results indicated that these apps inspired and empowered children to apply new literacy skills, extended their creativity through collaboration, and heightened the possibility of using iPads as literacy learning tools in the classroom (Hutchison et al., 2012).

In addition, a study showed children can share their feelings when they used a book-making app called Our Story, for example via personalisation, creating their own narrative, and customising images, audio, videos, and texts (Kucirkova, 2013; Kucirkova, Messer, Sheehy & Flewitt, 2013). Our Story is a personalised story creation app developed by the Open University team. It allows users to create their own story by taking and inserting pictures and videos, recording voices, and embedding texts into an easy-to-use virtual album (Kucirkova, 2013; Kucirkova et al., 2013). Kucirkova et al. (2013) found that Our Story engaged children in a meaningful and imaginative way, and teachers made positive comments about the app's ability to promote children's digital literacy and creativity.

Their actual conversations matched what they were creating on the app, encouraging the children to share their thoughts and logically narrate multimodally over the course of that time. Being able to share their story with others heightened their motivation and confidence (Kucirkova et al., 2013). Being able to customise their own story using iPads was relevant to their knowledge and preference for audio-visual components and allowed them to communicate themselves.

Furthermore, Flewitt, Messer, and Kucirkova (2014) conducted a two-month study involving students of three different age groups in school settings—nursery class (3- to 4-year-olds), primary class (4- to 5-year-olds), and primary class (7- to 13-year-olds)—using an open content OS app for creating and recording sound and videos and sharing the students' personalised digital narratives. Fascinatingly, in the nursery school studied, even a child known as a 'quiet' student participated in lively fashion and produced high-quality writing using the app, and another child showed a higher reading level on an iPad than he would normally show in the classroom. In addition to observation of children's interactions with iPads in the classroom, pre- and post-interviews and questionnaires were conducted with parents on home and school technology use and on the touchscreen device. Overall, Flewitt et al. (2014) found that iPads possess the potential to heighten children's literacy learning and motivation to engage, as well as the potential to extend individual interest in classroom-based activities.

The apps' usefulness as a communication device has been investigated in with some apps that allow the users to create avatars. Park (2011) emphasises avatars play an important role in engaging children and heightening their interest. Avatars in virtual worlds are used as a representation of oneself. Children tend to find affinity with groups and they find their identity through joining the group and getting involved in its activities (Hannaford, 2012). A survey showed visually and emotionally engage children in the apps, children are given the opportunity to create avatars in the apps, such as the Toca Boca series, Preschool Palace, etc (Guernsey & Levine, 2015). Children relate themselves to the app while practising literacy skills as they utilise features like avatars and customisations.

3.3.2 iPads as tools for socialisation and collaboration

One of the central factors of learning is that it should be interactive. Joint media activities are encouraged by the National Association for the Education of Young Children (NAEYC, 2012) which believes they should be used not only for pleasure but also for education, specifically literacy education. Research on children's social experiences with digital technology is insufficient to support how young children may use digital media as tools for collaboration.

Some studies have demonstrated that iPads help develop children's literacy with interaction and collaboration from teachers and peers in the early years of the school setting. In Merchant's (2015) study, iPad activities entailed social practices, since the children needed to negotiate as they played or communicated with teachers or peers. Taking turns seemed undefined and difficult for the young children (Merchant, 2015). However, some researchers have examined children's literacy-related app engagement through collaboration and found that the iPad is a resourceful tool to promote sharing.

Promoting sharing through buddy reading in the classroom, Wang and Christ's study (2014) analysed interactions between pairs and showed that preschool-aged children were capable of negotiation. When the children participated in shared activities using iPads, they were motivated to interact with others and were able to undergo a meaningful meaning-making process by supporting each other's comprehension processes while they read and interacted with the contents in the apps.

Engen, Giæver, and Mifsud (2017) observed peer interaction among third-graders in elementary school while engaging with the Book Creator app for five days. They used physical objects such as pencils, drawings, books, wooden spoons, and iPads to add text, record voices, and take pictures to create a multimodal fairy tale. In the beginning, they experienced difficulty in negotiating each other's opinions; however, they were capable of agreeing with each other in the end (Engen et al, 2017). This study highlights the role of iPads as social tools emphasises the importance of negotiation, such as turn taking to find mutual agreement, when working in groups on iPads.

3.3.3 Using iPads to connect online and offline lives

It is important to consider how digital content can impact the offline lives of young children in regards to their social and cultural context (Gillen, 2014). Some studies have been supportive of tablets, stating that traditional and digital reading processes could not be separated as one supported the other (Walsh & Simpson, 2013). Furthermore, many educators are enthusiastic about teaching with digital technology in classroom settings (Seales & Harding, 2013). It is apparent that preparing children for better opportunities using digital technologies is hardly being avoided in this digitalised society.

A literacy app may promote play with offline, non-digital toys, such as 'Doodlefind', which is designed to promote accurate spelling and can be played offline with pen and paper (Flewitt et al., 2015). Furthermore, stories created with digital devices are innovative and transformative in comparison to traditional story practices (Thomas, 2011). However, there is no need to separate these two media—print and digital can be supportive of each other. The BookTrust chief executive, Diana Gerald, explained that through the efficient use of printed books and digital books in combination, digital books can improve and promote children's reading for pleasure and can facilitate more reading of print books (Onwuemezi, 2016). The attraction of digital media does not necessarily disregard the importance of print media; therefore, the parallel development between the two is ideal for young audiences. Furthermore, many apps are based on young children's popular print books, which already establishes a connection between books and iPads. Online and offline spaces can thus be connected.

However, it should be emphasised that, for preschoolers, the balance between traditional and digital learning must be appropriately guided by adults (NAEYC, 2012; Donohue & Schomburg, 2017). In Flewitt, et al.'s explorative study (2015), the teachers encouraged 3- to 4-year-old children to use the vocabulary words that they saw in an app offline, which helped them to increase their vocabulary level. For instance, children searched for and inserted images related to the new vocabulary they were learning.

In addition, home education cannot be put aside as children are attempting new ways of meaning-making aside from schooling as they engage with digital technologies (Wohlwend, 2010). As parents increasingly own smartphones and touchscreen tablets, they have become a part of indispensable child-rearing practices because they can be utilised as a bonding activity between parents and children (Kirkorian & Pempek, 2013). To that end, adult-child interaction can be considered a social practice as it becomes an essential part of everyday daily life experiences (Merchant, 2015; Levy, 2009), and in consequence, they can employ iPads as fruitful educational home activities if parents and children join together. NAEYC (2012)'s position statement includes that these joint media activities are encouraged. In the end, with these digital technologies, 'percolating' influences between school and home in both is central for improving children's learning (Gillen & Kucirkova, 2018).

3.4 Summary

The advent of the iPad in 2010 opened up new possibilities for learning. Children's tablet activities have evidently grown along with the use of apps as virtual playgrounds and educational sources, and they will continue to do so (Guernsey & Levine, 2015). iPads are handheld, lightweight, and portable, making them ideal digital technology for use by young children to engage in literacy and play-based activities across time and locations (Neumann & Neumann, 2014). Playing with intuitive and customisable tablets is not only enjoyable, but it also motivates young children to learn. Access to digital devices is an important resource that may help young children practice literacy skills, digital literacy skills, and social skills.

Engaging tablet devices may contribute to enhancing literacy skills when they are repeatedly used. Children gain confidence and joy in playing with apps, while these also promote their expression and utilisation of their own knowledge and creativity (Kucirkova, 2015; Merchant, 2015) through collaborative meaning-making processes for social and cognitive development while interacting with peers in school. Some research demonstrate iPads may facilitate communication and collaboration.

There are numerous factors to consider when iPad are used education, such as connection between online and offline activities, interaction between the app and the child, and collaboration among children or between children and teachers in the classrooms. Nevertheless, little is known about how this new mobile technology can be used to improve early learning in the classroom (Merchant, 2015; Kucirkova, 2014). It is also challenging to set criteria or standards for the quality of apps that are nationally and educationally proven, because the operations of each application and tablet vary for different age groups, and particularly for young children who rapidly develop each month.

The last three sections of this chapter reviewed the literature on cognitive, communicative, and socialisation aspects of iPad use. They can relate to the three dimensions of the analytical framework of peer group interaction for my first two research questions: cognitive processing, social processing, and communication style (section 2.4) used to analyse transcripts. Then, relating to research question 3, I examined research related to the connection between online and offline lives.

CHAPTER 4: METHODOLOGY AND RESEARCH DESIGN

4.0 Introduction

My study explored how preschoolers develop understanding of literacy through the Aniland app, how children develop digital literacy skills over time, and the potential of digital media to assist with children's development of communication or social skills (e.g., collaboration, negotiation) in group activities practised in the classroom on a regular basis. To achieve this, I took a qualitative approach to the data collection process and data analysis. I created Aniland with the Anilab teammates, thus there were no copyright issues impeding the research, and all the participants began with equal levels of familiarity.

I chose a microgenetic methodology, which combines intensive observations across time and extensive case-by-case analysis (Gillen 2015; Martin et al., 2013; Siegler & Crowley, 1991). In this way, I observed the cognitive or behavioural changes in the preschoolers that emerged as they engaged in 10-15-minute weekly sessions with the literacy-learning iPad app and 2-3 hour-long literacy classes each week. Through naturalistic observation, I studied the informal student reactions and classroom dynamics, conversations, and settings.

I conducted semi-structured interviews (Copland & Creese, 2015; Given, 2008) with parents and teachers to learn their perspectives of the children's media behaviours. The interviews were semi-structured, thus I prepared a set of questions and created "probe questions" to deepen the conversations when needed (Copland & Creese, 2015, p. 32). This chapter details the participants' backgrounds and the site, methods, ethical approval procedure, data collection process, and coding protocol used in this study, as well as the design of Aniland and the technical equipment used.

4.1 Methodological approaches

4.1.1 Ethnographic approach

I took a linguistic ethnographic approach to my work with the young children. This qualitative method is a European response to linguistic anthropology (Copland & Creese, 2015). Linguistic ethnography is defined as “an interpretive approach which studies the local and immediate actions of actors from their point of view and considers how these interactions are embedded in wider social contexts and structures” (Copland & Creese, 2015, p. 13). It combines ethnographic understanding of social settings and in-depth analysis of linguistic data to provide insights into the workings of the social world, sensitive to the meanings, values, and perceptions of the participants (Tusting, 2013). Linguistic ethnography supported my research aim of carefully analysing located language use to reveal “the mechanisms and dynamics of social and cultural production” in the day-to-day activities of children (Rampton et al., 2004, p. 2). In the semi-structured interviews, parents and teachers were asked to describe their experiences and opinions of using iPads in learning literacy. The interviews were carried out at the end of the study. I led a semi-structured interview with the notion of using questions (Richards, 2003). I gave the interviewees an overview of the study and then allowed them to lead the dialogue.

In my study, naturalistic observation—that is, observing the participants in their natural environment—was employed to better understand young children’s cognitive and behavioural changes in their spontaneous environments (Gillen 2015; Martin et al. 2013; Siegler & Crowley, 1991). I spent as much time as possible around the children—rather than appearing only for the iPad activity—to ensure that they felt comfortable around me. I observed the children as I immersed myself into the school culture and became involved in their classroom dance, art, playground time, and literacy hours.

Initially, I sought to avoid interrupting the flow of the participants' engagement with their partners and the iPads, unless they had questions for me or needed help with the devices. However, ethnographic study is by nature flexible (Suwankhong & Liamputtong, 2013), and toward the end of the research, around the seventh week, I began giving the children projects to motivate them. For example, I asked them to find a word that began with the same first letter as their names. This was not planned from the beginning, but after brief meetings on the topic, we decided that adding something new to the routine would encourage the students to explore the reading room more than the avatar and activity rooms. This reflected the responsiveness and flexibility of ethnographic approaches, enabling me to work with the culture of the classroom and the teachers and to adapt to the environment.

4.1.2 Microgenetic method

In addition to taking the ethnographic approach, I employed the microgenetic method. This methodology is used in cognitive development research to collect detailed data concerning changes in a specific skill during the period of development (Luwel, 2012). Unlike traditional methods, the microgenetic approach illustrates the development throughout the transition process and emphasises the following five dimensions:

- The path of change: is the change qualitative or quantitative?
- The rate of change: is the change sudden or slow?
- The breadth of change: is the change domain-specific or generalisable across domains?
- The variability of change: how variable is a person's behaviour across similar tasks within a domain? Can similar patterns of change be seen across individuals?
- The source of change: what do the changes in behaviour, such as strategy use, suggest about the source of change? (Siegler, as cited in Flynn, Pine, & Lewis, 2006, p. 3)

These dimensions were useful prompts for answering my research questions on cognitive, social, and communication changes over time.

Using this method, my primary intention was to observe "moment-by-moment" actions and "utterances" (Du Bois, 1991, p. 73) and gradual changes over the 10 weeks of the study. Every Tuesday was an iPad day for both classrooms, and I visited two or three days more during the week to observe the children's literacy learning, arts and crafts, and athletic activities. I observed changes in the weekly interactions between the participants and with the iPads, the patterns of cooperation and collaborative learning, and repetition of the content provided in the app, noting whether any of these were transferred to other classroom activities.

4.2 Ethical procedure and settings

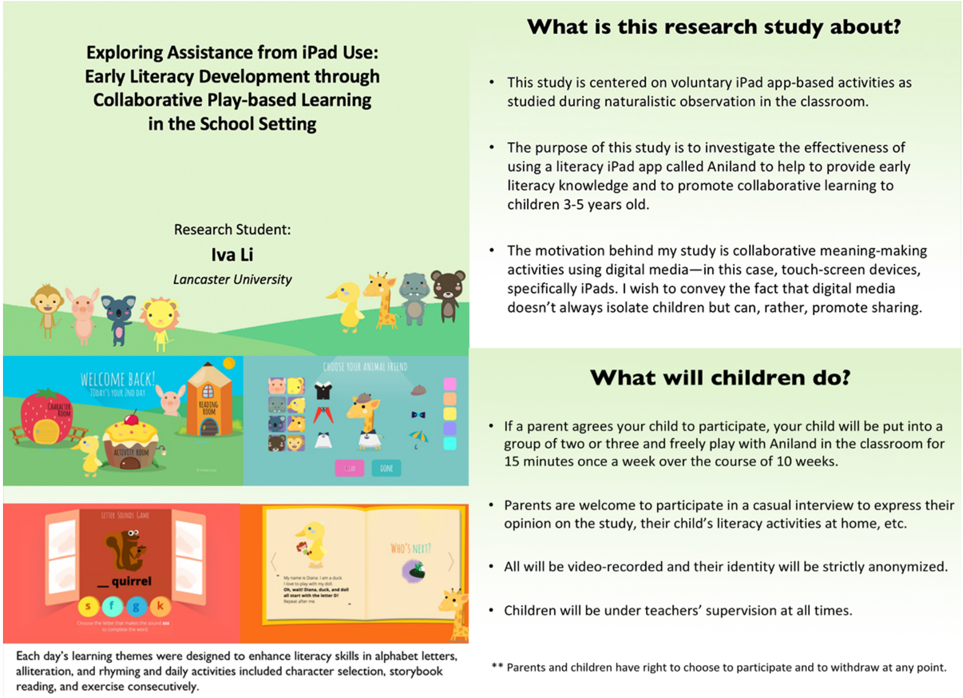
4.2.1 Ethical consideration

Since my study involved young children and video recordings, the ethical procedure was complicated and took longer than I had anticipated. The entire ethics approval took five months, from December 2015 to April 2016. Initially, I communicated with two classroom lead teachers in a public school in New York City and discussed a possibility of researching at the site. They agreed, explaining that it would be the first time a student had come in to conduct research. I then submitted the Stage 1B self-assessment form, the ethics questionnaire, the consent forms, and the information sheet to the Lancaster University Ethics Committee. Their approval was sent approximately a month later, with just a minor revision request. However, the research proposal reviewing process at the NYDOE IRB took two months and the proposal was finally denied.

The main reasons for the rejection were that public schools do not allow video recordings and that my project had the potential to be personal-product research. The most serious problem was not being allowed to record video, as it would have been difficult to produce transcriptions from audio files alone. It was necessary to match the images on the screen with the children's dialogue, so I began to look for another site. I investigated private institutions for preschool-aged children, with teachers who were enthusiastic about the use of the technology and video-recording was allowed.

4.2.2 The private preschool

After contacting seven institutions, in early March 2016, I secured a meeting with the director and the teachers of the private preschool in Manhattan, New York. I presented an overview of my study, including the reasons for using iPads, what Aniland is about, how this study is designed for literacy learning, and how children will participate, and I expressed my wish to observe other classroom activities (Figure 4.1). The director and the teachers accepted my proposal and agreed to allow me to conduct research in two classrooms beginning in April.



Exploring Assistance from iPad Use:
Early Literacy Development through
Collaborative Play-based Learning
in the School Setting

Research Student:
Iva Li
Lancaster University

My name is Diana. I am a duck.
I love to play with my doll.
Oh, wait! Diana, duck, and doll all start with the letter D!
Repeat after me.

Each day's learning themes were designed to enhance literacy skills in alphabet letters, alliteration, and rhyming and daily activities included character selection, storybook reading, and exercise consecutively.

What is this research study about?

- This study is centered on voluntary iPad app-based activities as studied during naturalistic observation in the classroom.
- The purpose of this study is to investigate the effectiveness of using a literacy iPad app called Aniland to help to provide early literacy knowledge and to promote collaborative learning to children 3-5 years old.
- The motivation behind my study is collaborative meaning-making activities using digital media—in this case, touch-screen devices, specifically iPads. I wish to convey the fact that digital media doesn't always isolate children but can, rather, promote sharing.

What will children do?

- If a parent agrees your child to participate, your child will be put into a group of two or three and freely play with Aniland in the classroom for 15 minutes once a week over the course of 10 weeks.
- Parents are welcome to participate in a casual interview to express their opinion on the study, their child's literacy activities at home, etc.
- All will be video-recorded and their identity will be strictly anonymized.
- Children will be under teachers' supervision at all times.

** Parents and children have right to choose to participate and to withdraw at any point.

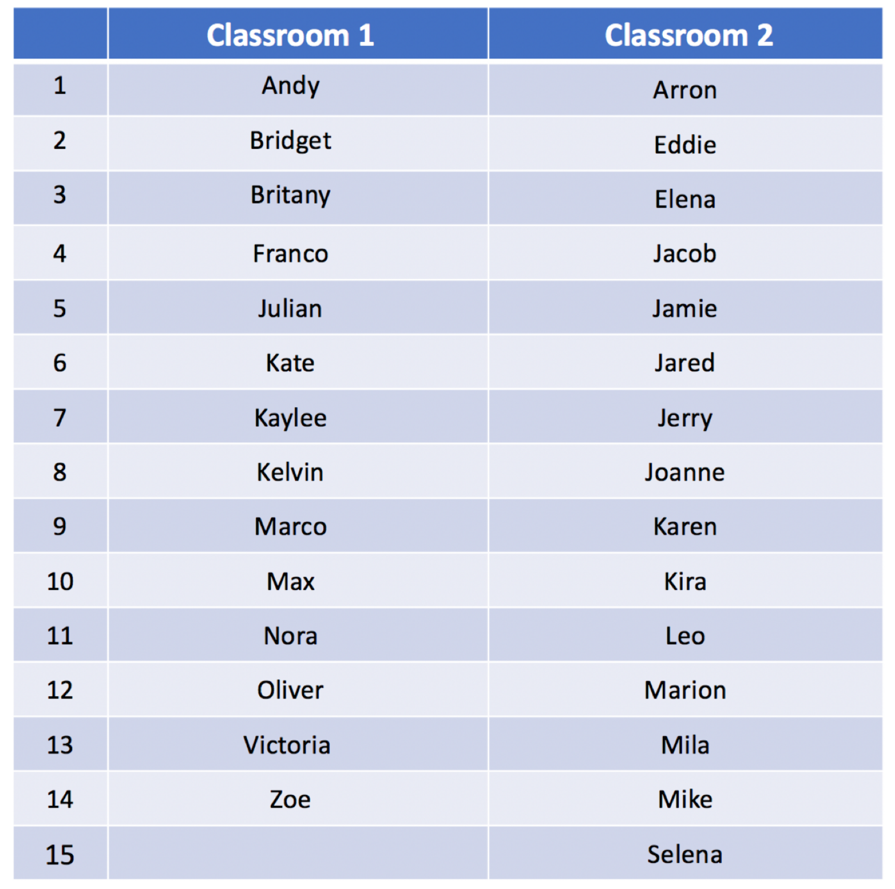
Figure 4.1. Presentation slides of my study shared during the meeting

The students at the institution are aged 3-5 years old. English is the official language of the institution. Google and Yelp reviews and word of mouth indicate that the school has a very good reputation. It cares for children from various backgrounds and employs dedicated teachers, who use research to develop their teaching practice. Its many extracurricular classes include art, music, dance, and martial arts. The school has received satisfactory feedback from its graduates. In fact, the mother of a child in Classroom 1 said that she had attended this school many years ago and had so enjoyed her experience that she chose to enrol her own child there, with one of her former teachers. This intergenerational attendance reflects the high regard in which the school is held. Ultimately, even with the video recordings and screen recordings, I had difficulty transcribing the children's contributions, thus I was glad to have found a school that allowed video recordings and warmly supported my research.

4.2.3 Participants

My study involved 29 children, aged 3-4 years old (M=42.2 months), and it took place over 10 weeks. The participants were divided into two classrooms: Classroom 1 and Classroom 2 (14 and 15 participants, respectively). One parent of a child in Classroom 1 did not give permission for their child to participate, and the teacher explained that the parent did not feel comfortable with her child being video-recorded. The school administrator informed me that 90% of the students were from low-income families. The children's names were anonymised and pseudonyms were used throughout the coding and analysis process to maintain confidentiality (see Table 4.1), as indicated in the explanations given on the informed consent documentation.

Table 4.1. *Pseudonyms used in the study*



	Classroom 1	Classroom 2
1	Andy	Arron
2	Bridget	Eddie
3	Britany	Elena
4	Franco	Jacob
5	Julian	Jamie
6	Kate	Jared
7	Kaylee	Jerry
8	Kelvin	Joanne
9	Marco	Karen
10	Max	Kira
11	Nora	Leo
12	Oliver	Marion
13	Victoria	Mila
14	Zoe	Mike
15		Selena

Additionally, four teachers in Classroom 1 and four teachers in Classroom 2 were involved in the research. I worked with an average of two teachers each week, depending on their schedules. The teachers helped the participants to resolve technical issues, where necessary.

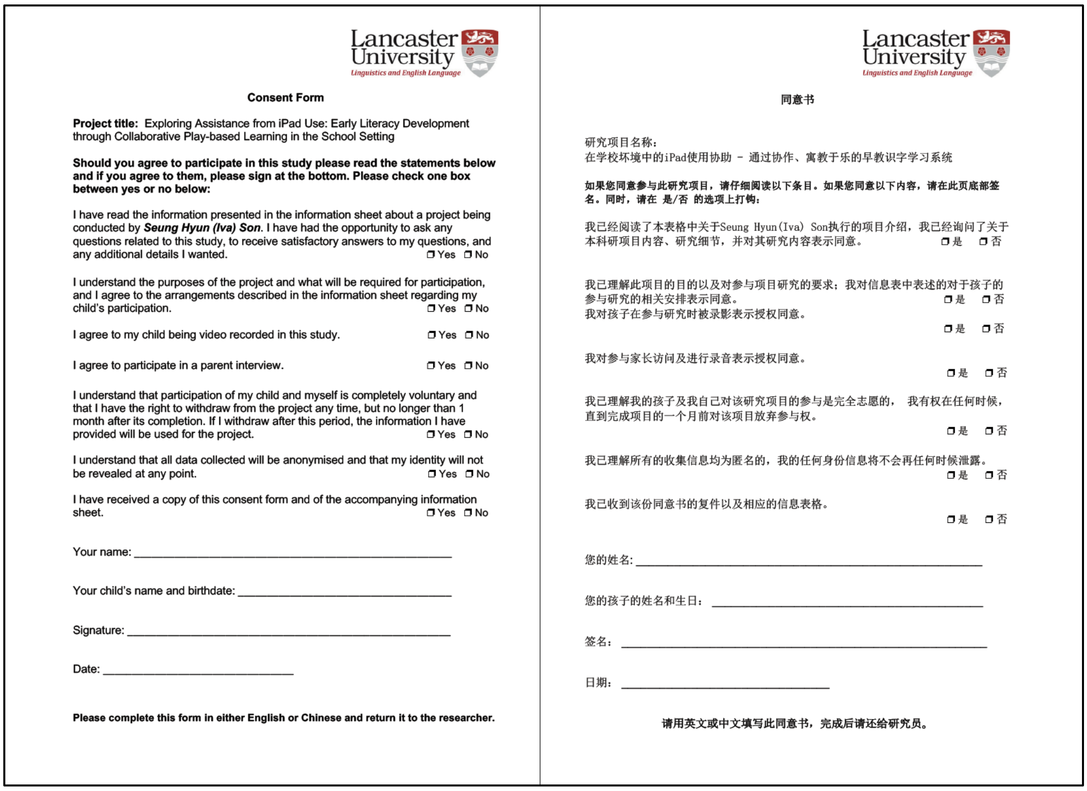
4.2.4 Interviews

The interviews were voluntary, and any parents who agreed to participate (by checking a box on the consent form) were interviewed informally when they arrived to collect their children from the classroom. I conducted semi-structured interviews to collect their perceptions and probe for more information and clarification of their answers, when necessary (Barriball & While, 1994). I began by introducing myself and explaining what I and the children had been doing with the iPads. I sought to make the interviewees feel comfortable to lead the conversation and informed them that I would take fieldnotes and our conversations would not be recorded. I then probed topics such as the children's media behaviour and the interviewees' opinions on the use of tablets, media rules, and so on. Due to the constraints of the school schedule, the parent interviews were held immediately before they collected their children and they lasted an average of less than 15 minutes.

The teacher interviews were held during lunch breaks or after school, and they lasted an average of less than 20 minutes. I conducted interviews with the teachers and parents or guardians who agreed to participate, and all consent forms were signed prior to scheduling the interviews. The interviews were audio-recorded with the consent of the participants. No sensitive information about the participants' lives was elicited. The interview data was regarded as supplementary, not as a focus for analysis itself. I draw on the interview data where it is helpful to illustrate points of discussion.

4.2.5 Consent forms

My supervisor, Dr Julia Gillen, and I discussed the amendment of the research site and reported it to Lancaster University. I then prepared the director's approval form for the university, consent forms, and information sheets for the parents, with each printed both in English (on the front) and Chinese (on the back) (Figure 4.2) to accommodate Chinese-speaking families, and another set for the teachers (Figure 4.3). I also prepared a Spanish version (See Appendix 5), but these were not ultimately used, as there were no Hispanic families in either of the classrooms. All the consent forms were collected before I began the research.



Lancaster University
Linguistics and English Language

Consent Form

Project title: Exploring Assistance from iPad Use: Early Literacy Development through Collaborative Play-based Learning in the School Setting

Should you agree to participate in this study please read the statements below and if you agree to them, please sign at the bottom. Please check one box between yes or no below:

I have read the information presented in the information sheet about a project being conducted by ***Seung Hyun (Iva) Son***. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted. ☐ Yes ☐ No

I understand the purposes of the project and what will be required for participation, and I agree to the arrangements described in the information sheet regarding my child's participation. ☐ Yes ☐ No

I agree to my child being video recorded in this study. ☐ Yes ☐ No

I agree to participate in a parent interview. ☐ Yes ☐ No

I understand that participation of my child and myself is completely voluntary and that I have the right to withdraw from the project any time, but no longer than 1 month after its completion. If I withdraw after this period, the information I have provided will be used for the project. ☐ Yes ☐ No

I understand that all data collected will be anonymised and that my identity will not be revealed at any point. ☐ Yes ☐ No

I have received a copy of this consent form and of the accompanying information sheet. ☐ Yes ☐ No

Your name: ____

Your child's name and birthdate: ______________________________

Signature: ____

Date: ____________________________

Please complete this form in either English or Chinese and return it to the researcher.

Lancaster University
Linguistics and English Language

同意书

研究项目名称：
在学校环境中的iPad使用协助 – 通过协作、寓教于乐的早教识字学习系统

如果您同意参与此研究项目，请仔细阅读以下条目。如果您同意以下内容，请在此页底部签名。同时，请在 是/否 的选项上打钩：

我已经阅读了本表格中关于Seung Hyun(Iva) Son执行的项目介绍，我已经询问了关于本科研项目内容、研究细节，并对其研究内容表示同意。 □是 □否

我已理解此项目的目的以及对参与项目研究的要求；我对信息表中表述的对于孩子的参与研究的相关安排表示同意。 □是 □否
我对孩子在参与研究时被录影表示授权同意。 □是 □否

我对参与家长访问及进行录音表示授权同意。 □是 □否

我已理解我的孩子及我自己对该研究项目的参与是完全志愿的， 我有权在任何时候，直到完成项目的一个月前对该项目放弃参与权。 □是 □否

我已理解所有的收集信息均为匿名的，我的任何身份信息将不会再任何时候泄露。 □是 □否

我已收到该份同意书的复件以及相应的信息表格。 □是 □否

您的姓名: ____

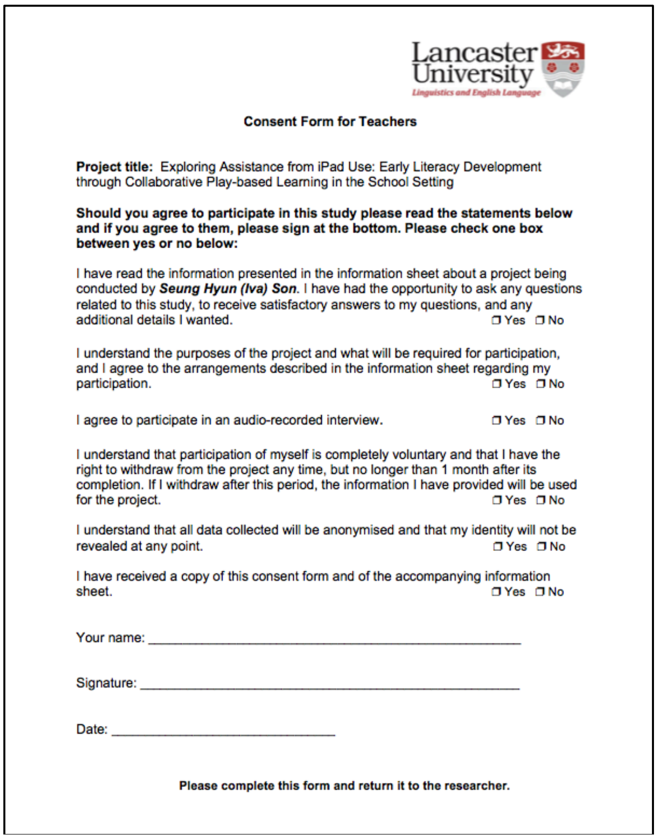
您的孩子的姓名和生日： ______________________________________

签名： ____

日期： ____________________________

请用英文或中文填写此同意书，完成后请还给研究员。

Figure 4.2. Consent forms for parents in Chinese and English



Lancaster University
Linguistics and English Language

Consent Form for Teachers

Project title: Exploring Assistance from iPad Use: Early Literacy Development through Collaborative Play-based Learning in the School Setting

Should you agree to participate in this study please read the statements below and if you agree to them, please sign at the bottom. Please check one box between yes or no below:

I have read the information presented in the information sheet about a project being conducted by ***Seung Hyun (Iva) Son***. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted. ☐ Yes ☐ No

I understand the purposes of the project and what will be required for participation, and I agree to the arrangements described in the information sheet regarding my participation. ☐ Yes ☐ No

I agree to participate in an audio-recorded interview. ☐ Yes ☐ No

I understand that participation of myself is completely voluntary and that I have the right to withdraw from the project any time, but no longer than 1 month after its completion. If I withdraw after this period, the information I have provided will be used for the project. ☐ Yes ☐ No

I understand that all data collected will be anonymised and that my identity will not be revealed at any point. ☐ Yes ☐ No

I have received a copy of this consent form and of the accompanying information sheet. ☐ Yes ☐ No

Your name: ____

Signature: ____

Date: ____________________________

Please complete this form and return it to the researcher.

Figure 4.3. Consent forms for teachers

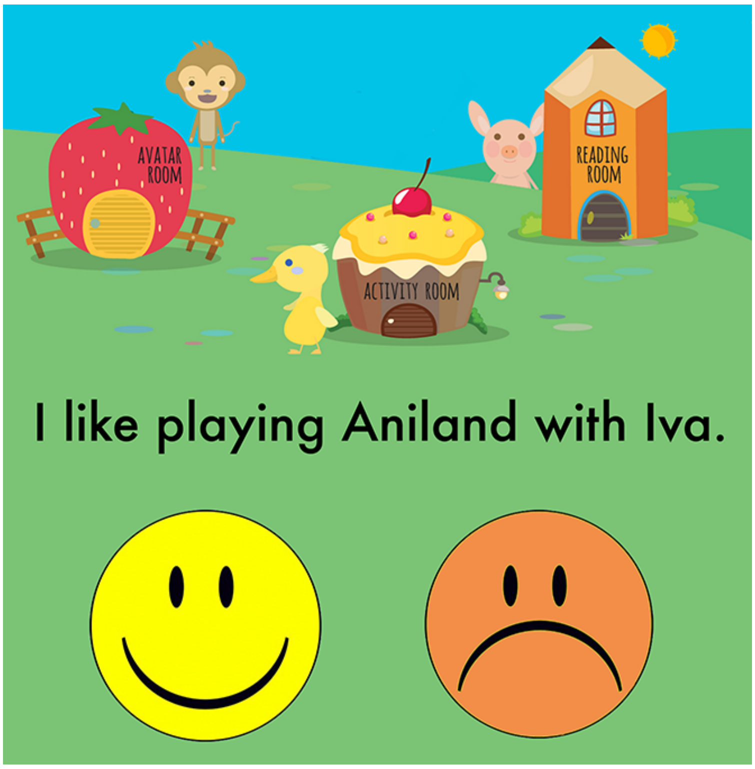


Figure 4.4. Consent forms for child participants

Children are generally considered vulnerable and decisions about their participation in research are made by adults (Powell & Smith, 2009). There is increasing discussion of the ethical issues around children's research rights (Jewitt, 2005) and the literature supports the view that, by making their own participatory decisions, children can develop skills and self-esteem, better decision-making and protecting children's privacy (Marchant & Kirby, 2004). Furthermore, The United Nations Convention on the Rights of the Child (UNCRC) asserts that children's participation rights are reserved, enabling children to freely express their opinions (Naties, 1989). For my study, I decided to provide the children with the consent forms, showing respect for their choice to participate—although their parents had already given agreement on their behalf. I designed the forms using characters from the Aniland app, as well as 'happy face' and 'sad face' icons and the phrase, 'I like playing Aniland with Iva' (Figure 4.4). I introduced the consent forms to the children on the first day of the study, showing them the form and saying,

> Hello, my name is Iva. I made this ABC animal game called Aniland and I hope you will play it. Do you want to play Aniland with me? If you want to, you can circle the happy face. If you don't want to play, you can circle the grumpy face.

This was intended to give them a voice, because while parents and guardians typically decide on behalf of the child, it is good practice for children to learn to speak for themselves.

4.3 Design of Aniland app

As mentioned earlier in section 1.3 (p. 3-5), a year before I began my PhD study, I created the Aniland app with the Anilab team members. Aniland was published as a web app to be used on the computers, and later as a free iOS app for iPads in March 2015. In this section, I explain the process of designing the app.

In 2010, I had the experience of creating a website called Gogo Monsterkids (Figure 4.5) on multilingual learning for young children, depicting characters who spoke in English, Spanish, and Korean. I created playful designs to catch the target-aged children's attention and make them want to continue playing beyond their initial attempts. From this project, I learned that children love colourful, 'lovable' creatures with body proportions like their own, who spoke in childlike tones. Children are always fond of surprises; creating their own characters; making, building, and playing games; and being creative.

In 2013, when browsing educational literacy iPad apps on iTunes for my son, who was aged two at the time, I observed that the apps designed for young children were expensive. Many of the free apps either required the user to watch advertisements or to purchase in-app items to use the full version. I decided to create a literacy app for young children to enhance their emergent literacy skills, designing a product available free of charge and that would not require the user to view advertisements.

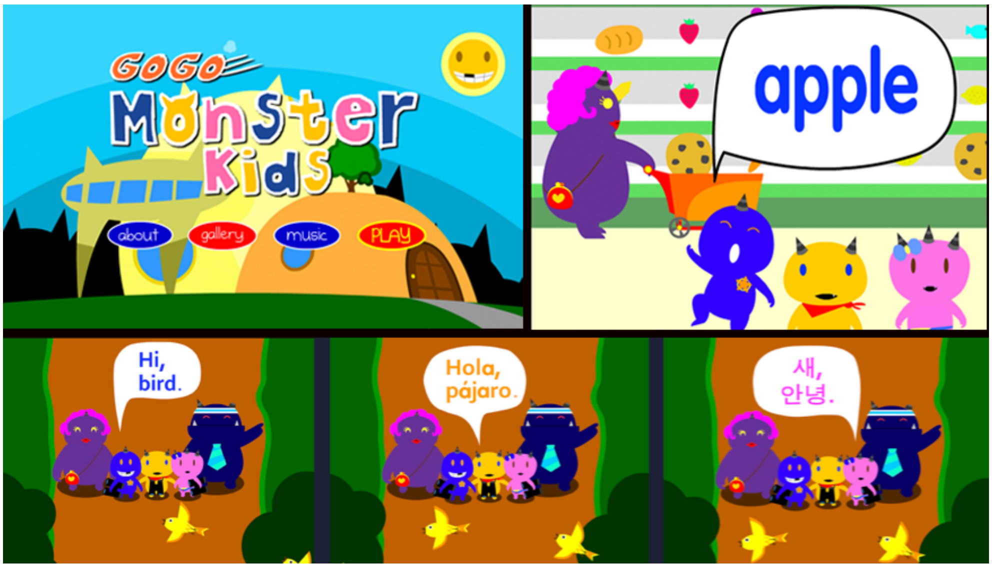

GOGO
Monster
Kids
about
gallery
music
PLAY
apple
Hi, bird.
Hola, pájaro.
새, 안녕.

Figure 4.5. Gogo Monsterkids inspired the design of Aniland

Writing scripts, creating characters and animations, coding, composing music, and revising had taken about 11 months when I was working on Gogo Monsterkids by myself. Inspired by this project, in December 2013, I initiated the emergent literacy learning project Anilland with team members and we were able to create the web app version of Aniland within 7 months.

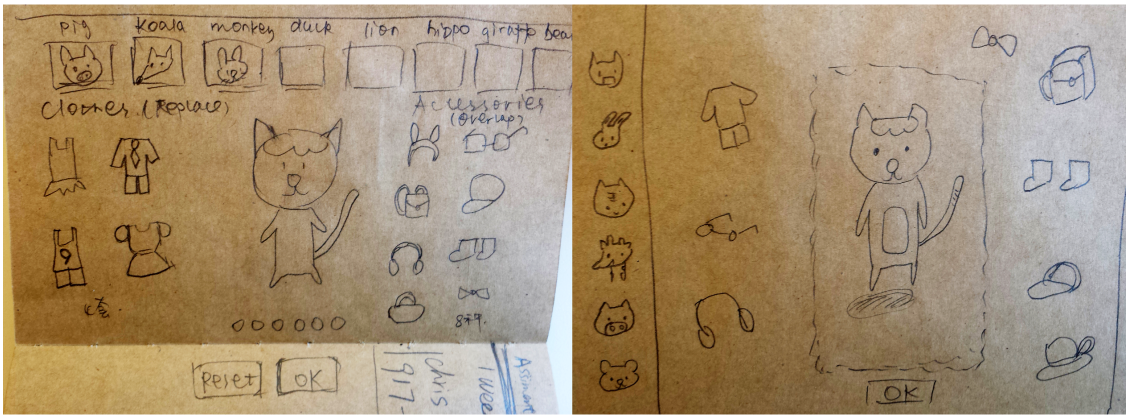

pig
koala
monkey
duck
lion
hippo
giraffe
Clothes (Replace)
Accessories (Overlap)
Reset
OK
OK

Figure 4.6. Sketches of characters

For the character design, we aimed for friendly, ‘lovable’ animals and gender-neutral colours. To make the characters appealing, they were given proportions similar to those of young children. We went through multiple iterations of character designs (Figure 4.6) and finalised eight animal characters (Figure 4.7). I emphasised on avoiding the colours stereotypically associated with particular genders (i.e., pink and blue).

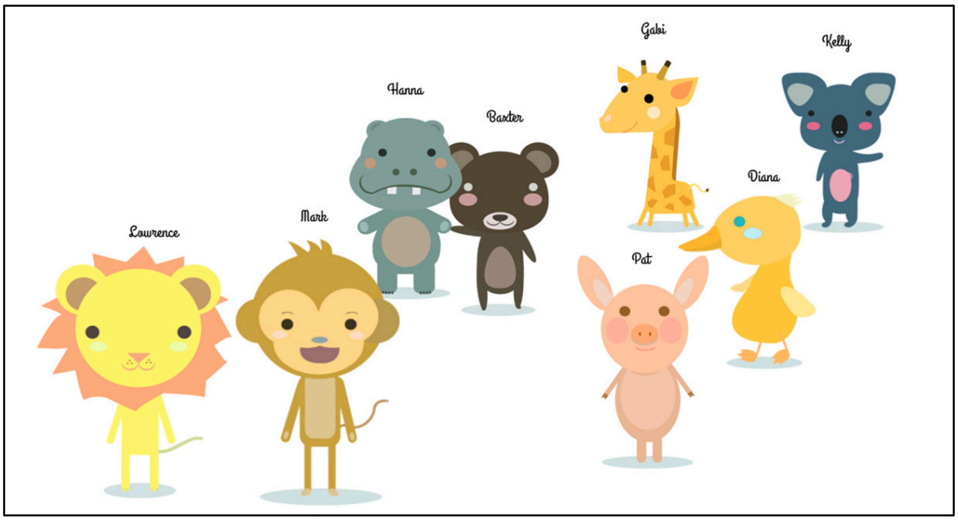

Gabi
Kelly
Hanna
Baxter
Diana
Mark
Lawrence
Pat

Figure 4.7. Final character design

The use of Aniland, as a new app, ensured that the children all began the study equally unfamiliar with the tool, as none had seen it before. In the first step, I developed a map (shown in Figure 4.8) to describe the learning goals of each section.

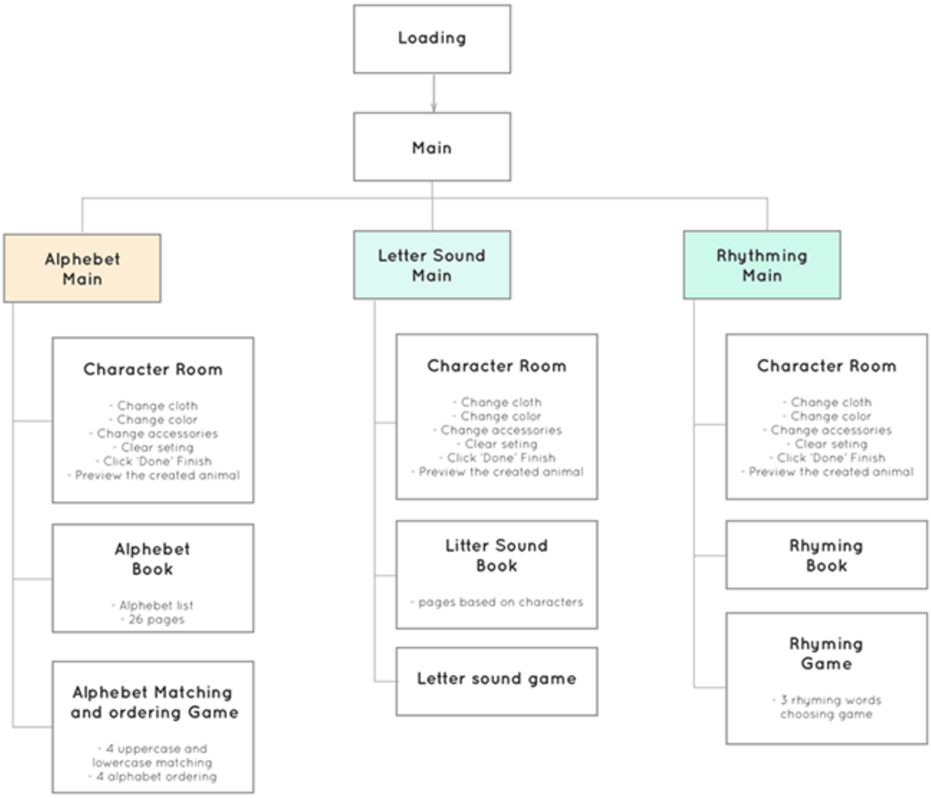
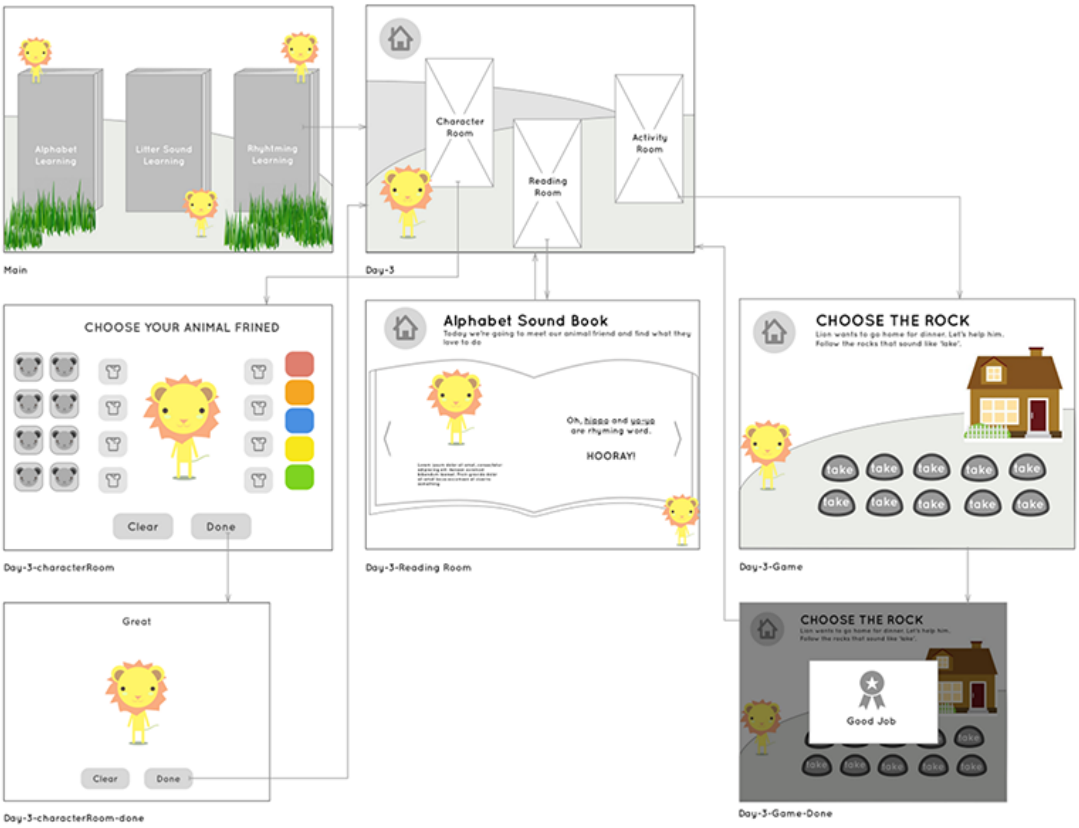

Loading
Main
Alphebet Main
Letter Sound Main
Rhythming Main
Character Room
- Change cloth
- Change color
- Change accessories
- Clear seting
- Click 'Done' Finish
- Preview the created animal
Alphebet Book
- Alphebet list
- 26 pages
Alphebet Matching and ordering Game
- 4 uppercase and lowercase matching
- 4 alphabet ordering
Character Room
- Change cloth
- Change color
- Change accessories
- Clear seting
- Click 'Done' Finish
- Preview the created animal
Litter Sound Book
- pages based on characters
Letter sound game
Character Room
- Change cloth
- Change color
- Change accessories
- Clear seting
- Click 'Done' Finish
- Preview the created animal
Rhyming Book
Rhyming Game
- 3 rhyming words choosing game

Figure 4.8. Feature map of Aniland

The app covers three basic early literacy topics: uppercase and lowercase letters in the English alphabet, phonics, and rhyming. Each topic is represented by a character room, in which users can select their favourite character of the day; a reading room related to each topic; and an activity room in which to play games related to the topic, with some already shown in the reading room.

Our team then created a wireframe with the final look and feel of the avatar room, reading room, and game/activity room (Figure 4.9). Building on the initial map, we added virtual rewards that users could attain after finishing each game. Our aim was to create a user-friendly interface, with icons and hot spots large enough for preschoolers to select when using either a PC or a touchscreen device.


Alphabet Learning
Litter Sound Learning
Rhyhtming Learning
Main
Character Room
Reading Room
Activity Room
Day-3
CHOOSE YOUR ANIMAL FRINED
Clear
Done
Day-3-characterRoom
Alphabet Sound Book
HOORAY!
Day-3-Reading Room
CHOOSE THE ROCK
take
Day-3-Game
Great
Clear
Done
Day-3-characterRoom-done
CHOOSE THE ROCK
Good Job
take
Day-3-Game-Done

Today we're going to meet our animal friend and find what they love to do

Oh, hippo and yo-yo are rhyming word.

Lion wants to go home for dinner. Let's help him. Follow the rocks that sound like 'take'.

Figure 4.9. Wireframe/look and feel

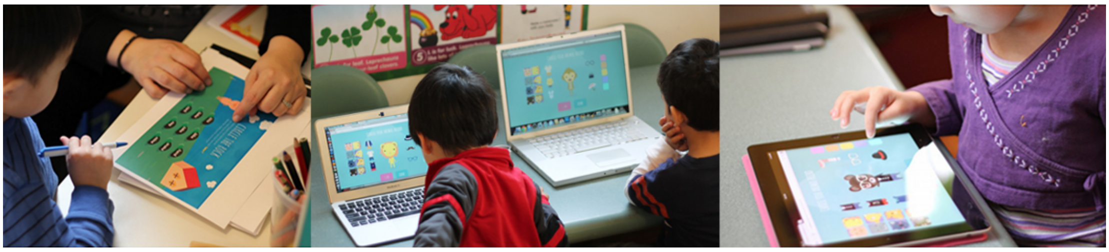


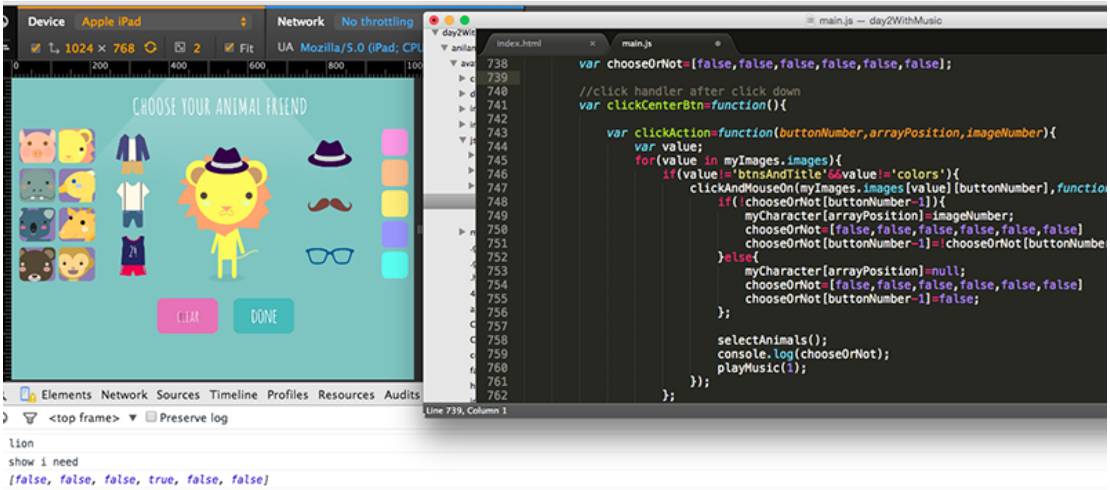
Figure 4.10. The initial research on prints, laptops and tablets

After confirming the final format of the app, I worked on the scripts, recorded narration, and composed the background music and sound effects. The pilot web app version was built using HTML5 and Canvas, and it worked on both PCs and tablets. This web app was published before beginning the iOS app development to explore how children managed desktop and touchscreen devices.

In the next stage, I printed all the books and games in Aniland. Through my personal contacts in New York City, I recruited a group of children and invited them to engage with these hard-copy format books and games (Figure 4.10). Aniland was shown to many parents and preschool-aged, children both on tablets and computers, to ensure that no harm was caused by its use and to monitor for technical glitches. I ran an unstructured pilot session, recruiting children through my own contacts. I did not record anything, but I did take pictures and recorded field notes.

My observations of young children playing with the app on both PCs and tablets revealed that preschool-aged children could manipulate tablets with greater ease than they could PCs, as the latter involved mouse-clicking and the children often confused the left and right mouse buttons. Here, I was able to observe how challenging the levels were for children aged 3-5 and to spot spelling errors.

In the next stage, our team moved forward with the iPad app development. We used the PhoneGap application (Figure 4.11) to turn the existing web app into an iOS format for publication on iTunes.


Device Apple iPad
1024 × 768 2 Fit
Network No throttling
UA Mozilla/5.0 (iPad; CPU
CHOOSE YOUR ANIMAL FRIEND
CLEAR
DONE
Elements Network Sources Timeline Profiles Resources Audits
<top frame> Preserve log
main.js — day2WithMusic
index.html
main.js
Line 739, Column 1

```
var chooseOrNot=[false,false,false,false,false,false];

//click handler after click down
var clickCenterBtn=function(){

    var clickAction=function(buttonNumber,arrayPosition,imageNumber){
        var value;
        for(value in myImages.images){
            if(value!='btnsAndTitle'&&value!='colors'){
                clickAndMouseOn(myImages.images[value][buttonNumber],functio
                    if(!chooseOrNot[buttonNumber-1]){
                        myCharacter[arrayPosition]=imageNumber;
                        chooseOrNot=[false,false,false,false,false,false]
                        chooseOrNot[buttonNumber-1]=!chooseOrNot[buttonNumbe
                    }else{
                        myCharacter[arrayPosition]=null;
                        chooseOrNot=[false,false,false,false,false,false]
                        chooseOrNot[buttonNumber-1]=false;
                    };

                    selectAnimals();
                    console.log(chooseOrNot);
                    playMusic(1);
                });
            };
```

```
lion
show i need
[false, false, false, true, false, false]
```

Figure 4.11. Coding process using PhoneGap

In March 2015, the first version of the Aniland app was published on iTunes, with a lion's face as its icon and a logo depicting animal characters (Figure 4.12). It was categorised as children's education and made available free, with no in-app advertising.

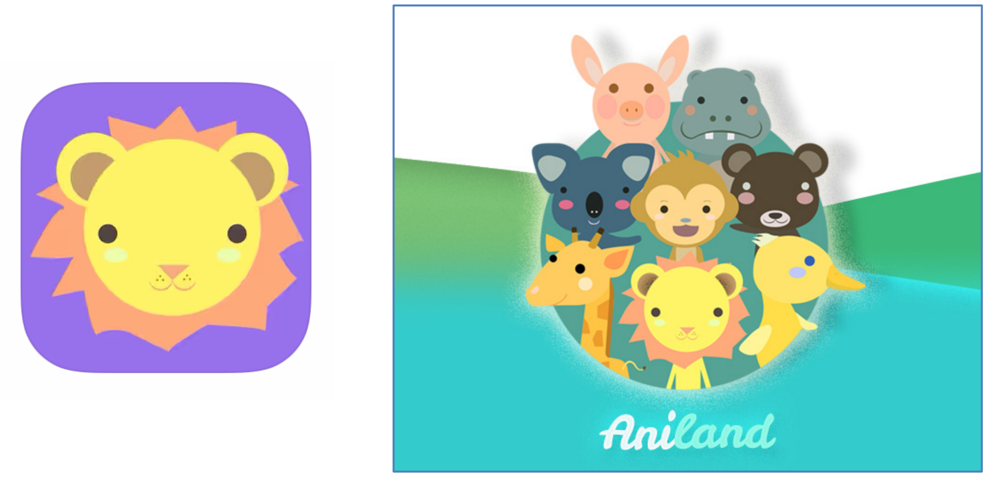


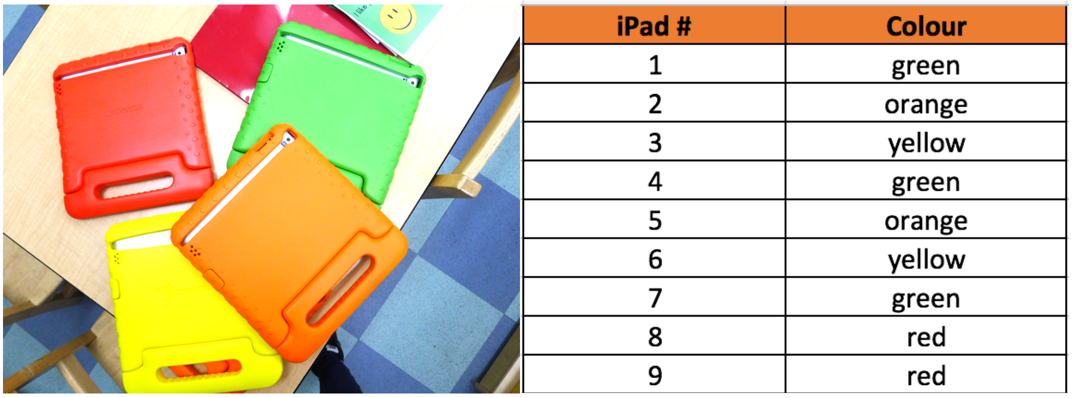
Figure 4.12. Aniland app icon (left) and logo depicting animal characters (right)

In February 2016, shortly before the study began, our team corrected typos, adjusted the sound volume, checked for technical bugs, and made the touch targets bigger to ensure they were suitable for the young users in the classrooms.

4.4 Instruments

4.4.1 iPads

I used nine iPads for the study, each encased in protective rubber in four gender-neutral colours (green, orange, yellow, and red) (Figure 4.13). The use of different colours was helpful for organising the files and for transcription after the video-recording.



iPad #	Colour
1	green
2	orange
3	yellow
4	green
5	orange
6	yellow
7	green
8	red
9	red

Figure 4.13. Various colours of iPads presented

4.4.2 Cameras

I used two types of camera to record the participants’ interactions with their peers, teachers, and iPads. I used eight Xiaomi action cameras, each of which is half the size of a palm and has no viewfinders in the back, making them less distracting for the children. I also used a Theta camera, which can record 360° spherical photos and

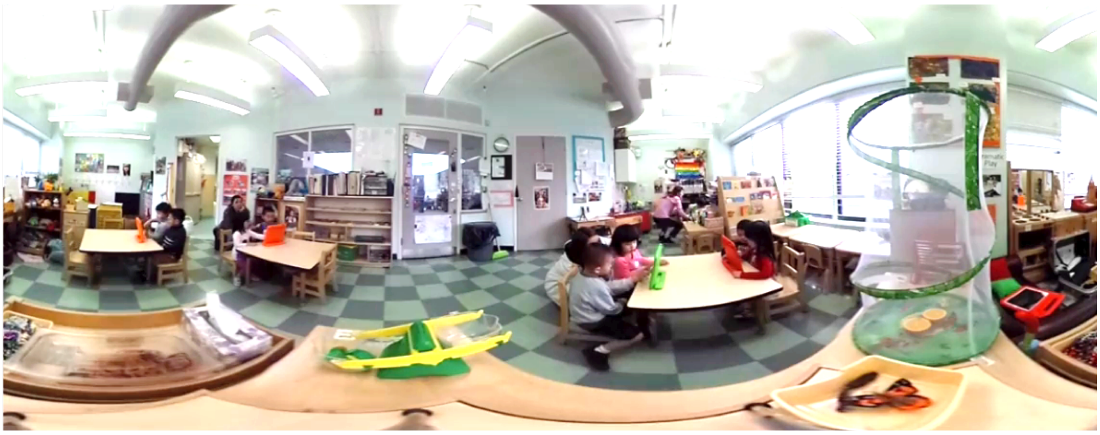


Figure 4.14. An example of a Theta 360° spherical camera recording

videos, to record the overall classroom activity (Figure 4.14). I used three-inch tripods to fix all the cameras at a right angle. I also took pictures occasionally with a point-and-shoot digital camera.

Although the parents and teachers had agreed (via the consent form) to the pictures being used for my thesis and any other educational purposes, I chose to blur all the faces to protect the participants' privacy, as the official British education research guidelines (BERA, 2011, p. 7) state that, "The confidential and anonymous treatment of participants' data is considered the norm for the conduct of research. Researchers must recognize the participants' entitlement to privacy and must accord them their rights to confidentiality and anonymity, unless they or their guardians or responsible others, specifically and willingly waive that right".

4.4.3 Screen recording

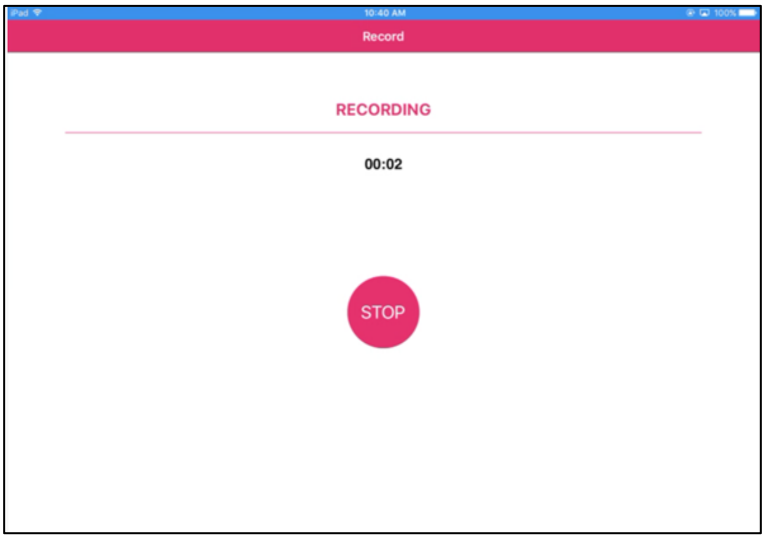
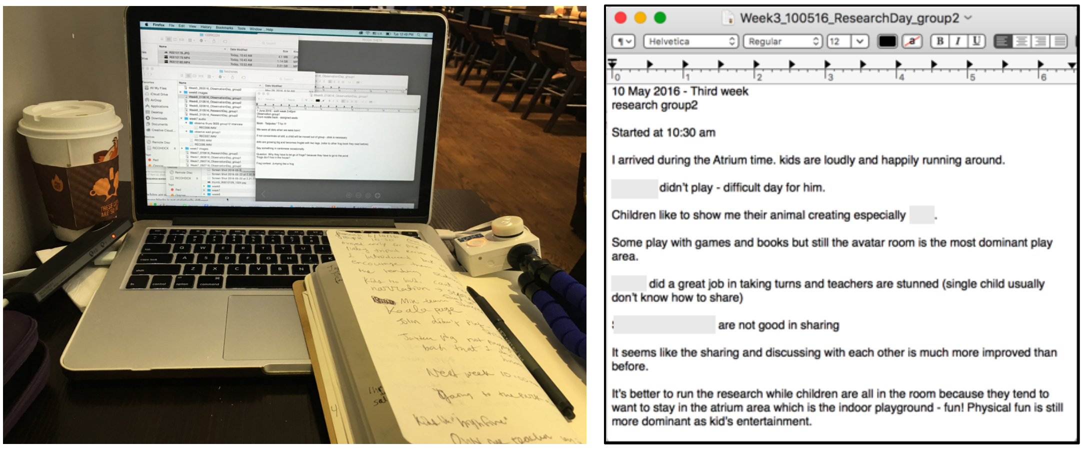


Figure 4.15. Activating Shou to record screen activities

I was cautious about the sound quality of the action cameras, as they were set up some distance from the participants (to avoid disturbing them) and there was significant background noise. To overcome this, I recorded the screen activity on the iPads using a screen-recording app called 'Shou' (Figure 4.15). At the time of the study (2016), the default screen recording feature on the iPad had not been released. Shou also recorded the children's voices, which greatly enhanced my understanding of the preschoolers' use of the touchscreen and allowed me to hear their conversations clearly for transcribing purposes.

4.4.4 Field notes

I took field notes during and after each observation. These primarily consisted of descriptions of the children's interactions, the environment, the mood of the classroom, the teachers' comments, the parents' comments, and so on. I usually made the notes immediately after the iPad session, as the children needed assistance throughout the sessions, which made it difficult to take long, contemporaneous notes. In addition to verbal interactions, I also paid careful attention to laughing/giggling, gestures, articulation, gaze, and additional prompts and assistance from the teachers. I took a short break between the two research times, organising my notes and typing them out using a text editor on my laptop (Figure 4.16).



10 May 2016 - Third week
research group2

Started at 10:30 am

I arrived during the Atrium time. kids are loudly and happily running around.

[redacted] didn't play - difficult day for him.

Children like to show me their animal creating especially [redacted].

Some play with games and books but still the avatar room is the most dominant play area.

[redacted] did a great job in taking turns and teachers are stunned (single child usually don't know how to share)

[redacted] are not good in sharing

It seems like the sharing and discussing with each other is much more improved than before.

It's better to run the research while children are all in the room because they tend to want to stay in the atrium area which is the indoor playground - fun! Physical fun is still more dominant as kid's entertainment.

Figure 4.16. An example of field notes and organisation

When visiting the two classrooms outside of the iPad sessions, I usually had the notebook with me. The data were transferred immediately after each session (the same day) and stored securely on an encrypted hard drive. Furthermore, I took fieldnotes when conducting interviews with the parents and teachers between Weeks 7 and 10. Real names appeared in the transcriptions and were then exchanged for pseudonyms when writing up the research.

4.5 Procedure

4.5.1 Initial meeting

Two weeks before the research began, I had an initial meeting with the two lead teachers to discuss how the children would participate in the study, what I would need to understand and prepare as a researcher in the classroom, and the teachers' roles in the study. Having built positive relationships with the teachers, I came to realise that the centre's diverse community, which is supportive of fun and engaging literacy activity, was well-suited to the study.

An information sheet and informed consent form were distributed to all potential participants' parents, guardians, and teachers before enrolment in the study. I gave a presentation at the time of distributing and collecting these forms, inviting any questions about the study. I visited twice in the morning to spend time with the children and meet the parents and hear their opinions about the research. I also informed them at this stage that I would be handing out permission forms and information sheets to the teachers to be sent home for the parents to review and sign. Additionally, I made sure that the parents and teachers understood that all the actual names mentioned in the recordings would be kept secure at the point of transcription and then anonymised when writing up the findings.

4.5.2 Observation

4.5.2.1 iPad time observations

I designed 10-15-minute weekly sessions in which the children would engage with the app. Interactional data from ethnographic studies include field notes, interviews, texts, and recordings (Copland & Creese, 2017). On a typical research day, I arrived at 10:15 am, prepared to start at 10:30 am. Every Tuesday, I entered Classroom 2 first with eight iPads, six action cameras, one 360° angle camera, and one digital camera, with eight mini tripods. After I had set up the equipment, the first half of the class was paired up and sat down to play with the app. In Classroom 2, the children sat together at one large table, and only half of the children played at one time, while the other half had free playtime (Figure 4.17 left). Following this, the second half of the class was paired up.

On the same day, I visited Classroom 1 at 3:15 pm and began at 3:30 pm. In Classroom 1, the children were divided into groups of two or three, and they all played at the same time (Figure 4.17 right). Through character selection, interactions with the storybooks, and exercises, I observed whether the children developed their

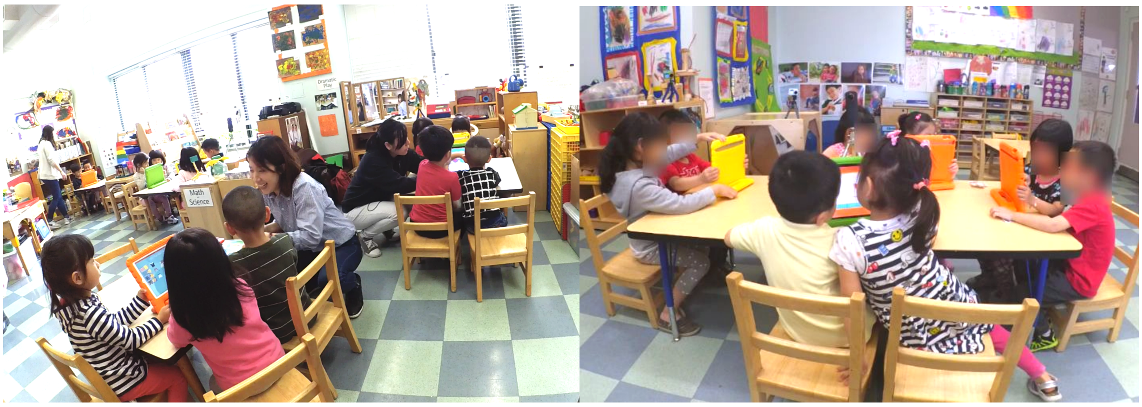


Figure 4.17. Classroom 1 and Classroom 2 setups

reading skills through their use of the app. The participants freely engaged with the iPads without being given a structure or particular rules for how to use them. In both classrooms, the children used the app for approximately 10-15 minutes. The group selections were made by the teachers and they attempted to pair the children differently each week.

Towards the end of the research, during Weeks 8-10, I gathered the children in a circle and introduced the characters and certain activities in the app before the children began to play. Two headteachers supported the research activities and arranged the children's groups. The teachers' roles were crucial here for organising the groups and providing general support. I provided support for any technical issues and answered the children's questions.

4.5.2.2 Class observation

Besides visiting the classroom with the iPads, I hoped to learn how preschool-aged children learned literacy in their daily school lives and literacy classes (Figure 4.18).

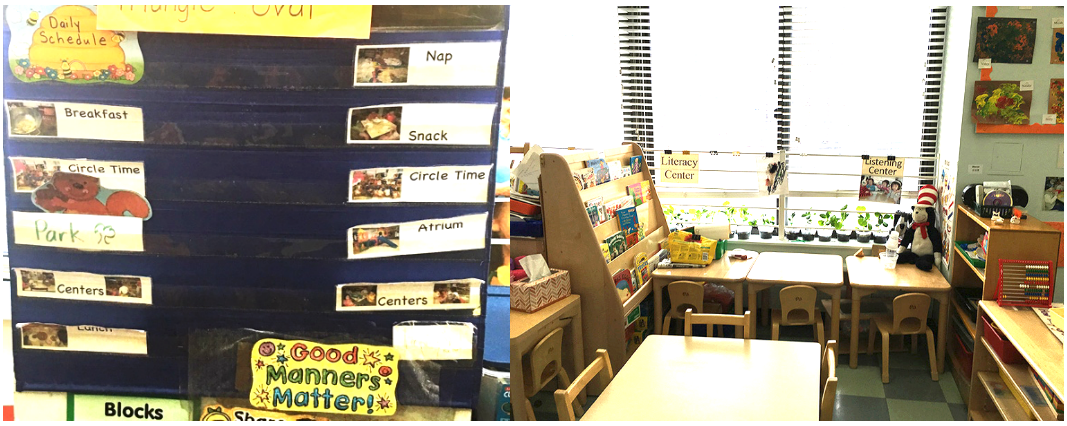

Daily Schedule
Nap
Breakfast
Snack
Circle Time
Circle Time
Park
Atrium
Centers
Centers
Lunch
Good Manners Matter!
Blocks
Literacy Center
Listening Center

Figure 4.18. The daily schedule (left) and setup of literacy centre (right)

Both classes had the same schedule: breakfast, circle time, park time, centre time, lunch, nap time, snack time, circle time, atrium time, and centre time, as seen in the daily schedule board on the left in Figure 4.18. Two circle times appeared, one in the morning and one in the afternoon; regarded as ‘literacy hours’, these sometimes involved reading individually or as a group and sometimes were dedicated to learning emergent literacy skills. The set-up of the literacy centre (Figure 4.18 right) shows books and tables for children to enjoy the reading time on their own. The children would also gather in a rug area, where the teachers would read books to them or introduce various components of emergent literacy skills, such as knowledge of alphabet letters, phonological awareness, print motivation, etc., and play literacy-related games.

I observed those literacy hours at the schools and the development in their literacy skills two or three times a week, which helped the children to become familiar with my presence and gave me a more rounded understanding of their literacy practices. I also participated in their art classes, indoor play time (‘atrium time’), and outdoor play time at a nearby park. I took field notes on these but did not record them with video or audio devices, so as to avoid being disruptive. The more I actively participated and helped teachers during these regular classes, the more comfortable the teachers and children seemed to feel with me, which contributed to my goals of building trusting relationships with the participants. Furthermore, with a linguistic sensibility, I better understood their everyday literacy practices as a close observant in the early classroom setting (Flewitt, 2011).

4.5.2 Interviews

4.5.2.1 Parents

Prior to the interviews, the parents signed the interview consent forms and were able to choose whether the interviews were audio-recorded. If they chose the audio recording option, I used a voice recording app on my iWatch. If they did not choose this option, I relied solely on field notes. Interviews were conducted after the class, when the children were being collected, and they ran from the seventh week to the last. Eight parents agreed to participate, and I took field notes for seven and audio-recorded one. The semi-structured interviews with the parents greatly enhanced my understanding of the participants' backgrounds and media habits (e.g., the kind of digital technology they used at home, how long the children had been engaging with it).

4.5.2.2 Teachers

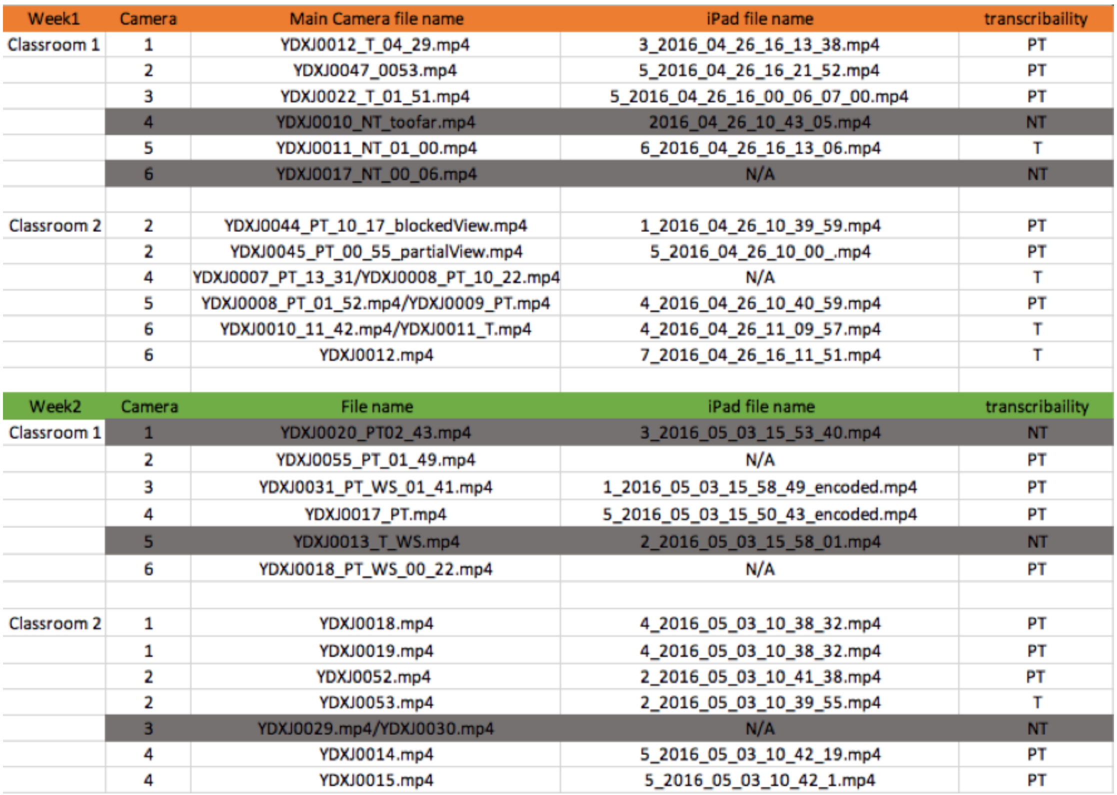
Before the study began, the teachers were asked to sign interview consent forms and indicate whether they would permit audio-recording. I interviewed six teachers (three from each classroom). I took fieldnotes for three teachers and audio-recorded two. Meetings were scheduled for the sixth and seventh weeks, and we met again in the ninth and tenth weeks. I received one teacher's answers via email due to her personal schedule in the last two weeks of my study. The semi-structured interviews with the teachers enhanced my understanding of the educators' views on media use (e.g., the advantages and disadvantages of using digital technology in the classroom, associated challenges for teachers).

4.6 Data collection

4.6.1 Approach to data processing

By the end of my study, I had obtained a total of 101 videos from the action cameras, each recording the actual interactions between the children. I had also gathered 92 supplementary videos of iPad screen-recordings. A list of these is shown in Table 4.2. On occasion, the children unintentionally stopped the screen-recordings by clicking a red bar across the top of the screen. When neither the main video nor the iPad screen videos were clear, I sought to match the corresponding videos for the best transcription results.

Table 4.2. *Excerpt from list of transcription files*



Week1	Camera	Main Camera file name	iPad file name	transcribaility
Classroom 1	1	YDXJ0012_T_04_29.mp4	3_2016_04_26_16_13_38.mp4	PT
	2	YDXJ0047_0053.mp4	5_2016_04_26_16_21_52.mp4	PT
	3	YDXJ0022_T_01_51.mp4	5_2016_04_26_16_00_06_07_00.mp4	PT
	4	YDXJ0010_NT_toofar.mp4	2016_04_26_10_43_05.mp4	NT
	5	YDXJ0011_NT_01_00.mp4	6_2016_04_26_16_13_06.mp4	T
	6	YDXJ0017_NT_00_06.mp4	N/A	NT
Classroom 2	2	YDXJ0044_PT_10_17_blockedView.mp4	1_2016_04_26_10_39_59.mp4	PT
	2	YDXJ0045_PT_00_55_partialView.mp4	5_2016_04_26_10_00_.mp4	PT
	4	YDXJ0007_PT_13_31/YDXJ0008_PT_10_22.mp4	N/A	T
	5	YDXJ0008_PT_01_52.mp4/YDXJ0009_PT.mp4	4_2016_04_26_10_40_59.mp4	PT
	6	YDXJ0010_11_42.mp4/YDXJ0011_T.mp4	4_2016_04_26_11_09_57.mp4	T
	6	YDXJ0012.mp4	7_2016_04_26_16_11_51.mp4	T
Week2	Camera	File name	iPad file name	transcribaility
Classroom 1	1	YDXJ0020_PT02_43.mp4	3_2016_05_03_15_53_40.mp4	NT
	2	YDXJ0055_PT_01_49.mp4	N/A	PT
	3	YDXJ0031_PT_WS_01_41.mp4	1_2016_05_03_15_58_49_encoded.mp4	PT
	4	YDXJ0017_PT.mp4	5_2016_05_03_15_50_43_encoded.mp4	PT
	5	YDXJ0013_T_WS.mp4	2_2016_05_03_15_58_01.mp4	NT
	6	YDXJ0018_PT_WS_00_22.mp4	N/A	PT
Classroom 2	1	YDXJ0018.mp4	4_2016_05_03_10_38_32.mp4	PT
	1	YDXJ0019.mp4	4_2016_05_03_10_38_32.mp4	PT
	2	YDXJ0052.mp4	2_2016_05_03_10_41_38.mp4	PT
	2	YDXJ0053.mp4	2_2016_05_03_10_39_55.mp4	T
	3	YDXJ0029.mp4/YDXJ0030.mp4	N/A	NT
	4	YDXJ0014.mp4	5_2016_05_03_10_42_19.mp4	PT
	4	YDXJ0015.mp4	5_2016_05_03_10_42_1.mp4	PT

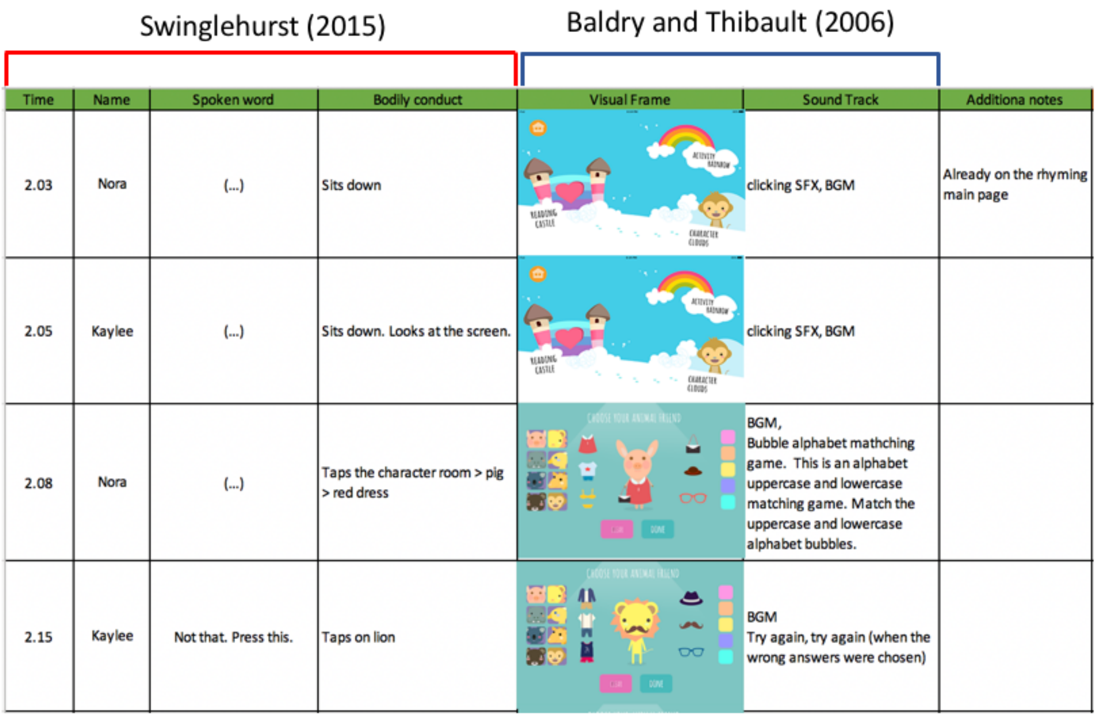
After pairing the action camera and the iPad screen recording files, I coded the whole list, depending on whether their quality was sufficient for transcription: ‘T’ (transcribe-able), ‘PT’ (partially transcribe-able), or ‘NT’ (not transcribe-able) (see Table 4.2). I greyed out the NT sources that were impossible to transcribe. For the data analysis, I divided the 10 weeks into three chunks: Weeks 1-3, 4-7, and 8-10. I then selected 30 videos from each group to note any major change.

For the transcription, I combined the different types of transcription formats. For the overall format, I followed the multimodal transcription format, as invented by

Swinglehurst (2015), which provides an effective methodological tool for the analysis of audio-visual data.

I then borrowed the ‘visual image’ and ‘soundtrack’ columns from the Baldry and Thibault (2006) multimodal transcription format to support my analysis of the semiotic modalities operating in each frame on the screen. For instance, I consistently used this format (shown in Table 4.3) throughout the analysis as a result of combining Swinglehurst’s (2015) and Baldry and Thibault’s (2006) multimodal transcription formats. ‘Additional notes section’ was solely created by me to include any extra remarks that would be useful to understand the moment.

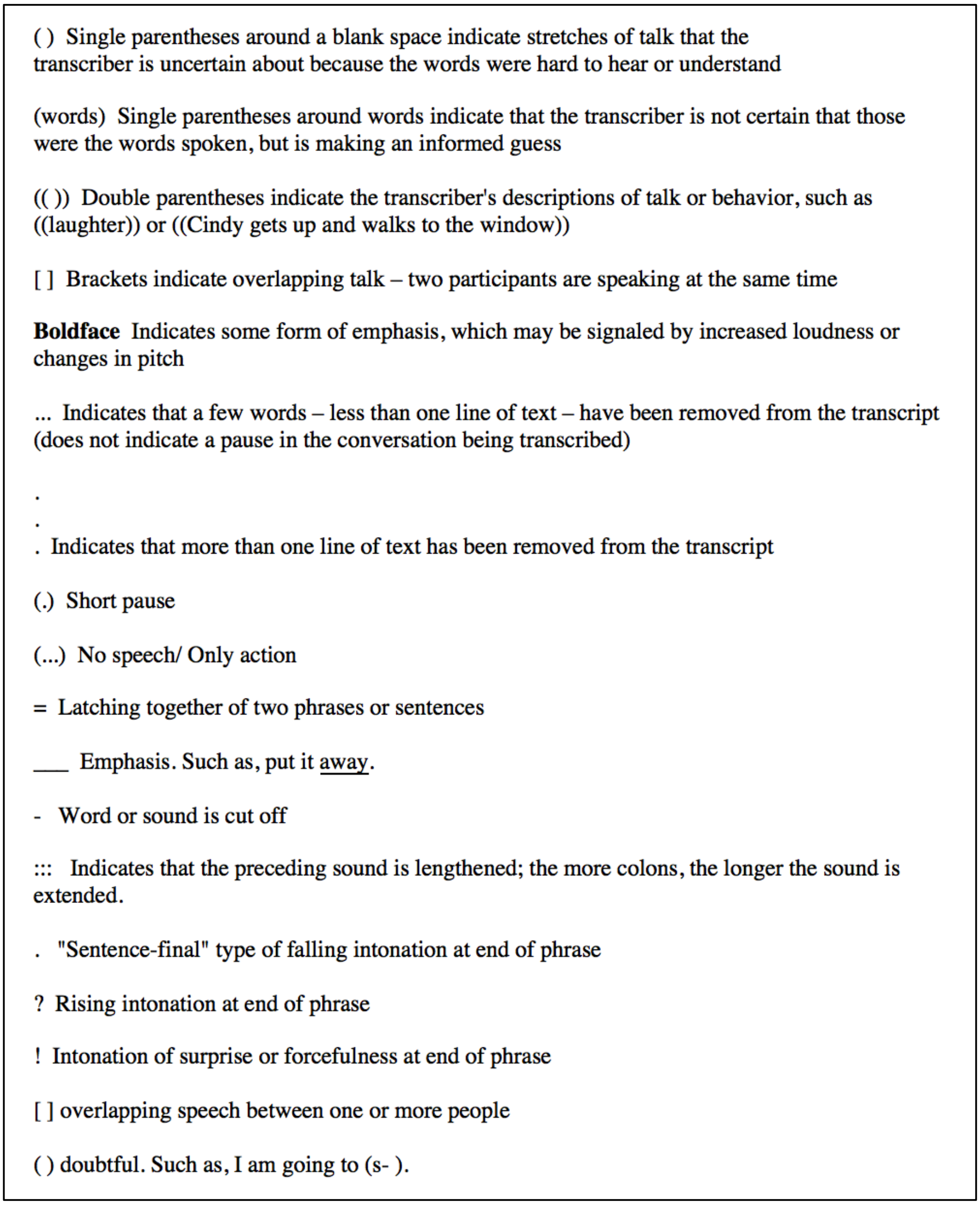
Table 4.3. *Transcription format adapted from* Swinglehurst (2015) and Baldry and Thibault (2006)



Swinglehurst (2015)				Baldry and Thibault (2006)		
Time	Name	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additiona notes
2.03	Nora	(...)	Sits down		clicking SFX, BGM	Already on the rhyming main page
2.05	Kaylee	(...)	Sits down. Looks at the screen.		clicking SFX, BGM	
2.08	Nora	(...)	Taps the character room > pig > red dress		BGM, Bubble alphabet mathching game. This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase alphabet bubbles.	
2.15	Kaylee	Not that. Press this.	Taps on lion		BGM Try again, try again (when the wrong answers were chosen)	

For each line of spoken language, I followed the Richards (2003) transcription conventions (Table 4.4).

Table 4.4. *Transcription conventions of talk adapted from Richards (2003)*



( ) Single parentheses around a blank space indicate stretches of talk that the transcriber is uncertain about because the words were hard to hear or understand

(words) Single parentheses around words indicate that the transcriber is not certain that those were the words spoken, but is making an informed guess

(( )) Double parentheses indicate the transcriber's descriptions of talk or behavior, such as ((laughter)) or ((Cindy gets up and walks to the window))

[ ] Brackets indicate overlapping talk – two participants are speaking at the same time

Boldface Indicates some form of emphasis, which may be signaled by increased loudness or changes in pitch

... Indicates that a few words – less than one line of text – have been removed from the transcript (does not indicate a pause in the conversation being transcribed)

.
.
. Indicates that more than one line of text has been removed from the transcript

(.) Short pause

(...) No speech/ Only action

= Latching together of two phrases or sentences

___ Emphasis. Such as, put it away.

- Word or sound is cut off

::: Indicates that the preceding sound is lengthened; the more colons, the longer the sound is extended.

. "Sentence-final" type of falling intonation at end of phrase

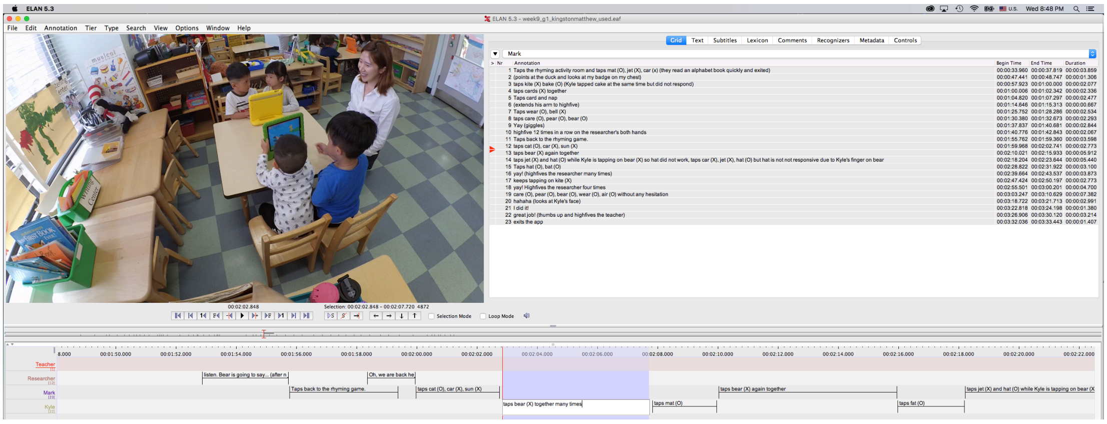
? Rising intonation at end of phrase

! Intonation of surprise or forcefulness at end of phrase

[ ] overlapping speech between one or more people

( ) doubtful. Such as, I am going to (s-).

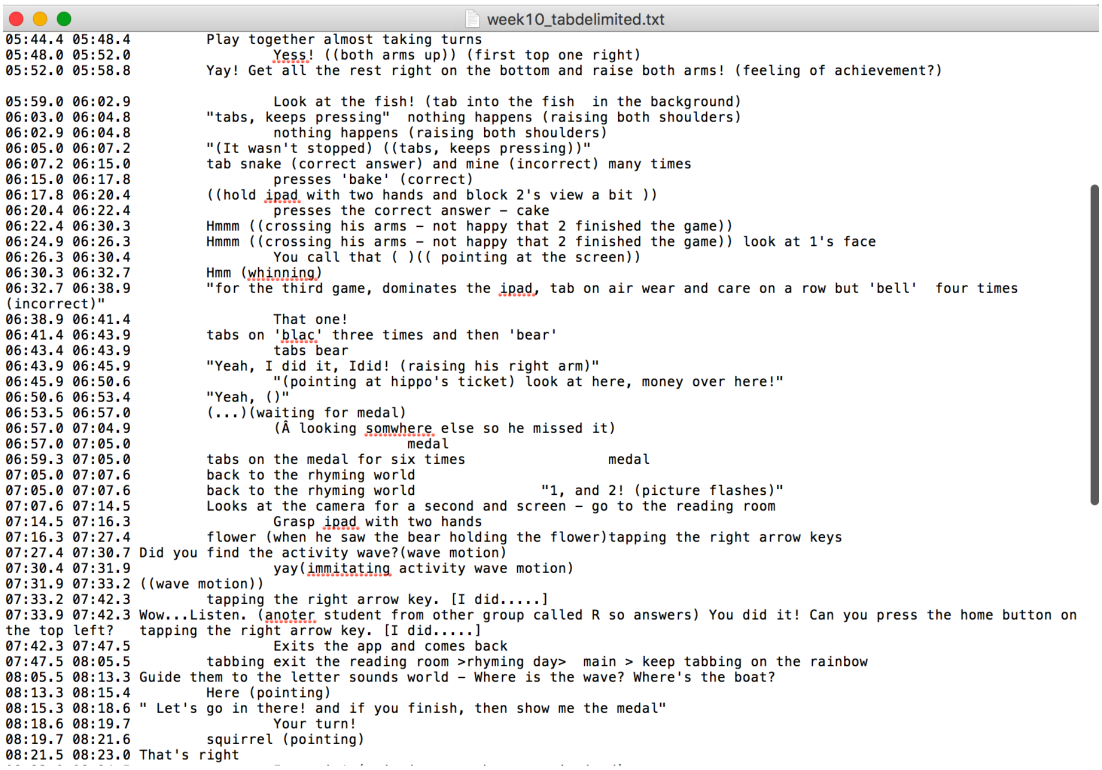
I used ELAN, created by the Max Planck Institute for Psycholinguistics in Nijmegen, Netherlands, to transcribe the video and screen recordings. This software's user-friendly interface (Figure 4.19) allowed me to embed multiple media (e.g., soundwaves and videos) and add tiers, as well as adding annotations in the annotation mode.


ELAN 5.3 - week9_g1_kingstonmatthew_used.eaf
File
Edit
Annotation
Tier
Type
Search
View
Options
Window
Help
Wed 8:48 PM
Grid
Text
Subtitles
Lexicon
Comments
Recognizers
Metadata
Controls
Mark
00:02:02.848
Selection: 00:02:02.848 - 00:02:07.720 4872
Selection Mode
Loop Mode
Teacher
Researcher
Mark
Kyle
listen. Bear is going to say... (after n
Oh, we are back he
Taps back to the rhyming game.
taps cat (O), car (X), sun (X)
taps bear (X) together many times
taps mat (O)
taps bear (X) again together
taps fat (O)
taps jet (X) and hat (O) while Kyle is tapping on bear (X

Nr	Annotation	Begin Time	End Time	Duration
1	Taps the rhyming activity room and taps mat (O), jet (X), car (x) (they read an alphabet book quickly and exited)	00:00:33.960	00:00:37.819	00:00:03.859
2	(points at the duck and looks at my badge on my chest)	00:00:47.441	00:00:48.747	00:00:01.306
3	taps kite (X) bake (O) (Kyle tapped cake at the same time but did not respond)	00:00:57.923	00:01:00.000	00:00:02.077
4	taps cards (X) together	00:01:00.006	00:01:02.342	00:00:02.336
5	Taps card and nap	00:01:04.820	00:01:07.297	00:00:02.477
6	(extends his arm to highfive)	00:01:14.646	00:01:15.313	00:00:00.667
7	Taps wear (O), bell (X)	00:01:25.752	00:01:28.286	00:00:02.534
8	taps care (O), pear (O), bear (O)	00:01:30.380	00:01:32.673	00:00:02.293
9	Yay (giggles)	00:01:37.837	00:01:40.681	00:00:02.844
10	highfive 12 times in a row on the researcher's both hands	00:01:40.776	00:01:42.843	00:00:02.067
11	Taps back to the rhyming game.	00:01:55.762	00:01:59.360	00:00:03.598
12	taps cat (O), car (X), sun (X)	00:01:59.968	00:02:02.741	00:00:02.773
13	taps bear (X) again together	00:02:10.021	00:02:15.933	00:00:05.912
14	taps jet (X) and hat (O) while Kyle is tapping on bear (X) so hat did not work, taps car (X), jet (X), hat (O) but hat is not not responsive due to Kyle's finger on bear	00:02:18.204	00:02:23.644	00:00:05.440
15	Taps hat (O), bat (O)	00:02:28.822	00:02:31.922	00:00:03.100
16	yay! (highfives the researcher many times)	00:02:39.664	00:02:43.537	00:00:03.873
17	keeps tapping on kite (X)	00:02:47.424	00:02:50.197	00:00:02.773
18	yay! Highfives the researcher four times	00:02:55.501	00:03:00.201	00:00:04.700
19	care (O), pear (O), bear (O), wear (O), air (O) without any hesitation	00:03:03.247	00:03:10.629	00:00:07.382
20	hahaha (looks at Kyle's face)	00:03:18.722	00:03:21.713	00:00:02.991
21	I did it!	00:03:22.818	00:03:24.198	00:00:01.380
22	great job! (thumbs up and highfives the teacher)	00:03:26.906	00:03:30.120	00:00:03.214
23	exits the app	00:03:32.036	00:03:33.443	00:00:01.407

Figure 4.19. The ELAN transcription software interface

I then exported this as tab-delimited text, with separate columns in the export for each tier in a text file, with a beginning and end time (Figure 4.20).


week10_tabdelimited.txt

```
05:44.4 05:48.4         Play together almost taking turns
05:48.0 05:52.0                 Yess! ((both arms up)) (first top one right)
05:52.0 05:58.8         Yay! Get all the rest right on the bottom and raise both arms! (feeling of achievement?)

05:59.0 06:02.9                 Look at the fish! (tab into the fish  in the background)
06:03.0 06:04.8         "tabs, keeps pressing"  nothing happens (raising both shoulders)
06:02.9 06:04.8                 nothing happens (raising both shoulders)
06:05.0 06:07.2         "(It wasn't stopped) ((tabs, keeps pressing))"
06:07.2 06:15.0         tab snake (correct answer) and mine (incorrect) many times
06:15.0 06:17.8                 presses 'bake' (correct)
06:17.8 06:20.4         ((hold ipad with two hands and block 2's view a bit ))
06:20.4 06:22.4                 presses the correct answer - cake
06:22.4 06:30.3         Hmmm ((crossing his arms - not happy that 2 finished the game))
06:24.9 06:26.3         Hmmm ((crossing his arms - not happy that 2 finished the game)) look at 1's face
06:26.3 06:30.4                 You call that ( )(( pointing at the screen))
06:30.3 06:32.7         Hmm (whinning)
06:32.7 06:38.9         "for the third game, dominates the ipad, tab on air wear and care on a row but 'bell'  four times
(incorrect)"
06:38.9 06:41.4                 That one!
06:41.4 06:43.9         tabs on 'blac' three times and then 'bear'
06:43.4 06:43.9                 tabs bear
06:43.9 06:45.9         "Yeah, I did it, Idid! (raising his right arm)"
06:45.9 06:50.6                 "(pointing at hippo's ticket) look at here, money over here!"
06:50.6 06:53.4         "Yeah, ()"
06:53.5 06:57.0         (...)(waiting for medal)
06:57.0 07:04.9                 (Â looking somwhere else so he missed it)
06:57.0 07:05.0                                 medal
06:59.3 07:05.0         tabs on the medal for six times                  medal
07:05.0 07:07.6         back to the rhyming world
07:05.0 07:07.6         back to the rhyming world                "1, and 2! (picture flashes)"
07:07.6 07:14.5         Looks at the camera for a second and screen - go to the reading room
07:14.5 07:16.3                 Grasp ipad with two hands
07:16.3 07:27.4         flower (when he saw the bear holding the flower)tapping the right arrow keys
07:27.4 07:30.7 Did you find the activity wave?(wave motion)
07:30.4 07:31.9                 yay(immitating activity wave motion)
07:31.9 07:33.2 ((wave motion))
07:33.2 07:42.3         tapping the right arrow key. [I did.....]
07:33.9 07:42.3 Wow...Listen. (anoter student from other group called R so answers) You did it! Can you press the home button on
the top left?   tapping the right arrow key. [I did.....]
07:42.3 07:47.5                 Exits the app and comes back
07:47.5 08:05.5         tabbing exit the reading room >rhyming day>  main > keep tabbing on the rainbow
08:05.5 08:13.3 Guide them to the letter sounds world - Where is the wave? Where's the boat?
08:13.3 08:15.4         Here (pointing)
08:15.3 08:18.6 " Let's go in there! and if you finish, then show me the medal"
08:18.6 08:19.7                 Your turn!
08:19.7 08:21.6         squirrel (pointing)
08:21.5 08:23.0 That's right
```

Figure 4.20. A sample of tab-delimited text

I organised the text files in chronological order in my hard drive folders, saved on a passcode-protected computer and hard drive, to which no one else had access.

4.6.2 Coding process

The primary goal of my study was to explore the nature of peer-group-centred interactions in relation to literacy learning. I adopted the analytical framework of peer group interaction developed by Kumpulainen and Mutanen (1999) to investigate students' social interactions during collaborative learning tasks. As discussed in section 2.4, the coding protocol was primarily divided into three dimensions: cognitive processing, social processing, and language functions.

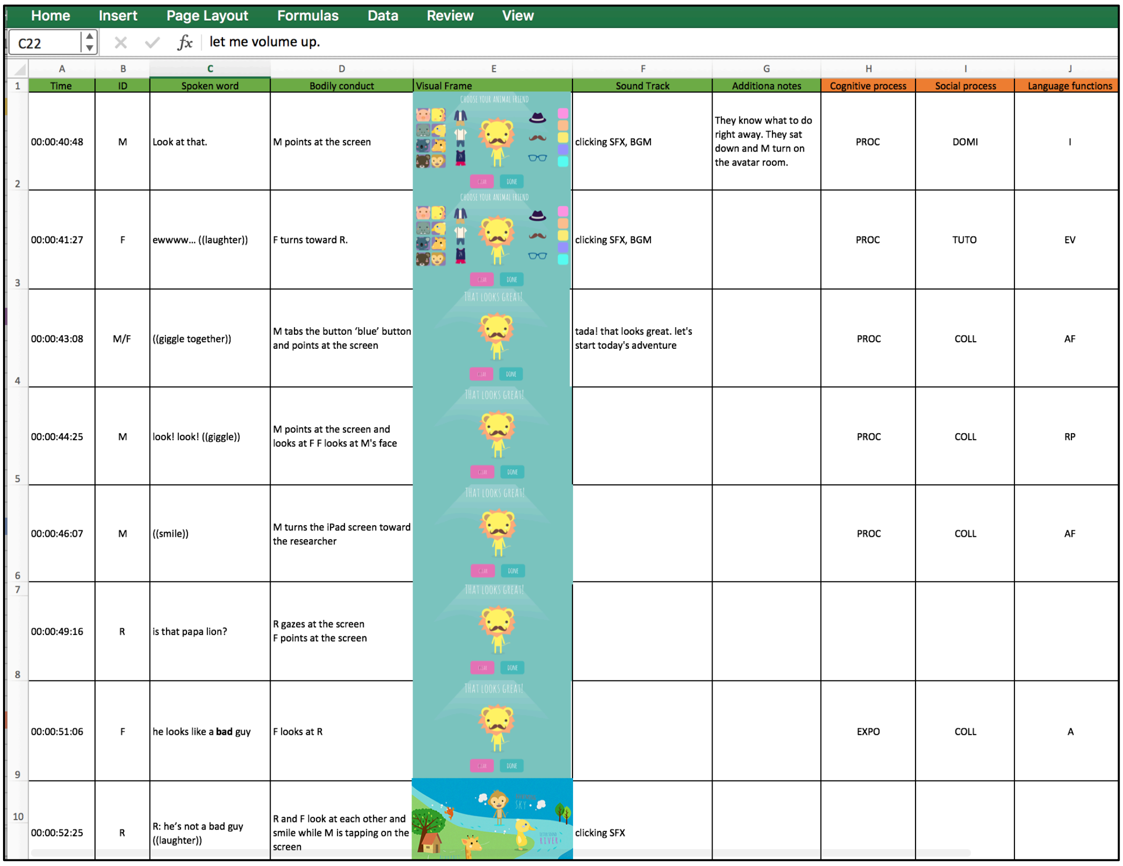
Analysis of cognitive processing in peer group interaction across learning situations can help to identify two different ways of learning. The first is *exploratory* or i*nterpretive* categorisation, which is geared toward a strategic form of learning that has undergone hypothetical testing. The second is *procedural*, the opposite of the first, and this is an immediate and unplanned process that lacks constructive reasoning.

The analysis of social processing interactions in peer group interaction is applicable for examining the presence or absence of understanding of sharing among peers by exploring types of participation and social relationships. Finally, analysis of the nature of verbal interaction may take an activity point of view (e.g., *dictation* and *reading aloud*), an interpretative view (e.g., informative, reasoning, evaluative), or a social perspective (e.g., affectional, responsive, judgmental) (Kumpulainen & Mutanen, 1999, p. 456-459).

4.6.3 Data analysis

I used Excel spreadsheets to code the transcriptions by importing the tab-delimited text files exported from ELAN. As shown in Table 4.5, I labelled the columns 'Time', 'ID', 'Spoken word', 'Bodily conduct', 'Visual frame', 'Soundtrack' and 'Additional Notes' (Table 4.5). I also added three columns to the far right to code peer interactions in terms of cognitive processes, social processes, and communication style.

Table 4.5. *An example of coding in Excel*



Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additiona notes	Cognitive process	Social process	Language functions
00:00:40:48	M	Look at that.	M points at the screen		clicking SFX, BGM	They know what to do right away. They sat down and M turn on the avatar room.	PROC	DOMI	I
00:00:41:27	F	ewwww... ((laughter))	F turns toward R.		clicking SFX, BGM		PROC	TUTO	EV
00:00:43:08	M/F	((giggle together))	M tabs the button 'blue' button and points at the screen		tada! that looks great. let's start today's adventure		PROC	COLL	AF
00:00:44:25	M	look! look! ((giggle))	M points at the screen and looks at F F looks at M's face				PROC	COLL	RP
00:00:46:07	M	((smile))	M turns the iPad screen toward the researcher				PROC	COLL	AF
00:00:49:16	R	is that papa lion?	R gazes at the screen F points at the screen						
00:00:51:06	F	he looks like a **bad** guy	F looks at R				EXPO	COLL	A
00:00:52:25	R	R: he's not a bad guy ((laughter))	R and F look at each other and smile while M is tapping on the screen		clicking SFX				

After conducting this sample data analysis, I simplified the timecode. For example, '00:16:20;11' (hours, minutes, seconds; frames) became '16.20' (minutes.seconds). I chose to do this because the video recordings were all 30 minutes or less, as each block was half an hour in length. The hours indicated on the timecode were 0, due to the research time, and the values on the frames were cumbersome and could be confused with seconds. I used a full stop in place of a colon to ease the transcription in Excel. If values are input with a colon, Excel attempts to convert these to times, by default, which complicates the notation with 'am' and 'pm'.

Most importantly, I excluded the codes I deemed too advanced for this age group, according to Kumpulainen and Mutanen (1999)'s analytical framework of peer group interaction (for example, *compositional* and *revision* and *dictating*), as the original framework was designed for primary school students. Additionally, I altered the abbreviations of some of the codes to make them easier for me to remember them. For instance, I changed the code for *agreement/disagreement* from 'Ja/Jd' to 'A/DA' and for *responsive* from 'A' to 'An'. This ultimately sped up the coding process. I renamed the third dimension *communication style* to cover both verbal and non-verbal communication, since my observations concerned gestures and gazes when the children were silent. In *social processing*, I created a *non-collaborative* code, following my observation that children often chose not to collaborate due to negative reasons, such as *argument*, *domination,* and *conflict*.

I added *acquisition* and *innovation* to *cognitive processing* and *problem-solving* in *social processing*. This framework primarily concerned digital literacies, but I exchanged *acquisition* for *literacy acquisition* so that I could show any new literacy knowledge gained in the app. I also edited *innovation* to indicate the application of the app content in extended or pretended play. All the edited and additional components of the original framework are shown in Table 4.6.

Table 4.6. *Revised analytical framework of peer group interaction*

Dimension	Analytical Categorization		Description
Cognitive processing	Exploratory	EXPO	- Interpreting the app's contents thoroughly with reflective analysis and problem solving
	Procedural	PROC	- Random navigation of the app without reflective analysis
	Literacy Acquisition	LA	- Showing any new literacy acquisition
	Innovation	IN	- Use an app to extended play or pretend play

Social processing	Collaborative	COLL	- Joint activity characterized by equal participation and meaning making
	Individual	INDI	- Student(s) are working on individual tasks with no sharing or joint meaning making
	Off-task	OFF	- Activity not related to the task
	Confusion	FUSI	- Lack of shared understanding, student(s) do not understand the task or each other, often includes silent episodes
	Domination	DOMI	- Student dominating the work, unequal participation
	Argumentative	ARGU	- Student(s) are faced with cognitive/social conflicts which are resolved and justified in a rational way
	Conflict	FLCI	- Student(s) are faced with cognitive/social conflicts which are often left unresolved
	Tutoring	TUTO	- Student helping and assisting another student
	Problem solving	PROB	- Trying different actions to solve an issue (e.g., seeking assistance from peers or adults for desired outcome)
Communication Style	Affectional	AF	- Expressing feelings or opinions
	Agreement/disagreement	A/DA	- Expressing agreement/disagreement
	Informative	I	- Providing information
	Interrogative	Q	- Asking questions
	Experiential	E	- Expressing personal information
	Responsive	AN	- Answering questions
	Reading	RE	- Reading the text
	Repetition	RP	- Repeating spoken language

For fluidity of item alignment when presenting the analysis of the children's choices on the app, I italicised the items from the activity room and avatar room when they were presented consecutively, thus avoiding the use of multiple indefinite articles. In this way, the flow of sentences was less disrupted. For example, when listing a series of avatar items, I stated, '*lion*, *suit*, *pig*, *red dress*, *purse*, *t-shirt*, *bikini*, *duck*, *blue dress*, *lion*, and *eye glasses*', rather than, 'a lion, a suit, a pig, a red dress, a purse, a t-shirt, a bikini, a duck, a blue dress, a lion, and a pair eye glasses.'

I analysed patterns in students' expressions, behaviours, and depths of understanding. Although Classroom 1 and Classroom 2 had unique characteristics in terms of people and culture, the sample analyses demonstrated that responses to RQ1-2 were somewhat similar for the two; and since the purpose was not to compare the classrooms, I decided to look at examples from both for each case. The greatest challenge was interpreting the silence, as the reasons for it depended on the factors affecting the children's focus (e.g., being lost, doing something else, having a disagreement, etc.). After adding codes to the last three columns, I analysed the files in regards to the three research questions cited in Chapter 1:

> RQ1. In what ways do preschoolers engage in meaning-making processes and practise emergent literacy skills when using iPads in the classroom?
>
> RQ2. What changes in peer group interaction were displayed over time when the children played with the app with their peers?
>
> RQ3. Are there any literacy practices with Aniland that later reappear in the classroom context?

4.7 Summary

In this chapter, I explain how ethnography—more specifically, linguistic ethnography—gave me the perspective and tools required to carry out my aims. I sought to conduct a microgenetic case study, with detailed analyses of moment-by-moment interactions, enriched by a more holistic understanding of children's literacy practices. I also employed other methods, such as observations of other lessons and interviews with parents and children. With the combined video-recording and screen-capture methodology, I achieved an effective means of analysing the children's interactions with screens, one another, and their teachers.

I also describe how I conducted my microgenetic case study, including the ethics and data collection procedures. I used naturalistic observation to observe the students' most spontaneous behaviours, the classroom dynamics, the students' conversations, and the classroom settings. I was not limited to any specific protocol. By trial and error—and with the teachers' support—I was able to ensure both my own and the teachers' active engagement in the later weeks of the intervention; as a result, I was able to enhance the preschool students' literacy practices through their use of the iPads.

I conducted the classroom research using the latest digital technology, including iPads, action cameras, and a 360-degree camera. It is my hope that the account I provide here is useful for linguistic ethnographic studies, as observing, transcribing, and analysing interactions is challenging with children.

In addition, I was present in the classroom during the children's literacy activities and other everyday activities 2-3 times each week. This mean that the students and teachers eventually felt comfortable with me, as though I had become a part of the institution.

Data organisation and analysis approach were explained above to show how I approached RQs 1-3, to which I now turn. The data analysis approach and process of selecting multimodal files were explained, in that the clarity of video and sound quality and relevance to the research questions would be closely examined in chapters 5 through 7. I will now go through the coded transcription files and answer the research questions.

CHAPTER 5
RESULTS AND ANALYSIS:
RESPONDING TO RESEARCH QUESTION 1

5.0 Introduction

In the present study, I analysed videos of children's interactions with their peers and with a literacy app, Aniland, for the iPad. I applied a coding protocol to analyse the children's learning outcomes in three dimensions: cognitive processing, social processing, and communication style. This was based on an analytic framework of peer group interaction (Kumpulainen & Mutanen, 1999). The full, revised, analytical framework of peer group interaction is described in Chapter 4.

For the analysis chapters 5, 6, and 7, I will begin by sharing for the convenience of the reader the tables for dimensions used to analyse excerpts. The excerpts are selected from the 27 transcribed files, nine for each chapter. Each section of the analysis chapters consists of three examples from the beginning (Weeks 1–3), middle (Weeks 4–6), and end phases (Weeks 7–10) in chronological order. I analysed interactions of children in each phase and then all three phases together in response to the corresponding research questions. In addition, I mixed examples from Classroom 1 and Classroom 2 in each case, as the purpose of this research was not to compare the two classrooms and my analyses have shown that there were no marked differences between the two.

To answer my first research question (*In what ways do preschoolers engage in the meaning-making processes and practise emergent literacy skills when using iPads in the classroom?*), I focussed on cognitive processing, which includes exploratory and procedural literacy acquisition and innovation, as shown in Table 5.1. I explored how the children's interactions changed throughout the phases of the study and have provided descriptive walk-throughs of the transcripts to take the reader through the development of the children's meaning-making processes when using Aniland.

Table 5.1. *Revised analytical framework of peer group interaction – cognitive processing*

Dimension	Analytical Categorization		Description
Cognitive processing	Exploratory	EXPO	- Interpreting the app's contents thoroughly with reflective analysis and problem solving
	Procedural	PROC	- Random navigation of the app without reflective analysis
	Literacy Acquisition	LA	- Showing any new literacy acquisition
	Innovation	IN	- Use an app to extended play or pretend play

I examined the coded responses to determine the manner in which the children interacted with the app, made meaning out of their experiences, practised new literacy information, and even attempted to engage in extended play. I also focussed on whether their mode of engagement with the iPad changed between exploratory modes (coded 'EXPO'), or navigating with reflective analysis and problem-solving, and procedural modes (coded 'PROC'), or random navigation without reflective analysis, in the following examples.

5.1 Beginning phase

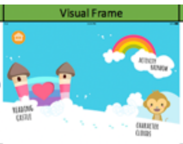
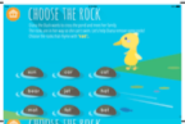
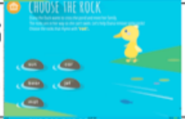
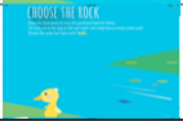
5.1.0 Preview

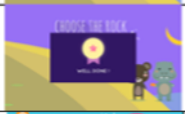
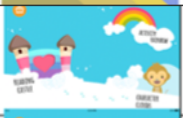
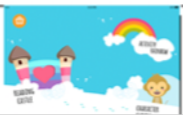
In the beginning phase (Weeks 1-3) of the study, children showed free exploration through the app. They usually exhibited a procedural (PROC) mode in cognitive processing, which means they did not show any clear purpose or analyse the contents of the app. Children were familiarising themselves with the app, my own presence around them, and a change in schedule, and they were adapting to using tablets, which they had not used in school and did not all possess at home. In the first week, I walked around the classroom and asked each child to circle a smiley or a grumpy face on their consent forms depending on whether they were happy or not to play the app. Children spent time mostly in the avatar room selecting animals and dressing them up. Because this was the children's first time playing Aniland, the emergent literacy practices and meaning-making processes might not have been observed due to the children adjusting to a new virtual environment. The teachers and I in this phase were more focussed on helping every child in a pair or group of three get an equal chance to play.

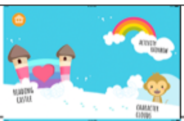
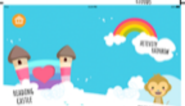
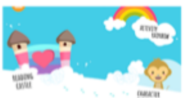
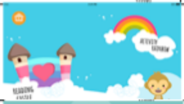
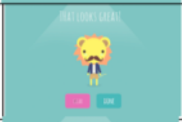
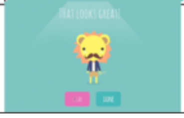
5.1.1 Example 1

In Week 1, children were sitting on a rug in a circle when I finished setting up my equipment in Classroom 2. I gave them a brief introduction explaining that I had created the Aniland app for children to interact with animals and alphabets, and I needed them to join play with the animals in the app. I had previously had an introductory visit, so some of children remembered me. Children were called by their teachers from a rug to a table area and sat at the tables in pairs. Three to four pairs were able to fit in a large table together and rotated after 15 minutes of play. The example below (Table 5.2) illustrates Franco and Julian's interactions with Aniland.

Table 5.2. *Transcription from Week 1*

Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
4.02	Julian	(..)	Taps the rhyming activity room		clicking sound, BGM		PROC	INDI	
4.05	Franco	(..)	Moves chairs toward the iPad		clicking sound, BGM		PROC	COLL	
4.12	Julian	Yayyyy! Boodee boodee boodee (xxx)	Moves the iPad toward Franco, taps all the rocks randomly and gets the correct answers, sun (x), cat (O), jet (X), fat (O), bear (X), bat (O), hat (O), then raises his both arms		clicking sound, BGM		PROC	INDI	AF
4.19	Franco	Yay!	Taps mat (O), screams and places both hands on his cheeks		Great job! You helped Diana the Duck cross the pond safely and meet her family.		PROC	COLL	

4.19	Franco	Yay!	Taps mat (O), screams and places both hands on his cheeks	CHOOSE THE ROCK	Great job! You helped Diana the Duck cross the pond safely and meet her family.		PROC	COLL	
4.36	Julian	(..)	Taps randomly on the rocks and gets the question correct, kite (X), card (X), lake (O), bike (X), cake (O), lake (O). Looks at Franco.	CLICK THE ROCK	clicking sound, BGM		PROC	DOMI	
4.42	Franco/Julian	((scream))		CLICK THE ROCK	BGM		PROC	COLL	AF
4.45	Julian	Ms Iva!	Looks for the researcher	CLICK THE ROCK	Wonderful! You helped Pat home safe for dinner.		PROC		
4.46	Franco	Ms Iva!	Looks for the researcher	CLICK THE ROCK	BGM				AF
4.51	Researcher	Yes!	Comes to the taple	CLICK THE ROCK	BGM				
4.53	Franco	Look! We got it!	Shows the iPad to the researcher	CLICK THE ROCK	BGM		EXPO	COLL	I
4.57	Researcher	Oh, you guys got it! So good, bravo! There's another one coming after this. You can get a medal after that.		CHOOSE THE ROCK	BGM				
5.02	Julian	(...)	Julian taps the correct answer with some wrong answers – air (O), black (X), bell (X), wear (O), jam (X), care (O), pear (O), star (X), bear(O)	CHOOSE THE ROCK	clicking SFX, BGM	Wear > air > care > pear >bear	PROC	DOMI	
5.07	Franco	Yay!		CHOOSE THE ROCK WELL DONE!	Bravo! Now Lawrence can go to the movies with Baxter.		PROC	COLL	AF
5.08	Researcher	What is your name?	Sits next to Julian with a cosent form	 CHOOSE THE ROCK WELL DONE!	Well done! You earned a medal! Woohoo!				
5.14	Julian	Julian.			BGM		PROC	OFF	AN
5.16	Franco	hippopatumus			BGM		PROC	OFF	AN
5.18	Researcher	Julian, are you happy playing Aniland?			BGM				
5.21	Julian	yes!	looks at the researcher		BGM			OFF	AN

5.24	Researcher	Can you circle a happy face if you are happy?	hands a pen		BGM				
5.32	Julian	(..)	grabs the pen and looks at Iva to assure		BGM			OFF	
5.38	Researcher	yeah, you have to press hard.			BGM				
5.40	Franco	(..)	circles the smiley face and gives the pen to the researcher		BGM			OFF	
5.45	Researcher	((to Julian)) Thank you Julian! ((to Franco)) What's your name?	moves to the Franco's side		BGM				
5.55	Franco	Franco			BGM			OFF	AN
5.58	Researcher	Felix, are you happy or sad playing Aniland? Can you circle the face?			BGM				
6.07	Franco	((smile))	circle big on smily face		BGM		PROC	OFF	AF
6.11	Researcher	Wow, thank you Felix! (to both) what's your favorite animals?			BGM				
6.23	Franco	lion			clicking SFX, BGM		PROC	OFF	AN
6.25	Julian	I like hippopatumus	Taps the avatar room		clicking SFX, BGM	plet is close to Julia	PROC	DOMI	AN
6.29	Franco	(..)	Reaches his arms and taps suit and mastache		clicking SFX, BGM		PROC	COLL	
6.33	Researcher	Wow it looks very smart.			clicking SFX, BGM				
6.37	Franco	((big laughter))	Taps done and shows toward the R		BGM		PROC	COLL	AF
6.39	Julian	((big laughter))	Looks at the camera		That looks great!		PROC	COLL	AF

SFX=sound effect
BGM=background music

Prior to this point, they had played in the avatar room for approximately 3 minutes, with Julian dominating the iPad and Franco watching him play. Julian tapped on the activity room and started the rhyming game (4.02), coded as PROC because the child's purpose in navigating to the activity room was unclear. Franco wanted to participate and moved his chair toward the iPad (4.05) (PROC). On the duck stage, Julian randomly tapped and got the first one incorrectly, *sun*, the next one correctly, *cat*, the next one incorrectly, *jet*, the next one correctly, *fat*, the next one incorrectly, *bear*, and the next two correctly *bat* and *hat*. Then, he shook his right arm and said, "Yay! Boodee boodee boodee (XXX)" (4.12) (PROC). Franco put both hand on his cheeks and screamed, "Yayyy!" (4.19) (PROC).

On the pig stage, Julian once again tapped randomly on the rocks and got some wrong and right answers – *kite* (incorrect), *card* (incorrect), *lake* (correct), *bike* (incorrect), *cake* (correct), *lake* (correct) and looked at Franco. (4.36) (PROC). They both screamed as they hear the narration, "Wonderful! You helped Pat home safe for dinner" (4.42) (PROC). Julian and Franco both called to me, "Ms Iva!" to show that they got the answer right (4.45) (4.46) (PROC). I came to the table and answered them, "Yes!" (4.51). Franco said, "Look, we got it!" showing the iPad to me. I said, "Oh, you guys got it! So good, bravo! There's another one coming after this. You can get a medal after that." Then the page automatically moved on to the bear stage. Julian was dominant, tapping rocks until he found all the correct answers. He tapped the correct response first *air*, incorrect one *black*, incorrect one *bell*, correct one *wear*, incorrect one *jam*, two correct ones *care* and *pear*, incorrect one *star,* and correct one *bear* (5.02). It was unclear whether Julian was finding the answers by guessing or applying thoughtfulness; therefore, I coded this as PROC. When the medal popped up, Franco cheered, "Yay!" (5.07) (PROC).

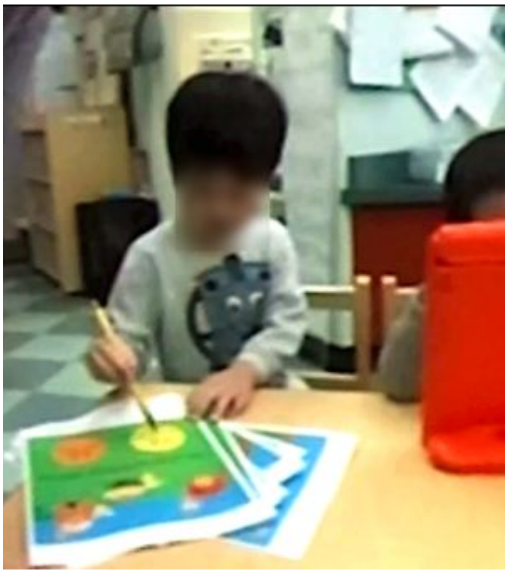


Figure 5.1. A child signs a consent form

When the page turned to the main menu, I sat next to Julian with a consent form (Figure 5.1) and asked, “What is your name?” (5.08). As mentioned in Chapter 4, I collected children’s versions of a consent form as well as parents’ and teachers’ in order to respect children’s own opinions on their willingness to play Aniland, not because their parents or teachers agreed to have them engage with the app. He answered, “Julian” and looked at the consent form (5.14). I did not code cognitive processing criteria when children were signing the form because they were not using the iPad in that interval. Followed by Julian, Franco answered, “Hippopotamus” instead of revealing his name (5.16). I asked Franco, “Are you happy playing Aniland?” (5.18). Franco looked at my face and responded, “Yes” (5.21). I asked Marco, “Can you circle a happy face if you are happy?” and handed a pen to him (5.24). He grabbed the pen and gazed at my face (5.32). I told him, “You have to press hard” (5.38). He circled the smiley face and then handed me back the pen (5.40). I said, “Thank you, Julian,” and moved to Franco’s side while asking him, “What’s your name?” (5.45). Franco said, “Franco.” (5.55). Then I asked him, “Franco, are you happy or sad playing Aniland? Can you circle the face?” (5.58). Franco smiled and made a big circle around a smiley face. I said “Thank you, Franco!” and asked both children, “What’s your favourite animals?” (6.11). Franco replied, “Lion” (6.23). Julian “I like the hippopotamus,” then tapped the avatar room and picked a lion (6.25); I coded this moment PROC because the reason for picking a lion was unclear, though he could have made a decision after hearing Franco.

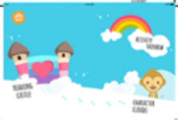
Julian was leading and Franco watching or reacting to Julian's play for most of the time. However, at this moment, Franco reached over and selected a moustache for the lion, which was wearing suspenders (6.29) (PROC). I commented, "Wow, it looks very smart." Franco tapped Done and showed the moustached lion to me with a big laugh (6.37) (PROC). Julian also laughed and looked at the camera. Franco giggled at what they had created (6.44) (PROC); they continued playing in the avatar room till it was time to switch with the next team.

In this example from Week 1 focussing on cognitive processing, I did not observe any clear purpose of navigation or meaning-making process. The children explored the longest in the avatar room and played rhyming games by randomly tapping on the rocks. Julian led the play and Franco watched him. When I was asking a child to circle a happy or sad face on a consent form, the other child did not engage in the app and waited for his peer to be done with signing the form.

5.1.2 Example 2

The transcription excerpt shown in Table 5.3 illustrates two children's interactions when playing Aniland in the second week in Classroom 1. The children were having a story time with the teacher prior to the iPad time. As soon as the teacher called Oliver and Alice's names, they moved rapidly to the table and sat down.

Table 5.3. *Transcription from Week 2*

Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
18.23	Oliver	I want Green!				green ipad is not available. Proceed with the yellow one.	PROC	DOMI	AF
18.28	Alice	(...)	Sits down first and goes into the avatar room lion >duck		clicking sound, BGM	main, alphabet day (realised it's not the place) > main > rhyming world	PROC	DOMI	
18.47	Oliver	(...)	Takes over giraffe-super giraffe-exit		clicking sound, BGM		PROC	DOMI	
18.53	Oliver	I want letter game.			clicking sound, BGM		PROC	DOMI	AF
18.55	Teacher	Talk to Alice. Are you guys doing it together?			clicking sound, BGM				
18.59	Oliver	I want another...	Goes into the rhyming book		clicking sound, BGM	Alice was tapping the character room	PROC	DOMI	DA
19.03	Teacher	Then talk to Alice and tell her			clicking sound, BGM				
19.16	Oliver	I don't know	Turns pages without listening		clicking sound, BGM		PROC	FUSI	AF
19.22	Teacher	You don't know what? Ok. Do you know how to do this Alice?			clicking sound, BGM	the noice level of classroom is too high at the moment to hear the narration well			
19.25	Alice	(...)	Touches the home button		clicking sound, BGM	exited the reading room	PROC	FUSI	
19.31	Teacher	Here, if you wanna make the animals, then that one, the monkey	Points at the monkey		BGM				
19.52	Alice	(...)	Taps blue, basketball jersey, and mustache		clicking sound, BGM		PROC	INDI	
19.58	Oliver	Not this colour, I said not this colour! Other colour!			clicking sound, BGM		PROC	DOMI	AF
20.03	Alice	(..)	Puts a hat and chanages to jacket for lion		clicking sound, BGM		PROC	DOMI	AF
20.11	Oliver	(..)	Attempts to change color		clicking sound, BGM		PROC	DOMI	AF
20.25	Alice	Share!	Pulls ipad toward her		clicking SFX, BGM		PROC	ARGU	AF

The example above (Table 5.3) illustrates Oliver and Alice's interaction while engaging with Aniland during the second week in Classroom 1. They were given a yellow iPad, out of four colours, orange, yellow, green, and red. Oliver wanted a green one (18.23) that was not available at the moment. Alice sat down on the chair in the real world, went into the avatar room, and selected a lion and then a duck in the virtual world. Oliver sat down next to her with a slightly dissatisfied facial expression (18.28). Oliver tapped on a superhero cape for the giraffe and exited the avatar room. Up to this point, they seem to have navigated without any purpose (PROC), navigated without a specific objective, while exploring functions of the app. Right then, Oliver said, "I want letter game" (18.53), expressing a purpose; however, he decided to tap into the rhyming book (18.59), not cooperating with his partner Alice and wandering around; hence, I coded this moment PROC.

Oliver tapped into the rhyming book seemingly random, but Alice was tapping the avatar room, so that did not work. If two items were tapped together, the page would respond to the button that was pressed first (18.59). The teacher encouraged Oliver to work with Alice and ask her opinions about where to move next (19.03). Oliver wanted to find something but was not able to fully express his desire to the teacher and moved on to the rhyming book without asking his partner. When Oliver said, "I don't know" (19.16), which is coded as PROC, as it is unclear whether he was uncertain about what the teacher said or did not know how to turn the page. When the teacher tried to involve Alice more, asking, "Do you know how to do this, Alice?" (19.22), Alice responded without a word, but by an action, touching the home button (19.25) rather than the next button. She appeared confused about what to press to turn the page and still randomly browsing (PROC) to figure out how to operate the app.

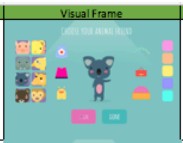
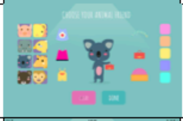
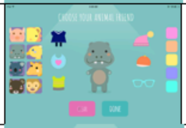
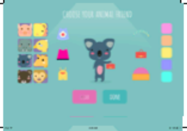
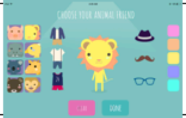
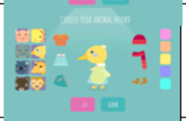
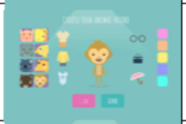
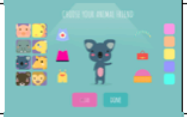
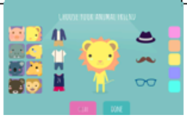
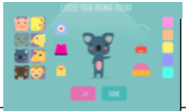
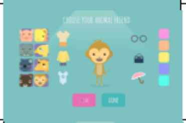
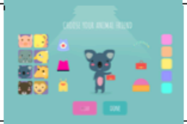
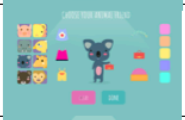
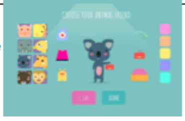
The teacher directed them to the avatar room (19.43) to demonstrate how to create the desired characters, saying, "Here, if you wanna make the animals, then that one, the monkey." Following the teacher's instruction, Alice tapped *lion*, *blue*, *basketball jersey* and *moustache* (19.52) as she searched (PROC) different options to create an avatar. Oliver opposed her selection of the colour, "Not this colour, I said not this colour! Other colour!" (19.58) (PROC) but she only changed outfit options for the hat and jacket (PROC). The collaboration and meaning-making process had not quite started yet.

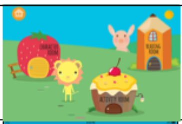
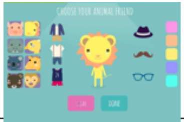
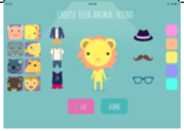
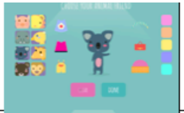
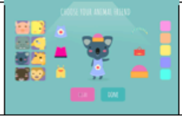
In sum, the Week 2 example illustrates a straightforward exploration in cognitive processing as Oliver and Alice casually navigated the app without focusing on a specific area such as character creation, reading, or gaming. The teacher's involvement and guidance are visible in this example, as she tried to support the children when they were confused and frustrated and encouraged both children to play equally. I do not define the procedural reactions as unimportant, since navigating through the apps and becoming familiarised is crucial in the early weeks of their engagement. As they were more familiar with working together as a group, I saw more potential for learning and meaning-making in the later stages. No evidence of emergent literacy skills had been present yet at this point.

5.1.3 Example 3

The below example (Table 5.4) was taking place in Week 3 in Classroom 1. When I entered the classroom, the children were having the reading time. After they organised new books to the bookshelves, a co-teacher asked them, "Are you ready to do an iPad?" and all shouted, "Yes!" The teacher told them, "When I call your name, go to where Ms Iva tells you to go." Then, the teacher asked Kate, "Kate, can you grasp the iPad and put it in front of you?" and she replied, "No!" The teacher spoke to everyone: "Yes, you have to share it. Just use your fingers." She called out everyone's name and the children sat down on the tables where I prepared an iPad for each pair.

Table 5.4. *Transcription from Week 3*

Time	ID	Spoken Words	Bodily Conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
6.00	Bridget	In the middle! Koala!	Places the iPad in the middle and taps koala		Let's choose your animal friend for today's adventure!	They had a trouble getting into the app because the screen recorder popped up.. A teacher helped.	PROC	INDI	AF
6.02	Kelvin	(..)	Taps the purse		clicking sound, BGM		PROC	INDI	AF
6.04	Bridget	Ms. Iva (..)	Taps hat, pig and blue Taps hippo and then Koala.		clicking sound, BGM		PROC	INDI	
6.10	Kelvin	Ms. Iva, Ms. Iva, look at this! I got lion!	Taps Koala to lion		clicking sound, BGM		PROC	INDI	I
6.16	Researcher	I like the lion			clicking sound, BGM				
6.17	Bridget	(..)	Changes to duck and chooses a dress		clicking sound, BGM		PROC	INDI	
6.19	Kelvin	(..)	pushes Bridget's finger and tap monkey		clicking sound, BGM		PROC	FLCI	
6.20	Bridget	(..)	Taps koala		clicking sound, BGM		PROC	INDI	
6.21	Kelvin	No	Taps lion		clicking sound, BGM		PROC	FLCI	AF
6.22	Bridget	No, no	Taps koala quickly after Kelvin taps lion		clicking sound, BGM		PROC	FLCI	AF
6.23	Kelvin	monkey I got lion lion, monkey	Taps monkey Turns his head left and right twice		clicking sound, BGM		PROC	INDI	AF
6.30	Bridget	(..)	Checks the back of the iPad		BGM	Maybe she tries to increase the volume?	PROC	OFF	
6.34	Kelvin	(..)	Stands up and checks the back of the iPad		BGM	Maybe he tries to increase the volume, too?	PROC	OFF	
6.41	Bridget	(..)	Keeps touching the edges of the iPad case and looks at the back of the iPad		BGM		PROC	OFF	

6.51	Kelvin	(..)	Exits the avatar room and stays on the alphabet day main page		BGM		PROC	INDI	
6.54	Bridget	(..)	Exits the alphabet day main page and goes to the home page		clicking SFX, BGM		PROC	INDI	
6.57	Kelvin	no, no			clicking SFX, BGM	when Bridget exits the alphabet room	PROC	COLL	AF
7.05	Bridget	(..)	Taps the alphabet grassland and the avatar room		clicking SFX, BGM		PROC	COLL	
7.06	Bridget	(..)	Taps monkey, koala, lion, and koala		BGM		PROC	DOMI	
7.12	Kelvin	(..)	Taps hat, purse, and hairband		BGM		PROC	INDI	
7.18	Bridget	(..)	Taps pink dress, apron, overall, hat, and purse		clicking SFX, BGM		PROC	DOMI	
7.34	Kelvin	Ms Iva, Ms Iva, look at this	Turns the iPad toward the researcher.		BGM	Researcher didn't hear them, he waits a bit and then turns back the iPad toward them	PROC	INDI	I
7.56	Researcher	That's a koala. Maybe a mommy koala? (laughter)			BGM	Researcher didn't hear them, he waits a bit and then turns back the iPad toward them	PROC	INDI	I
8.13	Bridget	(..)	Turns the iPad back toward them and changes to hippo		BGM		PROC	INDI	
8.18	Kelvin	(..)	Taps lion and tries to tap a pair of glasses		BGM		PROC	INDI	AF
8.21	Bridget	(..)	Taps koala		clicking SFX, BGM	So Kelvin does not get a chance to tap a pair of glasses	PROC	DOMI	
8.24	Kelvin	(..)	Frowns		clicking SFX, BGM	facial expressions shows he's a bit irritated that Bridget did not let him choose a pair of glasses	PROC	FLCI	AF
8.27	Bridget	koala	Picks a pink dress, hat and apron		clicking SFX, BGM		PROC	DOMI	AF
8.35	Kelvin	(..)	Stretches and sees a friend walking around the classroom; stands up		clicking SFX, BGM	A friend from another group walked around	PROC	OFF	
9.12	Bridget	(..)	Stands up and leaves the table		BGM		PROC	OFF	

In this example, I focussed on an interaction between Bridget and Kelvin on their meaning-making process and practising any emergent literacy through the app. The children did not get into the app and waited for a teacher, because the screen recorder page popped up. As soon as the teacher opened the app for them, Bridget held the iPad in the middle of the table and went into the avatar room and tapped *koala* (6.00). Yet, a child's understanding of the contents was not visible; therefore, I coded this moment in PROC. Kelvin chose the purse for koala (6.02) (PROC). Bridget called me, "Ms Iva" while she tapped *hat*, *pig* and *blue* icon, then *hippo* and *koala* (6.08) (PROC). Followed by Bridget, Kelvin looked for me, "Ms. Iva, Ms Iva, look at this! I got lion!" when he tapped *koala* to *lion* (6.10) (PROC). I came to check their progress and responded to Kelvin, "I like the lion." Bridget reached her arms to the iPad and changed to duck and chose a dress (6.17) (PROC). A conflict happening; Kelvin pushed Bridget's index fingers and tapped *monkey* (6.19) (PROC). Bridget resisted regardless Kelvin blocked her finger and chose *koala* (6.20) (PROC). The two children's conflict lasted a bit longer. Kelvin said "no" as he tapped *lion*. Then, Bridget yelled, "No, no!" and tapped koala quickly after Kelvin tapped *lion* (6.23) (PROC). Kelvin tapped *monkey*; told "monkey, I got lion, lion, monkey" and turned his head left and right twice, looking for me (6.23) (PROC). I was further back in the classroom so did not have a contact with him.

Suddenly, Bridget checked the back of the iPad (6.30) (PROC). By interpreting the video, I made an assumption that she was trying to increase the volume. Kelvin stood up and also checked the back of iPad like Bridget (6.34) (PROC). Bridget kept touching the edges of the iPad case and again looked at the backside (6.41) (PROC). Kelvin sat down, exited the avatar room which led to the alphabet day's main page (6.51) (PROC). Bridget tapped on the top left corner of the home button on the alphabet day (6.54) (PROC) that led to the home page of Aniland.

To Bridget's choice to return to the home page, Kelvin contested, "No, no" (6.57) (PROC). Bridget did not respond verbally but tapped the avatar room (7.05) (PROC). Simultaneously with Bridget's tap on the avatar room, Kelvin tapped the reading room but did not work, probably his tapping was slightly slower than Bridget's (7.05) (PROC). In the avatar room, Bridget tapped *monkey*, *koala*, *lion* and *koala*, respectively (7.06) (PROC). Kelvin tapped *hat*, *purse*, and *hairband* (7.12) (PROC). Bridget took longer than previous times to select *pink dress*, *apron*, *overall*, *hat* and *purse* (7.18) (PROC) while Kelvin was leaning back and passively watching Bridget's interaction with the screen.

When Bridget did not tap any more, Kelvin turned the iPad toward where I was standing and shouted, "Ms Iva, Ms Iva, look at this!" (7.34) (PROC). I was helping the team right across them and viewed the iPad screen that Kelvin was pointing at, so I responded, "That's a koala. Maybe a mommy koala?" with a laughter (7.56). Bridget changes the direction of the iPad toward themselves and selected hippo (8.18) (PROC). Kelvin tapped on *lion* and was about to tap a *pair of glasses* (8.21) (PROC); however, Bridget tapped quickly on *koala* (8.21) (PROC). Kelvin made a frown face (8.24) (PROC) because Bridget did not let him choose a pair of glasses. Bridget continued decorating the koala with *pink dress*, *hat* and *apron* (8.27) (PROC). When Kelvin was stretching his arms, he spotted a friend who was walking around the classroom, so he stood up to leave the table (8.35) (PROC). Bridget explored the outfit and accessory options for koala in avatar room and also left the table soon after Kelvin (9.12) (PROC). Everyone in the classroom lined up for the atrium time to play at the indoor playground.

Overall, the children both enjoyed decorating the animal avatars in the avatar room particularly to navigating clothing, accessory and colour options. While they stayed in the avatar room, they never completed the avatar by tapping the *done* button on the bottom right side of the screen. Kelvin, who was sitting on the right side, rarely tapped items on the left side except when he wanted to choose a lion. As will be discussed in section 5.2.3 (p. 117), Bridget's parent reported that her child repeatedly said her favourite animal was koala at home, during the semi-structured interview. They fairly played well together without significant lasting conflict, e.g., constant pushing away or dragging the iPad toward themselves. As a result, I did not observe any notable meaning-making or literacy learning outcomes in the beginning phase.

5.2 Middle Phase

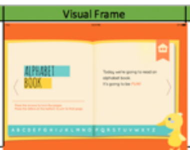
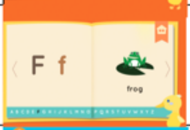
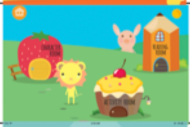
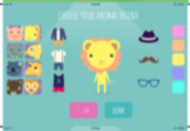
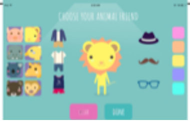
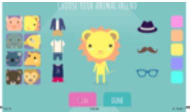
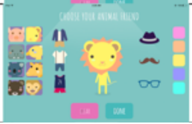
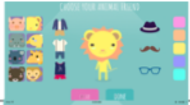
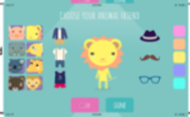
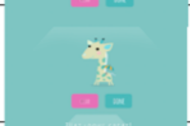
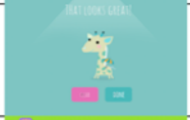
5.2.0 Preview

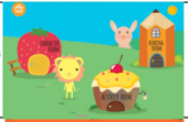
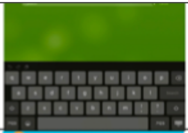
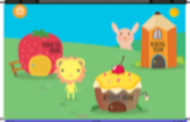
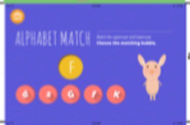
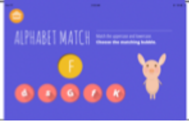
Interaction among children and with iPads during the middle phase (Weeks 4-6) was livelier, and all children were comfortable with using iPads by this point. I noticed the children's enhanced meaning-making processes when they received suggestions or feedback from the teacher on, for example, navigating correctly, finding the correct answers, focusing on the contents, received suggestions, etc. Furthermore, in one of the examples exhibited, a child pretended to sneeze when he heard an 'achoo' sound in the app and imitated the sound, possibly showing extended play (IN). Procedural modes were less apparent than in the first few weeks and exploratory modes were appearing more frequently in general. However, consistent navigation with purpose was not initially shown.

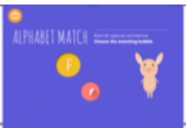
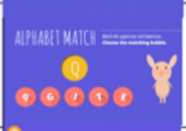
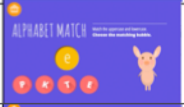
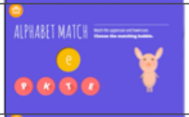
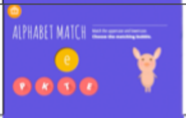
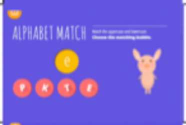
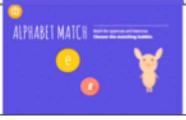
5.2.1 Example 1

In Week 5 in Classroom 2, the children had reading time prior to iPad time. After I set up the equipment, the teachers called out the children's names and instructed them to sit down. As shown in Table 5.5, Mike and Karen's cognitive processes exhibited a combination of both PROC and EXPO modes.

Table 5.5. *Transcription from Week 5*

Time	ID	Spoken Words	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
7.49	Mike	(..)	Goes into the alphabet book and taps all the pages		clicking sound, BGM		PROC	DOMI	
7.52	Karen	B, C, D, E, F (when Mike flips too fast) No! (then continues) N, O, P, Q, R, S, T, U, V	Does not touch the screen but continues to say the alphabets on the screen aloud		clicking sound, BGM		EXPO	INDI	AF
8.16	Mike	(..)	Exits the alphabet book and pushes Karen with his right arm and does not allow her to touch the screen		clicking sound, BGM		PROC	DOMI	
8.20	Mike	(..)	goes into the avatar room		Let's choose your animal friend for today's adventure!		PROC	INDI	
8.21	Karen	(..)	Looks elsewhere		clicking sound, BGM		PROC	OFF	
8.23	Mike	(..)	Taps the suspender		clicking sound, BGM		PROC	INDI	
8.25	Karen	(..)	Tries to tap another outfit		clicking sound, BGM		PROC	INDI	
8.26	Mike	(..)	Pushes away Karen's hand and taps monkey and then glasses		clicking sound, BGM		PROC	FLCI	
8.30	Karen	(..)	I want giraffe		clicking sound, BGM	maybe she wants to say something to Researcher	PROC	INDI	AF
8.32	Mike	(..)	Taps giraffe and then a cape and an umbrella		clicking sound, BGM		PROC	COLL	
8.35	Karen	(..)	Chooses green		clicking sound, BGM		PROC	INDI	
8.40	Mike	(..)	Taps done		Ta-da. That looks great! Let's start today's adventure.		PROC	DOMI	
8.42	Karen/Mike	tada	Says it at the same time		BGM		PROC	COLL	AF
8.44	Mike	(..)	Exits the avatar room and the app. he does not know how to go back in, shakes the iPad back and forth				PROC	INDI	
9.01	Karen	(..)	Swipes the screen left to right and the aniland main page come back				EXPO	COLL	AF

9.07	Mike	(..)	Snatches the iPad from Karen and exits the app by accident		BGM		PROC	INDI	AF
9.19	Researcher	Ok	Helps them go back to the app's main mpage		clicking SFX, BGM				
9.21	Mike	(..)	Enters the alphabet book		clicking SFX, BGM		PROC	COLL	
9.23	Karen	(..)	Attempts to tap		clicking SFX, BGM		PROC	COLL	
9.24	Mike	(..)	Blocks Karen's hand and keeps flipping		This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase bubbles.BGM		PROC	DOMI	
9.31	Karen	i, j, k, l, m, n, o, p, q, r, s, t, u, v, w	Starts to tap and reads the letters		BGM	Mike does not have his hands on the iPad anymore	EXPO	INDI	AF
10.10	Mike	(..)	Snatches the iPad and holds it up to the air		That's right, uppercase F, and lowercase F		PROC	DOMI	
10.11	Mike	(..)	Taps the reading room and looks elswhere		BGM		PROC	OFF	
10.21	Karen	(..)	Looks around and smiles at the camera		This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase bubbles.BGM		PROC	OFF	
10.30	Karen	Ms. Ival Ival	Taps the screen, exits and the keybaord pops up.		That's right, uppercase F, and lowercase F		PROC	OFF	AF
10.32	Researcher	Oh	Sets the screen back to Aniland		BGM				
10.37	Karen	F	Plays the alphabet matching game. Matches F and f at once.		This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase bubbles.		EXPO	INDI	AF
10.49	Mike	(..)	Looks elsewhere		clicking SFX, BGM		PROC	OFF	
10.56	Karen	Q, T, E	Reads the answer options and taps G		clicking SFX, BGM		EXPO	INDI	AF

10.59	Mike	(..)	Taps f		That's right, uppercase F, and lowercase F		EXPO	INDI	
11.04	Karen	(..)	Taps Q and q		That's right, uppercase Q, and lowercase q		EXPO	INDI	
11.08	Researcher	What's that? That letter?	Points at E		clicking SFX, BGM				
11.20	Karen	That's letter E!			clicking SFX, BGM		EXPO	COLL	AN
11.16	Mike	(..)			clicking SFX, BGM		EXPO	COLL	AN
11.18	Researcher	That's right! Lowercase e and uppercase E. You know alphabets very well.			That's right, uppercase E, and lowercase e				
11.25	Karen/Mike	(..)	They put the iPad in the middle, putting head to head and continues to play the game.		BGM		EXPO	COLL	

As shown above (Table 5.5), Mike tapped into the alphabet book and went through the pages rapidly (7.49), and I coded this initiation as PROC because the purpose of choosing the book was not transparent. Karen did not touch the screen when Mike was flipping through the pages, but read aloud "B, C, D, E, F," and expressed that Mike should not turn the pages rapidly: "No!" Then she read "N, O, P, Q, R, S, T, U, V," correspondingly, and this moment was coded EXPO (7.52) because she made a meaningful connection with the contents on the screen. Mike exited the alphabet book after they reached the final page but pushed Karen's left arm with his right arm when tapping the screen (8.16) (PROC). Mike entered the avatar room (8.20) without any observed reflective analysis (PROC). Karen looked elsewhere, to where another pair was playing (8.21) (PROC). Mike tapped suspenders for the lion (8.23) (PROC); Karen turned her gaze back to the screen and attempted to tap another outfit for the lion (8.25) (PROC). However, Mike pushed away Karen's hand and tapped the monkey, then a pair of glasses (8.26) (PROC).

When Karen asked Mike for a giraffe (8.30) (PROC), contrary to his prior reactions – for example, pushing Karen's arms – he listened to her, tapped the giraffe first, then a cape and an umbrella (8.32) (PROC). Karen reached out and chose green (8.35) (PROC). Mike tapped Done after she finished (8.40) (PROC). When they heard the narration, "Ta-da, that looks great! Let's start today's adventure!" Karen and Mike shouted "Ta-da" at the same time (8.42) (PROC). Although they were working far better as a group than the previous time, neither exhibited a particular purpose in navigation. Mike exited the avatar room and accidentally exited the app (8.44) (PROC) He shook the iPad back and forth because he did not know how to go back into the app. After watching Mike, Karen swiped the screen left to right and the main page came back (9.01); this was coded as EXPO, since Karen's action showed that she knew how to navigate to where she wanted. At that moment, Mike snatched the iPad from Karen and exited the app again (9.07) (PROC). I noticed this and tapped the screen to bring back the main page.

For the second time, Mike entered the alphabet reading room (9.21) (PROC). Karen tried to tap on the screen (9.23) (PROC) but her hand was pushed away by Mike's. Mike continued to dominate the iPad and flipped through the pages (9.24) (PROC). Up till the letter 'I', Karen tapped the pages without Mike's opposition but read the alphabet from 'i' to 'w' on the screen as Mike was turning the pages, so she was able to make a meaningful connection with the app (9.31) (EXPO). Mike suddenly snatched the iPad and held it up in the air as if he wanted to play on his own, then exited the reading room (10.06) (PROC). Karen looked around, turned back and smiled at the camera (10.09) (PROC). Mike entered the reading room and gazed elsewhere (10.11) (PROC). While Mike was looking at the pair next to them, Karen tapped the screen and the keyboard popped up. She called my name: "Ms Iva! Iva!" (10.30) (PROC). I set the screen back to the main page of Aniland (10.32).

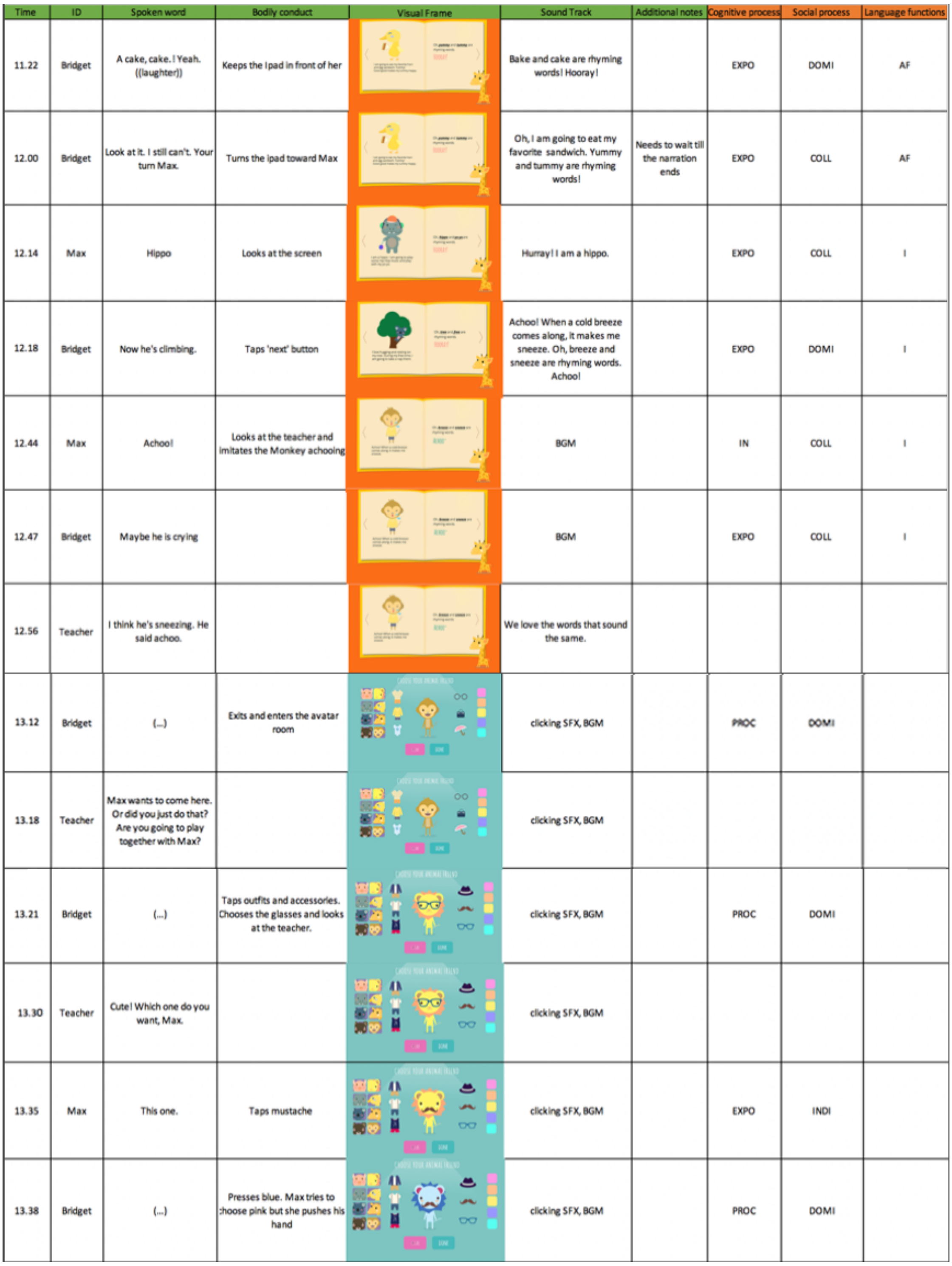
From this point, Karen entered the alphabet matching game and got the first question to match the uppercase F and the lowercase f at once (10.37): EXPO mode had begun. Mike looked elsewhere for a moment (10.59) (PROC). After the narration, "This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase bubbles" on the F page, Karen read all the answer examples: d, s, G, f, and K, then tapped a wrong answer – G (10.56) (EXPO). Mike turned toward the iPad and quickly tapped the correct answer, f (10.59) (EXPO). When the page turned, I pointed at 'e' and asked "What's that? That letter?" Karen answered first, "That's letter E!" (11.12) (EXPO) and Mike followed by answering, "E" (11.16) (EXPO). I praised them, "That's right! Lowercase e, and uppercase E. You know the alphabet very well" (11.18). From then on, Mike and Karen put the iPad in the middle by themselves, sat with their heads together and continued to play the game cooperatively (11.25) (EXPO).

In the mid-phase example, Mike had a tendency to dominate the iPad in the beginning but did not persist in this behaviour for the whole duration. Overall, some practices of emergent literacy skills were evident, particularly when Karen read along with what had been appearing on the screen in the reading room; the first time, Mike was flipping through the book (7.52), and the second time, Karen was reading it as well (9.31). In sum, they started the session in a procedural mode; however, toward the end, they were able to navigate and stay in the reading and alphabet game rooms without exiting or doing anything off-task.

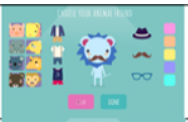
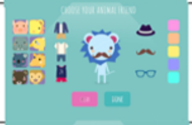
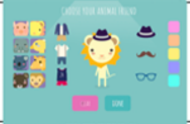
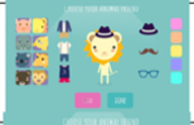
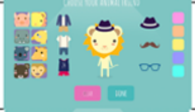
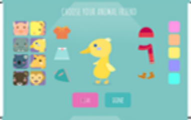
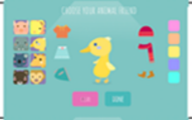
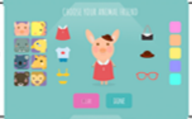
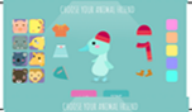
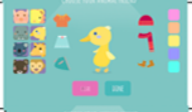
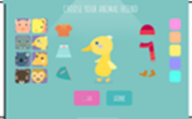
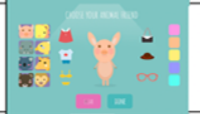
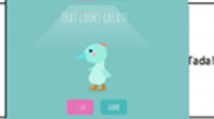
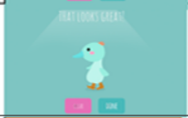
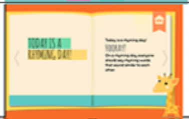
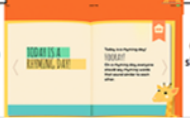
5.2.2 Example 2

Interaction between two children at the start of Week 6 in Classroom 1 was overall smoother than in the beginning phase and exhibited exploratory cognitive processing through the children's enhanced respect for each other's decisions, despite occasional dominant decisions by one child. The interaction between Bridget and Max are portrayed in Table 5.6.

Table 5.6. *Transcription from Week 6*



Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
11.22	Bridget	A cake, cake.! Yeah. ((laughter))	Keeps the Ipad in front of her		Bake and cake are rhyming words! Hooray!		EXPO	DOMI	AF
12.00	Bridget	Look at it. I still can't. Your turn Max.	Turns the ipad toward Max		Oh, I am going to eat my favorite sandwich. Yummy and tummy are rhyming words!	Needs to wait till the narration ends	EXPO	COLL	AF
12.14	Max	Hippo	Looks at the screen		Hurray! I am a hippo.		EXPO	COLL	I
12.18	Bridget	Now he's climbing.	Taps 'next' button		Achoo! When a cold breeze comes along, it makes me sneeze. Oh, breeze and sneeze are rhyming words. Achoo!		EXPO	DOMI	I
12.44	Max	Achoo!	Looks at the teacher and imitates the Monkey achooing		BGM		IN	COLL	I
12.47	Bridget	Maybe he is crying			BGM		EXPO	COLL	I
12.56	Teacher	I think he's sneezing. He said achoo.			We love the words that sound the same.				
13.12	Bridget	(...)	Exits and enters the avatar room		clicking SFX, BGM		PROC	DOMI	
13.18	Teacher	Max wants to come here. Or did you just do that? Are you going to play together with Max?			clicking SFX, BGM				
13.21	Bridget	(...)	Taps outfits and accessories. Chooses the glasses and looks at the teacher.		clicking SFX, BGM		PROC	DOMI	
13.30	Teacher	Cute! Which one do you want, Max.			clicking SFX, BGM				
13.35	Max	This one.	Taps mustache		clicking SFX, BGM		EXPO	INDI	
13.38	Bridget	(...)	Presses blue. Max tries to choose pink but she pushes his hand		clicking SFX, BGM		PROC	DOMI	

13.40	Teacher	Which one do you want, Max. Bridget, ask Max.			clicking SFX, BGM				
13.42	Max	pink			clicking SFX, BGM		EXPO	AN	I
13.42	Bridget	(...)	Bridget just taps other options and chooses yellow and a hat		clicking SFX, BGM		PROC	DOMI	
13.45	Teacher	Yeah, yellow. Let's see Max. Max, what animal you like?			clicking SFX, BGM				
13.47	Max	I like that. Hippo	points at the screen		clicking SFX, BGM		EXPO	AN	I
13.52	Bridget	Duck!	changes to a duck		clicking SFX, BGM		EXPO	DOMI	I
14.01	Teacher	Oh. Let's do Max's first. Max wants hippo and then we make duck. Okay?			clicking SFX, BGM	encourages to take turns			
14.09	Max	Okay.	Max picks a hippo and then a pig with a hat.		clicking SFX, BGM		EXPO	INDI	AN
14.17	Teacher	Now we can make your duck, okay?	To Bridget		clicking SFX, BGM				
14.20	Bridget	(...)	Pulls the ipad toward herself		clicking SFX, BGM		EXPO	DOMI	
14.23	Teacher	You take turns. You can still leave it here, you're sharing.			clicking SFX, BGM				
14.26	Bridget/ Max	(...)	Play togerher and take turns		clicking SFX, BGM		EXPO	COLL	
14.41	Bridget	Yay!	Holds the iPad up		Tada! That looks great! BGM		EXPO	DOMI	AF
14.43	Teacher	That's so cute. Can you put it down, please? Max do you want to do it?			BGM				
14.46	Max	Yeah.	Goes into the rhyming room		Today is a rhyming day!		EXPO	INDI	AN
14.52	Teacher	(To Bridget) I like how you're playing with Max. This is very nice. You keep playing like this you could get a sticker. Okay Bridget?	Points at the next page button and Max taps it		On a rhyming day, everyone should say rhyming words that sound similar to each other.				

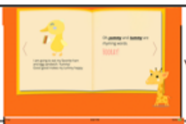
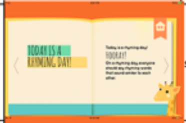
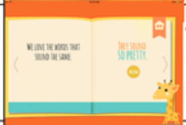
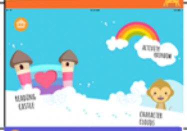
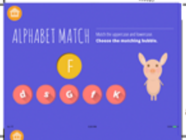
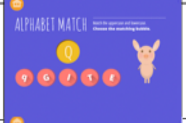
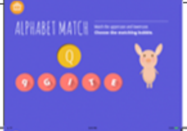
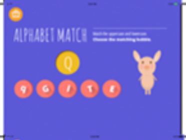
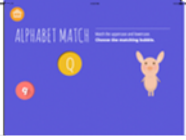
14.55	Bridget	My turn.	Turns the page and finds the duck		It's lunch time. I am going to eat my favorite ham and egg sandwich. Yummy! Good food makes my tummy happy. Oh my! Yummy and tummy are rhyming words. Hooray!		PROC	PROB	AF
15.02	Teacher	You're taking turns. You give Max a turn, too, or else you won't get a sticker.			On a rhyming day, everyone should say rhyming words that sound similar to each other.				
15.09	Bridget	(...)	Keeps owning the iPad to herself and taps the next button till the last page		We love the words that sound the same. They sound so pretty. The End.	Teacher left the taple	EXPO	DOMI	
15.34	Researcher	That way you can go outside. That's right. Home button, you go outside, you go back to Home page.	Researcher comes to the taple. Bridget presses the home button then the activity room		clicking SFX				
16.00	Max	(...)	Taps on the lowercase f		BGM bubble alphabet mathiing game this is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase alphabet bubbles. That's right, uppercase F, and lowercase f	Activity room	EXPO	INDI	
16.04	Researcher	F! Great! Let's another one. That's upper case Q. What matches with that?			BGM				
16.07	Bridget	Q!	Taps on the lowercase q.		clicking SFX	Ipad is in the middle	EXPO	COLL	
16.11	Max	(...)	Taps on the uppercase T.		clicking SFX	Narration of the correct response	EXPO	COLL	
16.17	Researcher	Good!	Claps with Bridget		That's right, uppercase Q, and lowercase q		EXPO		

Table 5.6 depicts the moment from the teacher assigned seats to Bridget and Max, Bridget sat down and started right away with the rhyming book. As depicted in Bridget said, “A cake, cake. Yeah!” (11.22) with laughter as the narration said, “Bake and cake are rhyming words! Hooray!” as she understood and listened to the narration (PROC). She kept the iPad towards herself but soon turned it towards Max and said, “Look at it. I still can’t. Your turn, Max” (PROC), implying she wanted him to solve the problem of the page not turning quickly. Bridget’s tapping responded, and the page turned to a hippo with a yoyo when Max looked at the screen and said, “Hippo” (12.14), hence I coded their collaborative problem-solving with PROC. Bridget reflected on the page with a koala (12.18) on which Koala was taking a nap on the

tree, saying, “Now, he’s climbing.” (PROC). On the next page, they both listened to the narration carefully: “Achoo! When a cold breeze comes along, it makes me sneeze. Oh, breeze and sneeze are rhyming words. Achoo!” Max imitated or continued with a pretend play (IN) at 12.44. Bridget interpreted the monkey’s snot on the page as tears and said, “Maybe he is crying” (PROC). Then the teacher commented, “I think he’s sneezing. He said “achoo’” (12.56), which clarified Bridget’s misunderstanding about the sneezing as crying.

After the monkey’s page, Bridget flipped the pages and exited the reading room, moving to the avatar room (13.12) without any consideration (PROC). The teacher asked her whether she had made the decision by herself or with Max (13.18). She did not answer the teacher and tapped multiple accessories and clothes in sequence for the lion and showed it to the teacher (PROC). Then the teacher led Max to participate by saying, “Cute! Which one do you want, Max?” (13.30), and he responded, “This one” by tapping the moustache (13.30) with an affirmative voice (EXPO). When Max tried to choose pink (13.35), Bridget pushed his hand away and pressed blue, showing that he navigated without any specific purpose (PROC). The teacher promoted their collaborative thinking and critical decision-making by suggesting to Mathew, “Which one do you want, Max?” Then she said, “Bridget, ask Max” (13.40). Max answered “pink” (13.42), which he hadn’t said when he pressed it previously, so he persisted that it happened (EXPO).

They somewhat developed common or shared ideas about what rhyming is as they talked and laughed. However, Bridget persisted in her choices by tapping yellow skin and a hat (13.43) (PROC). The teacher made another attempt to involve Max by saying, “Yeah, yellow. Let’s see, Max. Max, what animal do you like?” (13.45), and Max pointed at a hippo on the screen (13.47) and expressed his opinion by saying, “I like that, hippo” (EXPO). Then Bridget said, “Duck!” and changed to a duck; I coded this moment as EXPO because it was her opinion and decision despite not collaborating with Max. The teacher again gave directions to them so that Max could get an equal chance to participate (14.01); she said, “Oh. Let’s do Max’s first. Max wants hippo, and then we make duck. Okay?” With an answer of “Okay,” Max picked a hippo first and then a pig with a hat (EXPO).

Here, the teacher’s role was critical to guide the children in making respectful decisions together so neither of them would feel left out. The teacher asked Bridget, “Now we can make your duck, okay?” (14.17). Then Bridget and Max agreed on each other’s decisions and played together, taking turns changing the characters from *pig*, *duck*, *giraffe*, and *hippo*, and changing the skin colours to *pink*, *yellow*, and *blue* and the accessories to *red dress*, *blue dress*, *basketball jersey*, etc. (14.26). When Bridget got excited about their final creation, a *blue duck* with a *blue dress*, she held up the iPad as the narrations said, “Tada! That looks great!” (14.41) (EXPO). The teacher praised what they had created and made sure Bridget was careful with the iPad and that she and Max were playing together by saying, “That’s so cute. Can you put it down, please? Max, do you want to do it?” (14.41). Max agreed with the teacher by saying, “Yeah” (14.46) and went back into the rhyming room where they had started the day (EXPO).

After observing the two children working together, the teacher praised Bridget by saying, “I like how you’re playing with Max. This is very nice. You keep playing like this, you could get a sticker. Okay, Bridget?” (15.02). The teacher pointed at the arrow key to remind Bridget how to turn the page. Bridget expressed “my turn” (15.09) and turned the page until she saw a duck (EXPO). Before the teacher left the table, she emphasised the children should take turns, particularly Bridget (15.09). When the teacher left, Bridget kept the iPad to herself and tapped until the last page of the rhyming book (15.09). I coded this moment as PROC since she didn't try to listen or read the contents on the pages.

I went to check on the children (15.34) at the table and confirmed that pressing the home button on the top right corner of the book leads to the home page. While I was talking, Bridget went to the home page and entered the activity room. From this point, they began equitable turn taking and analysing and interpreting the alphabet letters. Bridget shouted "q!" (16.07) and tapped the lowercase q, the correct answer for the first question for the bubble alphabet matching game (EXPO). The narration worked slowly, stating that "q" was the right answer, and Max tapped on the uppercase T (16.07), which I coded as EXPO. Then the narration indicated, "That's right, uppercase Q and lowercase q"; Bridget and I clapped together (16.07) when hearing "excellent", and I interpreted this meaningful achievement in playing the games as EXPO.

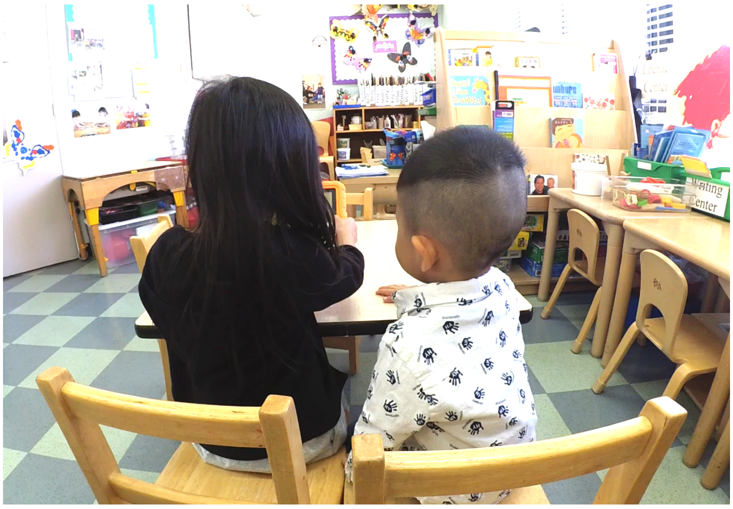


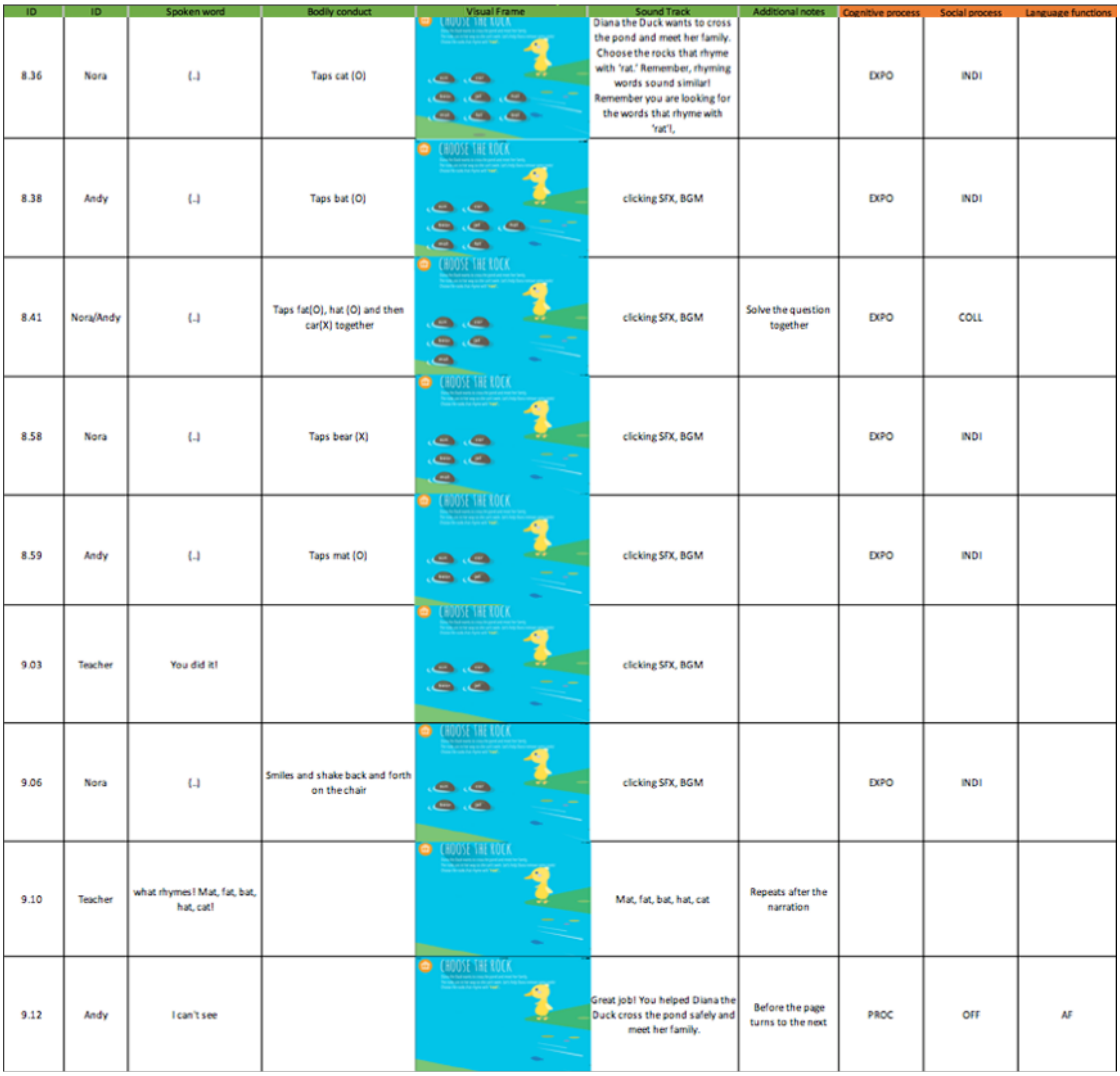
Figure 5.2. One exhibits dominance over an iPad in Week 6

In the mid-phase, the children were generally capable of navigating through the app thoroughly since they understood mostly where to locate the avatar room, reading materials, and games. Although the children shared and showed respectful cognitive engagement, there were still moments when Bridget showed a tendency to possess the iPad and make dominant decisions, as shown in Figure 5.2.; however, she was able to correct herself when the teacher became involved. In the activity room, they showed an accurate tapping on the correct answers which may indicate their literacy skills had enhanced.

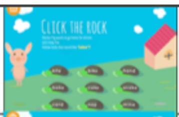
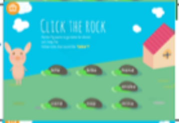
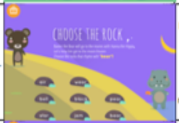
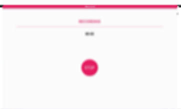
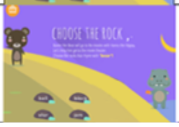
5.2.3 Example 3

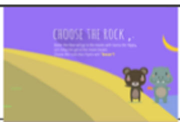
As shown below in Table 5.7, Andy and Nora in Week 6 in Classroom 2 played creating the animal avatars in the avatar room up to this point where transcription begins. Nora and Andy's exploratory cognitive interaction was more visible in this excerpt.

Table 5.7. *Transcription from Week 6*



ID	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
8.36	Nora	(..)	Taps cat (O)		Diana the Duck wants to cross the pond and meet her family. Choose the rocks that rhyme with 'rat.' Remember, rhyming words sound similar! Remember you are looking for the words that rhyme with 'rat'!,		EXPO	INDI	
8.38	Andy	(..)	Taps bat (O)		clicking SFX, BGM		EXPO	INDI	
8.41	Nora/Andy	(..)	Taps fat(O), hat (O) and then car(X) together		clicking SFX, BGM	Solve the question together	EXPO	COLL	
8.58	Nora	(..)	Taps bear (X)		clicking SFX, BGM		EXPO	INDI	
8.59	Andy	(..)	Taps mat (O)		clicking SFX, BGM		EXPO	INDI	
9.03	Teacher	You did it!			clicking SFX, BGM				
9.06	Nora	(..)	Smiles and shake back and forth on the chair		clicking SFX, BGM		EXPO	INDI	
9.10	Teacher	what rhymes! Mat, fat, bat, hat, cat!			Mat, fat, bat, hat, cat	Repeats after the narration			
9.12	Andy	I can't see			Great job! You helped Diana the Duck cross the pond safely and meet her family.	Before the page turns to the next	PROC	OFF	AF

9.13	Teacher	You can see, look!		 CLICK THE ROCK	Pat the Pig wants to go home for dinner. Let's help Pat choose the rocks that rhyme with 'lake'. Remember, rhyming words sound similar! Choose the rocks that rhyme with 'lake'? Snake	The page turns to a question with Pat the pig			
9.16	Andy	(..) Don't!	Tap on bake (O), kite (X), bike(X), hand(X), cake (O), snake(O) Shouts when Nora wants to tap	 CLICK THE ROCK	clicking SFX, BGM		EXPO	DOMI	DA
9.24	Teacher	(..)	Takes a sip of tea from her tumbler	CLICK THE ROCK	clicking SFX, BGM				
9.28	Nora	Is that coffee?		CLICK THE ROCK	bake, cake, snake		PROC	OFF	Q
9.32	Teacher	It's not coffee, it's tea.		CLICK THE ROCK	Wonderful! You helped Pat home safe for dinner.				
9.38	Nora	(..)	Pays attention again when the page turns to the third question. Taps care (O)	 CHOOSE THE ROCK	Lawrence the Lion will go to the movies with Baxter the Bear. Let's help him get to the movie theater. Choose the rocks that rhymes with 'bear'! Remember, rhyming words sound similar! ,		EXPO	INDI	
9.41	Andy	(..)	Taps wear (O), black (X)	CHOOSE THE ROCK	clicking SFX, BGM		EXPO	INDI	
9.44	Nora	Oh...	Her pinky touches the top red bar and moves to the recording page				PROC	FUSI	AF
9.47	Andy	Ahhh!	Tap and screams with his palms on his cheeks				PROC	FUSI	AF
9.48	Nora	Ahhh!	Places her palms near her cheeks				PROC	FUSI	AF
9.51	Teacher	Uh oh	Moves out of it and goes back to the app	CHOOSE THE ROCK	clicking SFX, BGM				
9.55	Andy	(..)	Taps bell (X) > pear (O)	CHOOSE THE ROCK	clicking SFX, BGM		EXPO	INDI	
9.59	Nora	(..)	Taps care (O) > bear (O) >jam (X) > star (X) > bell (X) > air (O)	CHOOSE THE ROCK	clicking SFX, BGM		EXPO	INDI	AF
10.08	Andy	Hahaha	Taps on the air (O) after Nora does. Laughts when the bear moves	 CHOOSE THE ROCK	clicking SFX, BGM		EXPO	COLL	AF

10.12	Nora	Got it!			BGM		EXPO	COLL	AF
10.14	Andy	[...]	Holds the ipad by himself and listens to the narration		air, wear, care, pear, hair		EXPO	DOMI	
10.20	Nora	[...]	Looks elsewhere where the teacher is and looks at the screen		Bravo! Now Lawrence can go to the movies with Baxter.		PROC	OFF	
10.23	Andy	uh oh	Presses the medal and the ipad falls back		BGM		PROC	INDI	
10.26	Nora	Hahaha	Laughes when the iPad falls again		Well done! You earned a medal! Woohoo!		PROC	INDI	AF
10.32	Andy/Nora	[...]	They grasp the iPad together		BGM		PROC	COLL	
10.39	Andy	[...]	Points at the rainbow		BGM		EXPO	COLL	
10.44	Nora	That's a rock!	Enters the reading room		clicking SFX, BGM		EXPO	INDI	I
10.49	Andy	Look!	Turns all the pages in the reading room, not listening, pushing Nora's left arm away. Presses home button and exits		Today's a rhyming day... clicking SFX, BGM		EXPO	INDI	AF
11.08	Nora	[...]	Moves the ipad toward her and enters the rhyming activity room		Diana the Duck wants to cross the pond and meet her family. Choose the rocks that rhyme with 'rat.' Remember, rhyming words sound similar! Remember you are looking for the words that rhyme with 'rat'!,		PROC	DOMI	
11.12	Andy	Hmm how about me?	Places ipad in the middle and exits the activity room and the app		BGM		PROC	DOMI	AF
11.15	Nora	you are not sharing!	Looks for the teacher and stands up				PROC	FLO	AF
11.17	Researcher	You guys need to share.	Walks toward their table						

11.18	Andy	(..)	Taps car (X) > cat (O) > bat (O) > hat (O) > fat (O) >bear (X) > mat (O)	CHOOSE THE ROCK	clicking SFX, BGM		EXPO	DOMI	
11.24	Nora	I don't want to play anymore.	Toward the researcher	CHOOSE THE ROCK	clicking SFX, BGM		PROC	OFF	AF
11.27	Researcher	Ok. Everyone will finsh at the same time. You tell me which animal you like so I can give you a paper doll.		CHOOSE THE ROCK	clicking SFX, BGM				
11.29	Andy	I like lion, lion, lion!		CHOOSE THE ROCK	clicking SFX, BGM		PROC	OFF	I
11.31	Researcher	aright!		CLICK THE ROCK	Pat the Pig wants to go home for dinner. Let's help Pat choose the rocks that rhyme with 'lake'. Remember, rhyming words sound similar! Choose the rocks that rhyme with 'lake'? Snake				
11.32	Nora	(..)	Taps the table with both hands	CLICK THE ROCK	BGM		PROC	OFF	
11.37	Andy	(..)	Tries to turn it off the iPad, exits the app, and the iPad falls back				PROC	OFF	
11.41	Nora	(..)	Helps Andy to stand the iPad on the table				PROC	COLL	
11.49	Researcher	So now I am going to give you paper dolls. You need to line up and tell me which one you would like.	Stands in the center of the classroom						
11.51	Nora	(..)	Lines up first to receive the paper doll.				PROC	OFF	
11.54	Andy	I want lion. Lion! Lion!	Moves toward the line and jumps				PROC	OFF	I

Nora exited the avatar room and selected the rhyming activity room. After listening to the narration to choose the rocks that rhyme with ‘rat’, she quickly tapped one of the correct responses, *cat* which showed her thorough understanding of the navigation and rhyming activity; therefore, coded this moment as EXPO (8.36). Followed by Nora’s turn, Andy tapped another correct answer *bat* (8.38) (EXPO). Then, they solved problems together by tapping two correct answers *fat* and *hat* together and then one wrong answer *car* together (8.41) (EXPO). Although they selected some incorrect responses, they seemed to navigate painstakingly and had absorbed literacy information in the activity room. Nora made an incorrect choice *bear* (8.58) (EXPO) but did not try other answers and gave Andy a chance to tap a correct one *mat* (8.59) (EXPO). The teacher praised them for completing the first question: “You did it!” (9.03). Although Nora did not tap the last answer, she expressed her pleasure in her team's progress – she smiled and shook her body back and forth on the chair. The teacher repeated after the narration that repeated all the right responses that rhymed with *rat* (9.10). When no rocks were visible, right before the page moved to the next question, Andy complained, “I can’t see” (OFF) (PROC). Immediately after the page turned, the teacher informed Andy: “You can see, look!” (9.13).

On the next question in which Pat the pig looked for the rocks that rhymed with ‘lake’, Andy tapped a correct response *bake*; an incorrect response *kite*; an incorrect response *bike*; another incorrect response *hand* and two correct responses *cake* and *snake* while shouting “don’t!” not let Nora to touch the iPad (9.16) (EXPO). This action was contrary to their collaborative play previously, she was seemingly led to Nora becoming distracted and looking at another table. When the narration repeated the correct answers, *bake*, *cake* and *snake*, the teacher took a sip of tea from her tumbler (9.24). Nora asked with a curious look on her face: “Is that coffee? (9.28) (PROC). The teacher answered it was tea (9.32).

When the page turned to the third question, where Baxter the bear looked for the rocks that rhymed with ‘bear’, Nora paid attention again and tapped *care* (9.38) (EXPO). Andy naturally took a turn to tap one correct response *wear* and one wrong response *black* (9.41) (EXPO). By accident, Nora touches the red bar on the top of the screen that led to the screen recording screen (9.44) (PROC). Andy screamed, “Ahhh!” with his palms on his cheeks (9.47) (PROC). Nora imitated Andy and also screamed, “Ahhh!” as placing her palms near her cheeks (9.48) (PROC). Both of them did not try to fix the problem until the teacher tapped to move out of the recording screen page and went back to the app (9.51). Immediately upon the page turning back to the previous rhyming activity page, Andy tapped one wrong answer *bell* and one right answer *pear* (9.55) (EXPO). Nora chose two correct answers *care* and *bear*; three incorrect answers *jam*, *star* and *bell*, and a correct one *air* respectively (9.59) (EXPO). Andy tapped *air* once more after Nora did since the rock was not removed (10.08) (EXPO). They did not choose the right answers consequently but quickly found the correct ones in a collaborative manner. As soon as the rocks disappeared, Nora cheered, “Got it!” (10.12) (EXPO). When the narration repeated the correct responses, Andy held up the iPad and tried to listen carefully (10.14) (EXPO). Nora looked elsewhere, to where the teacher was, and then gazed at the screen again (10.20) (PROC). Andy tapped the medal; but he pushed harder than usual, it fell back on the table (10.23) (PROC). Nora laughed aloud, seeing the iPad fell on the table (PROC).

When the screen turned to the rhyming day’s main page, Andy and Nora grasped the iPad at the same time without any conflict (10.32) (EXPO) Andy pointed at the activity rainbow (10.39) (EXPO); however, Nora responded “That’s a rock!” referring to the rocks in the rhyming game that the previously played and tapped on the reading castle (EXPO) (10.44). In the reading room, Andy pushed Nora’s left arm to block her from tapping, pushed the ‘next’ arrow symbol till the last page and exited the book (10.49) (PROC). Followed by Andy’s dominant behaviour, Nora also pulled the iPad toward her and entered the rhyming activity room (PROC) (11.08). Andy positioned the iPad to the middle and expressed, “Hmm, how about me?” and tapped the home button to exit the activity room (11.12) (PROC). Nora yelled at Andy: “You are not sharing!” and left the table to find the teacher (11.15) (PROC). I came to the table to see how they were doing and placed the iPad in the middle: “You guys need to share.” (11.17). However, Andy persisted in playing on his own; he tapped an incorrect response *car*; four correct responses *cat*, *bat*, *hat*, and *fat*; an incorrect response *bear*, and a correct one *mat* (11.18) (EXPO). Although he was navigating with reflective analysis or problem-solving at this point, his dominance over the iPad had resulted in lowering Nora's interest in the meaning-making process. Nora said, "I don't want to play anymore" to me (11.24) (PROC). My intention was to have children finish at the same time so they were not distracted by anyone who would stand up first; hence, I told Nora, "OK. Everyone will finish at the same time. You tell me which animal you like so I can give you a paper doll." (11.27). Andy answered instead of Nora: "I like lion, lion, lion!" (11.29) (PROC). Nora tapped the table with both hands patiently waiting for her peers to be done with the iPad (11.32) (PROC).

Andy tried to turn off the iPad, exits the app, and it fell on the table (11.37) (PROC). Nora offered help to position the iPad on the table (11.49) (PROC). I announced that the iPad time was over: "So now I am going to give you paper dolls. You need to line up and tell me which one you would like." and asked them to line up (11.49). Nora lined up first (11.51) and Andy moved to the line and jumps as shouting, "I want lion. Lion! Lion!" (11.54). I handed the children the paper dolls with their favourite animal characters (Figure 5.3) and they put them in the backpack to bring home before heading to the atrium time. In Week 6, instead of the stickers, I prepared the paper dolls as rewards that might lead to their offline activity. As it was discussed in section 5.1.3 (p. 99), a parent informed me that her daughter brought a paper doll of her favourite animal character, Kelly the koala, home and she played with her mom and dad. To summarise, they started the

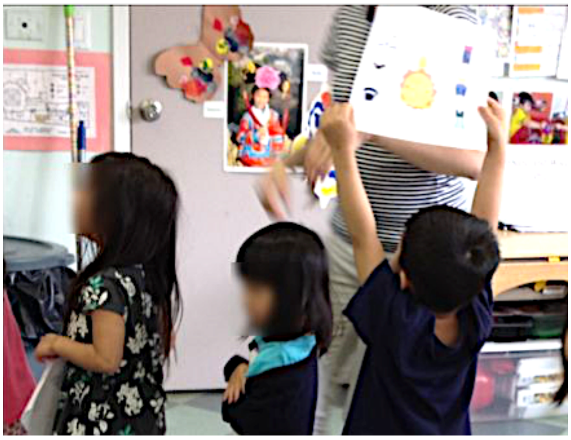


Figure 5.3. Children receive the paper dolls and wait for the atrium time

session in procedural mode; however, toward the end, they were able to navigate and stay in the alphabet game room without exiting or doing anything off-task. The children started the session in procedural mode; changed to the exploratory mode; however, toward the end, their cognitive processing returned to procedural mode again.

5.3 End phase

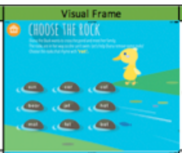
5.3.0 Preview

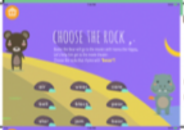
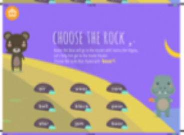
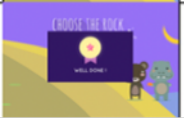
Compared to the previous phases, children exhibited the exploratory mode most frequently during the final phase (Weeks 7-10). Children showed confidence in navigating in the app and choosing the correct responses. Furthermore, they tended to spend a longer time in reading and activity rooms and guess the correct answers more quickly in the activity room. It was apparent that their decision-making had improved, both in choosing the correct places and buttons to tap and in supporting each other with better suggestions or solutions. These overall improvements could be interpreted as positive practice experience with the app in terms of digital literacy and emergent literacy skills. Additionally, teachers' guidance and co-play with the children engaged them further to practise their literacy skills and led them to instances of attained intersubjectivity.

5.3.1 Example 1

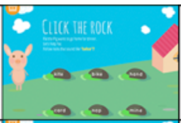
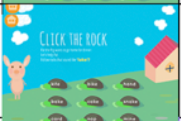
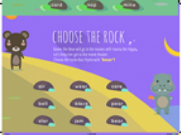
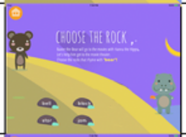
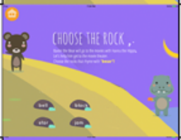
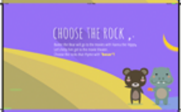
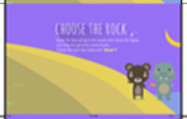
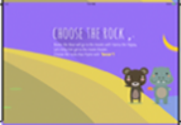
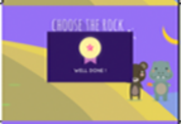
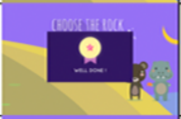
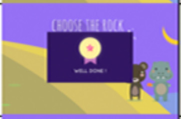
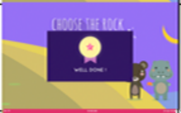
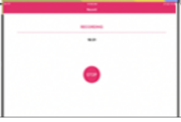
In Week 8, in Classroom 1, I set up the equipment while the children were having reading time. When the children's names were called by a teacher, Mark and Kyle settled down on the table and Mark quickly flipped through the alphabet book on the app. The interaction between the two are described below in the Table 5.8.

Table 5.8. *Transcription from Week 8*

Time	ID	Spoken Words	Bodily Conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
3.34	Mark	(..)	Taps the rhyming activity room and taps mat (O), jet (X), car (x)		Diana the Duck wants to cross the pond and meet her family. Choose the rocks that rhyme with 'rat.' Remember, rhyming words sound similar! Remember you are looking for the words that rhyme with 'rat'!, mat, BGM	Before this moment, Mark flipped through the alphabet book quickly	PROC	DOMI	
3.38	Kyle	(..) I got it! I got it! I got it! I got it! I got it!	Taps bat (O), hat (O), cat (O), jet (X), fat (O) looks at Mark Raises his arms and repeats "I got it" toward the researcher		bat, hat, cat, fat, BGM		PROC	DOMI	AF
3.47	Mark	(..)	Points at the duck and looks at my badge on my chest		BGM		PROC	OFF	
3.49	Kyle	Oh, duck!	Points at my badge		mat, fat, bat, hat, cat		PROC	OFF	AF
3.51	Researcher	My favourite... duck!	Points at the duck on the screen		Great job! You helped Diana the Duck cross the pond safely and meet her family.				
3.55	Kyle	(..)	Taps mine (X), snake (O), hand (X)		Pat the Pig wants to go home for dinner. Let's help Pat choose the rocks that rhyme with 'lake'. Remember, rhyming words sound similar! Choose the rocks that rhyme with 'lake'? Snake		PROC	INDI	
3.58	Mark	(..)	Taps kite (X) bake (O)		bake, BGM	Kyle tapped cake at the same time but did not respond	PROC	INDI	
4.00	Kyle/Mark	(..)	taps cards (X) together		BGM		PROC	COLL	
4.01	Researcher	snake, bake, and...			clicking sound, BGM				
4.03	Kyle	(...)	taps kite (X), bike (x)		BGM		PROC	INDI	
4.05	Mark	(...)	Taps card (X) and nap (X)		BGM		PROC	INDI	
4.08	Kyle	(...)	Taps hand (X) and cake (O)		cake, BGM		PROC	INDI	
4.12	Researcher	cake, that's right			Bake Cake Snake				
4.13	Kyle	I got it!	Raises right arm		Wonderful! You helped Pat home safe for dinner.		PROC	INDI	AF

4.14	Researcher	(...)	highfives Kyle	CLICK THE ROCK	BGM				
4.15	Mark	(...)	Extends his arm to highfive the researcher three times	CLICK THE ROCK	BGM		PROC	INDI	
4.18	Researcher	let's do another one!	After the highfives	 CHOOSE THE ROCK	Lawrence the Lion will go to the movies with Baxter the Bear. Let's help him get to the movie theater. Choose the rocks that rhymes with 'bear'! Remember, rhyming words sound similar! , BGM				
4.20	Kyle	hmm...	Taps air (O), bell (X)	 CHOOSE THE ROCK	air, BGM		PROC	INDI	
4.26	Mark	(...)	Taps wear (O), bell (X)	CHOOSE THE ROCK	wear, BGM		PROC	INDI	
4.28	Kyle/Mark	(...)	Taps bell (X) multiple times together	CHOOSE THE ROCK	BGM		PROC	COLL	
4.30	Mark	(...)	Taps care (O), pear (O), bear (O)	CHOOSE THE ROCK	care, pear, bear, BGM		EXPO	INDI	
4.32	Kyle	I got it!	Taps black (X), bell (X). Raises his right arm	CHOOSE THE ROCK	air, wear, care, pear, hair	Actually Mark tapped the last one	PROC	INDI	AF
4.36	Researcher	Oh, great job! You are gonna get a medal!		CHOOSE THE ROCK	BGM				
4.38	Mark	Yay !	Giggles	CHOOSE THE ROCK	BGM		PROC	INDI	AF
4.39	Kyle	yay!	Laughter	CHOOSE THE ROCK	Bravo! Now Lawrence can go to the movies with Baxter, BGM		PROC	INDI	AF
4.40	Researcher	Great job!		CHOOSE THE ROCK	BGM				
4.41	Mark	((Giggles))	highfives 12 times in a row on the researcher's both hands	CHOOSE THE ROCK	BGM		PROC	INDI	AF
4.53	Researcher	Listen. Bear is going to say... Well done!	After narration	 CHOOSE THE ROCK WELL DONE!	Well done! You've earned a medal.	Mark taps begins the rhyming game again			

5.00	Mark	(...)	Taps cat (O), car (X), sun (X)	CHOOSE THE ROCK	Diana the Duck wants to cross the pond and meet her family. Choose the rocks that rhyme with 'rat.' Remember, rhyming words sound similar! Remember you are looking for the words that rhyme with 'rat'!, cat, BGM		PROC	INDI	
5.03	Kyle/Mark	(...)	Taps bear (X) together many times	CHOOSE THE ROCK	BGM		PROC	COLL	
5.08	Kyle	(...)	Taps mat (O)	CHOOSE THE ROCK	mat, BGM		PROC	LA	
5.10	Kyle/Mark	(...)	Taps bear (X) again together		BGM		PROC	COLL	
5.16	Kyle	(...)	Taps fat (O)	CHOOSE THE ROCK	fat, BGM		EXPO	COLL	
5.18	Mark	(...)	Taps jet (X) and hat (O) and then taps car (X), jet (X), hat (O)		hat, BGM	hat is not not responsive due to Kyle's finger on bear first time	EXPO	INDI	
5.24	Kyle	(...)	Taps sun (X) bat (O) and fat (O)	CHOOSE THE ROCK	bat, fat, BGM	Kyle's finger is on the screen so the answers are not responsive	EXPO	INDI	
5.29	Mark	(...)	Taps hat (O), bat (O)	CHOOSE THE ROCK	hat, bat, BGM		EXPO	LA	
5.32	Researcher	That's right! mat fat bat fat cat sound similar, right?		CHOOSE THE ROCK	mat, fat, bat, hat, cat, BGM				
5.37	Kyle	Got it! Yay! (...)	Raises his right arm Highfives the researcher Looks at a teacher who passes by the table		Great job! You helped Diana the Duck cross the pond safely and meet her family.		EXPO	INDI	
5.40	Mark	yay!	Highfives the researcher many times	CHOOSE THE ROCK	BGM		EXPO	INDI	
5.44	Kyle	Yay!	Highfives the researcher many times	CLICK THE ROCK	Pat the Pig wants to go home for dinner. Let's help Pat choose the rocks that rhyme with 'lake'. Remember, rhyming words sound similar! Choose the rocks that rhyme with 'lake'? Snake, BGM		EXPO	INDI	
5.47	Mark	(...)	Keeps tapping on kite (X)	CLICK THE ROCK	BGM		EXPO	INDI	

5.50	Kyle	I got it!	Taps cake (O), bake (O), snake (O), raises right arm after tapping snake		cake, bake, snake	gets the correct answers without hesitation	PROC	LA	
5.56	Mark	Yay!	Highfives the researcher four times		BGM		EXPO	INDI	
6.00	Researcher	You guys are so good!			Lawrence the Lion will go to the movies with Baxter the Bear. Let's help him get to the movie theater. Choose the rocks that rhymes with 'bear'! Remember, rhyming words sound similar! , BGM				
6.03	Mark	care (O), pear (O), bear (O), wear (O), air (O)			care, per, bear, wear, air	gets the correct answers without any hesitation	EXPO	LA	
6.10	Kyle	(...)	Stands up and cheks the back of the iPad		BGM	maybe he is checking the sound?	EXPO	INDI	
6.19	Mark	hahaha	Looks at Kyle's face		BGM		EXPO	INDI	
6.22	Kyle	(...)	Taps Baxter the bear		air, wear, care, pear, hair		EXPO	INDI	
6.23	Mark	I did it!			Bravo! Now Lawrence can go to the movies with Baxter, BGM		EXPO	INDI	
6.24	Kyle	(...)	Looks around		BGM		PROC	INDI	
6.26	Teacher	(...)	Points at the virtual reward		Great job! You've earned a medal.				
6.27	Mark	great job!	Repeats after the narration. Thumbs up and highfives the teacher		BGM		EXPO	INDI	
6.30	Kyle	(...)	Taps the reward		BGM		EXPO	INDI	
6.32	Mark	(...)	Accidently exits the app by tapping the red recording bar on the top				PROC	OFF	

Kyle and Mark started to engage in the rhyming game as the narrator introduced Diana the duck to find words that rhymed with 'rat' on the screen. Mark tapped on the correct answer mat, although two incorrect answers, *jet* and *car* (3.38), were also available; this is interpreted as random input, so I coded this moment as

PROC. Kyle tapped three correct responses in a row – *bat*, *hat*, *cat* – and then the wrong answer, *jet*, followed by another correct one, *fat* (3.38) (PROC). He happily shouted, “I got it!” while looking at Mark and then at me. However, until this point I was not assured that he got the questions correct by coincidence or by putting deep thought into cognitive processing. Off the iPad, Mark pointed at my duck badge I was wearing on my chest (3.47) (PROC). To redirect them to their task, I pointed at the duck on the screen and said, “My favourite, duck!” (3.51).

The screen turned to the Pat the pig page where the narrator introduced them to the concept of picking something that rhymed with ‘lake’. Kyle tapped an incorrect response, *mine*; a correct response, *snake* and an incorrect one, *hand* (3.55) (PROC). Mark then selected an incorrect response, *kite*, and a correct answer, *bake* (3.58) (PROC). They might be remembering some of the answers from the previous weeks, but I cannot make a clear judgement yet because of the following choice they had made. Then, the two children tapped *card* together (4.00) (PROC). I tried to give them a hint by referring back to the answers they had already chosen, “snake, bake and…” (4.01) (PROC). Kyle chose the wrong answers *kite* and *bike* (4.05) (PROC) and Mark chose *card* and *nap*, incorrect answers (4.08) (PROC). Kyle tapped *hand* and then got a correct answer, *cake*, so I added, “cake, that’s right” (4.12) (PROC). When Kyle heard the narration, “Wonderful! You helped Pat get home safe for dinner”, he raised his right arm and shouted, “I got it!” (4.13) (PROC). I gave Kyle a high five (4.14) and Mark also reached out his hand and gave me three high fives (4.15).

In the next Baxter the bear page, the children were told to find rocks that contain words that rhymed with ‘bear’. Kyle tapped the correct one, *air*, first and then *bell* (PROC) (4.26). Next, they consecutively tapped *bell* together (4.30) (PROC). Then Mark chose all of the correct answers, *care*, *pear* and *bear*, consecutively (4.30) (PROC). At the moment, Kyle did not realise that Mark had already chosen the answers and tapped on *black* and *bell*. He shouted, “I got it!” when he heard the narrator repeat the correct rhyming words (4.32) (PROC). I praised them, “Oh, great job! You are gonna get a medal!” (4.36) and Mark (4.38) and Kyle (4.39) both shouted, “yay!” with giggles and laughs (PROC). At that point, Mark proudly gave me 12 high fives (4.41) (PROC). I asked them to listen to the narration when the reward showed up: “bear is going to say… Well done!” (4.53).

After they exited the rhyming game room to return the main page after receiving the reward on the screen, I did not give them any directions. Mark re-entered the same place and tapped *cat* (correct), and *car* and *sun* (incorrect) (5.00); therefore, I still coded this as PROC as their understanding of the content was ambiguous. Kyle and Mark tapped the incorrect rock, *bear*, many times (5.03) (PROC). Then, Kyle moved his finger to *mat* (5.08), but his action for this response was still considered PROC due to the next choice. Kyle and Mark tapped *bear* again without remembering that they had already tried it (5.10) (PROC). Kyle moved his finger to tap the correct answer, *fat* (5.18), and EXPO cognitive processing started at this point. Mark tapped the wrong answer, *jet*, and then the right one, *hat*. However, *hat* was not recognised as an input as Kyle was tapping *bear* at the same time, so Mark tapped *hat* again when Kyle’s fingers were off the screen (5.24) (EXPO). Kyle tapped *sun* incorrectly, and then *bat* and *fat* correctly (5.24) (EXPO). Mark found the correct responses *hat* and *bat* without hesitation (5.29) (EXPO). I added, “That’s right! ‘mat’, ‘fat’, ‘bat’, ‘fat’, ‘cat’ sound similar, right?” (5.32). Kyle raised his right arm, and shouted, “I got it!” He gave me a high five and said “yay” to a teacher who was passing by their table (5.37) (EXPO). Mark also high-fived me many times and shouted, “yay” (5.40) (EXPO). Kyle again high-fived me and yelled “yay” (5.44) (EXPO) while the screen turned to the Pat the pig page.

On the pig page, Mark repeatedly tapped on *kite* although it was incorrect (5.47) (PROC). After Mark removed his finger from the screen, Kyle quickly chose the right responses *cake*, *bake* and *snake* and raised his right arm saying, “I got it” (5.50) (EXPO). Mark noticed those were correct answers and together they cheered “yay!” (5.56) (EXPO). I praised their quick resolution, “You guys are so good!” (6.00).

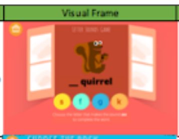
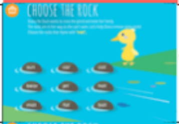
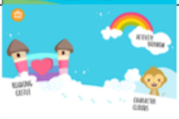
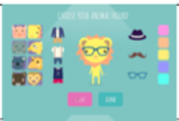
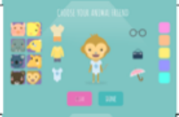
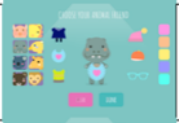
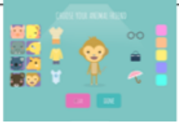
On the bear page, Mark started off by easily tapping *care*, *pear*, *bear*, *wear* and *air*, all correct answers (6.03) (EXPO). Mark stood up and check the back of the iPad, apparently looked for a volume button (6.10). This action was related to the content of the app so I coded it as EXPO. All of the rocks disappeared on the page, and Kyle tapped the face of Baxter the bear (6.22) (EXPO). Mark shouted, “I did it!” when he heard the narration “Bravo! Now Lawrence can go to the movies with Baxter” (6.23) (EXPO). Kyle looked around the room (6.24) (PROC) and a teacher who was walking by pointed at the reward on the screen (6.26). After listening to the narration (“Great job! You’ve earned a medal”), Mark repeated “Great job!” (6.30) (EXPO). Kyle tapped the reward, exited the activity room, and the moved into an avatar room with some time left until the iPad day was over.

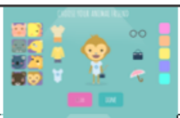
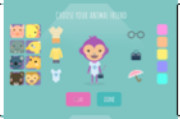
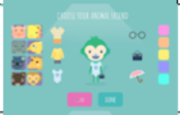
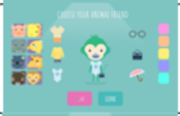
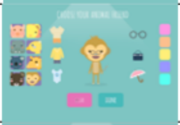
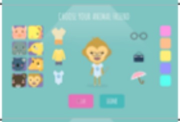
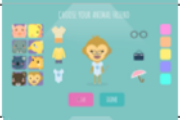
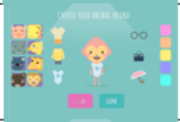
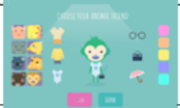
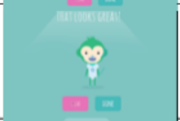
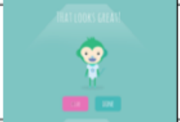
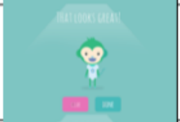
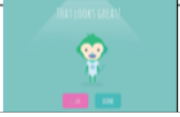
This end phase’s example showed that the children’s cognitive processing had changed from PROC to EXPO over time. Particularly when playing the rhyming game, the second time, the children exhibited EXPO more frequently than the first time; they focussed much better and provided the correct responses quicker and more precisely than previous phases; therefore, their literacy skills may have somewhat improved. There was no pushing away or any other show of dominance that lasted longer than the previous times. Turn-taking was so natural that they did not face the consequence of having the app taken away.

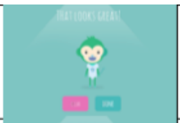
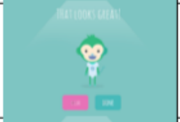
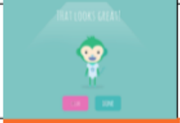
5.3.2 Example 2

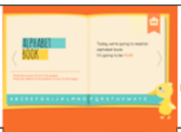
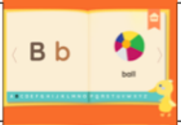
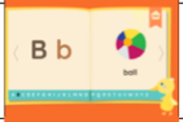
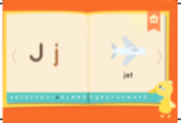
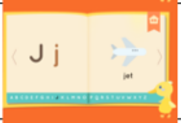
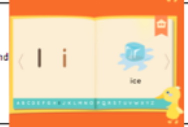
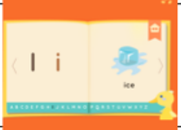
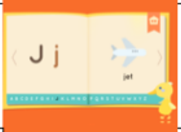
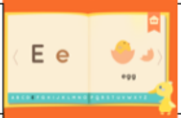
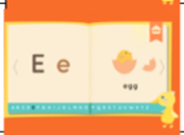
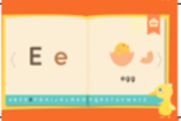
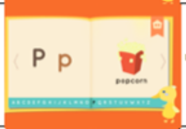
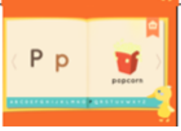
The below example from Week 9 (Table 5.9) occurred in Classroom 2. When I finished setting up the iPads and equipment, half of the class was ready for the iPad and the other half already started with centre time where the children could select their own tasks to play with puzzles, to play in a sandbox, to play with dolls, to read books, to build blocks, etc. In the beginning of the iPad time, I told the children that they would be receiving the tattoo stickers instead of the regular stickers. I got a permission from the office and the teachers to make sure that the Tattoo stickers were allowed and the officer told me the children had the tattoo stickers often. I also informed the teachers and the children those were made with organic materials.

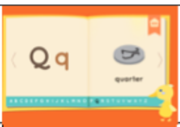
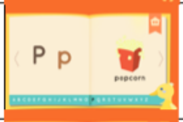
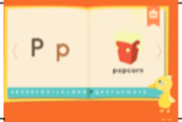
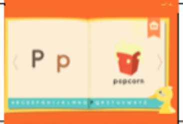
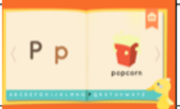
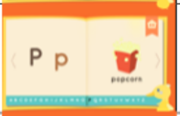
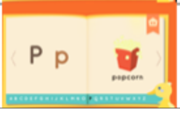
Table 5.9. *Transcription from Week 9*

Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
Elena	4.03	[..]	Taps the app and goes into the letter sound activity room. Taps s and f and taps home button to exit but it did not respond. Taps on s, f, g, and k.		Choose the letter that makes the sound [s] to complete the word. [s s s]	Up to this point, two kids were playing the character room	PROC	DOMI	
Joanne	4.14	Elena is not sharing!	Stands up to look for a teacher and sits down		Diana the Duck wants to cross the pond and meet her family. Choose the rocks that rhyme with 'rat.' Remember, rhyming words sound similar! clicking sound, BGM		PROC	FLCI	AF
Elena	4.17	[..]	Enters the rhyming game. Taps on rocks with her palm and exits.	CHOOSE THE ROCK	clicking sound, BGM	Keeps the iPad in the middle so I categorised this as INDI, rather than DOMI	PROC	INDI	
Joanne	4.21	[..]	Pulls the iPad to herself		clicking sound, BGM		PROC	DOMI	
Elena	4.25	[..]	Pulls the iPad to her side. Taps lion > glasses > pig > dress > glasses > tshirt > bikini > duck > dress > lion > suit > glasses		clicking sound, BGM		PROC	DOMI	
Joanne	4.37	This, this! (XXX)	Taps monkey and baby onesie and turns the screen to Elena		clicking sound, BGM		PROC	COLL	AF
Elena	4.39	[..]	Taps hippo > bib > blue		clicking sound, BGM		PROC	INDI	
Joanne	4.40	This is a grandma.	To blue hippo		BGM		PROC	COLL	I
Elena	4.43	[..]	Taps bear > accidently exits and comes back > monkey		clicking sound, BGM		PROC	INDI	

Joanne	4.49	(..)	Pulls the iPad to herself and taps on monkey > baby onsie > purse		clicking sound, BGM		PROC	COLL	I
Elena	4.51	This is a baby Purple. Purple, ok?	Pulls the iPad to her side and taps purple		clicking sound, BGM		PROC	COLL	Q
Joanne	5.01	(..) Look!	Pulls the iPad to herself and taps green Looks at the table where the researcher is standing		clicking sound, BGM		PROC	COLL	AF
Elena	5.06	Elena is not sharing	To the researcher		clicking sound, BGM		PROC	INDI	AF
Joanne	5.10	(..)	Taps purple > orange > glasses > no glasses		clicking sound, BGM		PROC	DOMI	
Researcher	5.15	Joanne, share with Elena please.			clicking sound, BGM				
Joanne	5.18	I am sharing			clicking sound, BGM		PROC	INDI	AF
Elena	5.19	(..) No!	Pulls the iPad green (monkey) > pink > hippo > monkey > orange > green pink		clicking sound, BGM		PROC	INDI	AF
Joanne	5.34	(..)	Taps green and attempts to bring the iPad toward herself		clicking sound, BGM		PROC	DOMI	
Elena	5.37	(..) Look at it!	Keeps the iPad to herself. Taps monkey (reset the colour) > green Shows the screen to the teacher		Ta-da. That looks great! Let's start today's adventure.		PROC	INDI	AF
Teacher	5.39	What's that?			BGM				
Elena	5.41	It's a monkey!			BGM		PROC	INDI	AN
Teacher	5.49	Did you find your letter? Your name?	From an opposite table		BGM				

Elena	5.52	No, I can't find it.			BGM		PROC	INDI	AN
Teacher	5.54	You can't find it? Do you want me to help you?		THAT LOOKS GREAT!	BGM				
Elena	5.56	(..)	Nods her head and holds the iPad with both hands		BGM		PROC	INDI	
Teacher	5.59	We are looking for the ABC, the alphabet book	Came to their table and pushes the iPad to the middle		BGM				
Joanne	6.06	(..)	Taps on the iPad's home button, exits the app. Taps back the app and enters the rhyming reading room. She flips till the last page.	TODAY IS A RHYMING DAY!	Today is a rhyming day! On a rhyming day, everyone should say rhyming words that sound similar to each other.		PROC	INDI	
Teacher	6.24	Rhyming? Where is the alphabet? Where do you think it is?			We love the words that sound the same. They sound so pretty. The End.				
Joanne	6.31	(..)	Exits the reading room.		clicking SFX, BGM		PROC	DOMI	
Teacher	6.33	Do you think it's in the rainbow (rhyming activity room)?			clicking SFX, BGM				
Joanne	6.34	(..)	Exits the rhyming day's main page and enters the alphabet day's main page		clicking SFX, BGM	good at navigating	EXPO	INDI	
Teacher	6.35	There!	Points at the giraffe that represents alphabet day		BGM				
Joanne	6.37	(..)	Taps the letter sound activity room.	ALPHABET MATCH F	This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase bubbles.		PROC	INDI	
Teacher	6.40	Ah! Alphabet match!		ALPHABET MATCH F	clicking SFX, BGM				
Joanne	6.42	(..)	Exits the activity room		clicking SFX, BGM		EXPO	INDI	
Teacher	6.43	We went to that one. This.	Points at the reading room		clicking SFX, BGM				

Joanne	6.45	(..)	Taps the alphabet letter reading room		Today we 're going to read an alphabet book. It's going to be fun! Press the arrows to turn the pages. Press the letters at the bottom to jump to that page.		EXPO	INDI	
Elena	6.53	(..)	Taps and moves to B		Uppercase B, Lowercase b – ball, B is for ball.		EXPO	INDI	
Teacher	6.55	Where is your name? What letter, Joanne!	Looks at Joanne		BGM				
Joanne	6.58	J!	Taps on J on the bottom alphabet navigation bar		Uppercase J, Lowercase j – jet, J is for jet.		EXPO	INDI	AN/PROB
Teacher	6.59	Aha, J for what? Jet! Jet! Jet! What about you Elena? What's your name starts with? Your name starts with what letter, Elena?	Looks at Joanne Looks at Elena		BGM				
Elena	7.07	E!	Taps the 'next' arrow symbol and moves to 'I'		Uppercase I, Lowercase i – ice, I is for ice.		EXPO	INDI	AN
Joanne	7.09	Ice!	Points at the ice on the screen		BGM		EXPO	COLL	I
Elena	7.10	E! Egg!	Taps the 'next' arrow key		Uppercase E, Lowercase e – egg, E is for egg.	the noice level of classroom is too high to hear the narration well	EXPO	INDI	PROB
Teacher	7.13	Yes, also for egg!			BGM				
Joanne	7.17	Egg!			BGM		EXPO	COLL	I
Teacher	7.18	Very good! so you found your letters!	Leaves the table		BGM				
Joanne	7.24	Hehehe	Taps the pages quickly and stops at p		Uppercase P, Lowercase p – popcorn, P is for popcorn.		EXPO	INDI	AF
Elena	7.35	Popcorn!	Points at the screen		BGM		EXPO	COLL	I

Joanne /Elena	7.38	(..)	Elena taps back button and Joann taps next button. The screen flickers going back and forth between 'P' and 'q'		Uppercase Q, Lowercase q - quarter, Q is for quarter.		EXPO	ARGU	
Elena	7.44	Pulls the iPad to herself', taps and find P. Ms. Iva, pop, popcorn!	Taps next by accident, and taps back to 'P'		BGM		EXPO	INDI	AF
Researcher	8.05	That's right! P for popcorn! Do you like popcorn?			BGM				
Elena	8.09	Yeah! Yum yum yum	Pretends to eat popcorn		BGM		IN	COLL	AF
Researcher	8.11	Me too, yum yum yum			BGM				
Joanne	8.13	Me too, yum yum yum	Pretends to eat popcorn		BGM		IN	COLL	AF
Elena	8.15	Yum, yum, I eat popcorn	Still prenteds to eat popcorn		BGM		IN	COLL	AF

The teacher called eight children's name to play Aniland for the first round. Elena and Joanne were paired for the day. I assigned the children a mission to find the first letters of their names and show them to me on the screen. I showed them an example, "My name is Iva. My name starts with 'I' so I will go find the page 'I'!" When I turned the pages to 'I', a child spoke aloud, "I is for ice!" After my brief introduction, the children shortly started to engage with the app.

In the beginning, children's navigation and meaning-making with the app was unclear. Elena took over the iPad; tapped the app icon; chose the letter sound activity room; tapped the first letter 's' and 'f' respectively to complete 'squirrel'; tapped 's'. 'f', 'g' and 'k' again when there was no response; and exited the room (4.03) (PROC). Joanne shouted, "Elena is not sharing!" and stood up to look for a teacher and then sat down (PROC) (4.14). Without responding to Joanne, she entered the rhyming game; tapped on the rocks with her palm a couple of times and exited the room when nothing happened (4.17) (PROC). Although Elena was dominant in interacting with the iPad, she had kept the iPad in the middle since the beginning.

When the page turned to the rhyming day's main screen, Joanne pulled the iPad to herself (4.21) (PROC). Then, Elena experimented with the character options by tapping *lion*, *optical glasses*, *pig*, *dress*, *optical glasses*, *t-shirt*, *bikini*, *duck*, *dress*, *lion*, *suit*, and *optical glasses*; however, I did not find any pattern or reflective analysis at this point (4.25) (PROC). As Joanne tapped *monkey* and *baby onesie*, turned the screen to show it to Elena and shouted, "This, this! (XXX)!" (4.37) (PROC). Elena did not respond to Joanne and tapped *hippo*, *bib*, and *blue* (4.39) (PROC). To the hippo with a bib on the screen, Joanne said, "This is a grandma." (4.40) (PROC). Elena tapped *bear*, accidentally exited the avatar room; came back to the room and chose *monkey* (4.43) (PROC). Joanna pulled the iPad to herself and selected *monkey*, *baby onesie*, and *purse* (4.44) (PROC). To the screen, Elena said, "This is a baby" and asked Joanna's opinion to change the character's colour: "Purple, purple, ok?" (4.51) (PROC). Despite the children's apparently random exploration in the character items, they made substantive conversations about what was visible on the screen.

Despite their previous collaborative interaction, Joanne pulled the iPad to herself and tapped green and looked for me to show what she had created (5.01) (PROC). Elena told me, "Elena is not sharing" with an upset tone (5.06) (PROC). Joanne persisted with her own decision by tapping *purple*, *orange*, *optical glasses*, and finally, *optical glasses* again to deselect (5.10) (PROC). Walking toward the table, I told Joanne, "Share with Elena please." (5.15). Joanne answered, "I am sharing" (5.18) (PROC). This time, Elena pulled the iPad and tapped *green* (monkey), *pink*, *hippo*, *monkey*, *orange*, *green*, and *pink* as shouting 'no!' with a disgusted tone when the monkey turned into *pink* (5.19) (PROC). Joanne reached her arm to tap *green* and did not succeed to pull the iPad to herself (5.34) (PROC). Elena kept the iPad to herself and tapped the *monkey* and reset the colour. Then she called the teacher, who was working with another group in the opposite side of the same table: “Look at it!” after tapping *green* (5.37) (PROC). The teacher responded, “What’s that?” (5.39). Elena answered, “It’s a monkey!” (5.41) (PROC). The teacher asked Elena, “Did you find your letter? Your name?” (5.49). Elena responded, “No, I can’t find it.” (5.52) (PROC). The teacher offered assistance: “You can't find it? Do you want me to help you?” (5.54). Elena nodded her head and held the iPad with both hands (5.56) (PROC).

Shortly, the teacher came to their table and positioned the iPad to the middle: “We are looking for the ABC, the alphabet book” (5.59). Joanne tapped on the iPad's home button, unwillingly exited the app; tapped back the app; entered the rhyming reading room and flipped till the last page (6.06) (PROC). As they were in the rhyming book, the teacher asked, “Rhyming? Where is the alphabet? Where do you think it is?” (6.31) (PROC). Joanne exited the rhyming book to the rhyming day’s main page (6.34) (PROC). The teacher questioned, “Do you think it's in the rainbow (i.e., rhyming activity room)?” (6.34). At this point, Joanne demonstrated her good navigation skill by exiting the rhyming day, finding the home page, and entering the alphabet day's main page (6.34) (EXPO). The teacher also mentioned the spot with giraffe would direct them to the alphabet day’s page, but Joanne already understood where it was located (6.35). However, Joanne chose the letter sound activity room instead of the reading room (6.37) (PROC). The teacher reminded Joanne that this was the alphabet matching game (6.40). She immediately taped the exit button to go to the main page (EXPO) (6.42). The teacher pointed at the reading room (6.43), and Joanne tapped into the room (6.45) (EXPO).

When the page turned to the alphabet reading room, Elena reached her arm out; tapped the next button and stopped at the letter ‘B’ page (6.53) (EXPO). The teacher reminded of the mission to spot the page that had the first letters of their names. First, the teacher asked Joanne, “Where is your name? What letter, Joanne?” (6.58). Joanne responded, “J!” as tapping the J on the bottom of the alphabet navigation bar (6.59), which demonstrated a good understanding of the book’s contents (EXPO). The teacher emphasised the contents on the page: “Aha, J for what? Jet! Jet! Jet!” Then, asked Elena questions: “What about you Elena? What's your name starts with? Your name starts with what letter, Elena?” (6.59). Elena immediately answered, “E!” as tapping the next button and moves to the letter ‘E’ page (7.07) (EXPO). Joanne shouted “ice!” at the letter ‘I’ page, when Elena was flipping through the alphabet book (7.09). On the page ‘E’, Elena shouted, “E! Egg!” toward the teacher (7.13) (EXPO). Joanne also shouted, “Egg!” (7.17) (EXPO). Before leaving the table, the teacher praised them: “Very good! so you found your letters!” (7.18). In order to reach the desired pages, Joanne tapped on the alphabet navigation bar on the bottom of the page whereas Elena tapped the next button. Both ways exhibited meaning-making in learning with an iPad.

After Joanne and Elena had found their letters, they kept engaging in the alphabet reading room. With laughter, Joanne tapped the pages quickly and stopped at ‘P’ (7.24) (EXPO). Elena pointed at the screen and shouted, “popcorn!” (7.35) (EXPO). Then, Elena tapped back button and Joann tapped next button. The screen flickered going back and forth between 'P' and 'Q' (7.44) (EXPO). Elena pulled the iPad to herself, found ‘P’ again: “Ms Iva, pop, popcorn!” (8.09) (EXPO). As walking toward their table, I responded, “That's right! P for popcorn! Do you like popcorn?” (8.05). At this moment (8.09), Elena demonstrated IN that she pretended to eat popcorn with hand gesture: “Yeah! Yum, yum, yum.” I imitated her pretend play: “Me too, yum, yum, yum.” Soon, Joanne joined: “Yum, yum, I eat popcorn” (8.15). After eating imaginary popcorn, the iPad time was over, and they left the table. Then, they lined up and handed out the tattoo stickers their preferred animal characters. By applying slight water drop from the sink on the tattoo stickers, the teachers and I help the children to put them on their arms or on the top of their hands only if they wished. Many of the children enjoyed the tattoos on themselves by repeatedly looking at them and compared with others (Figure 5.4). Some wanted to put them on their notebooks but I explained the tattoo stickers required water which could wet them. Since this was happening during the end phase, children were aware they could attain a sticker at the end of the iPad time, however; the tattoo sticker was a surprise and added another amusement for them.

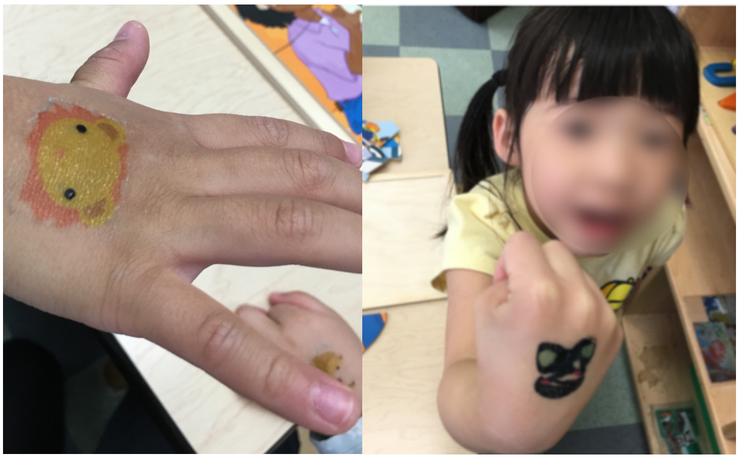


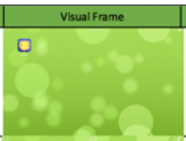
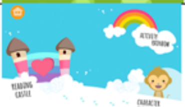
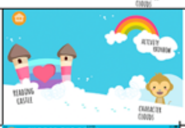
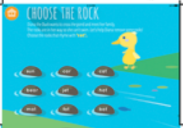
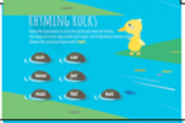
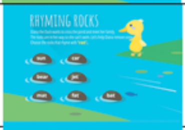
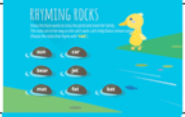
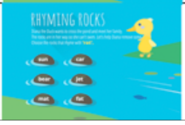
Figure 5.4. Children enjoy having the tattoo stickers

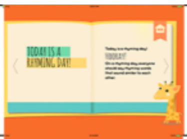
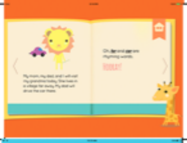
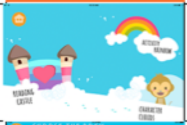
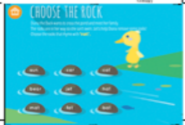
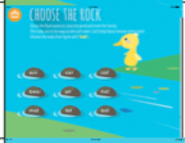
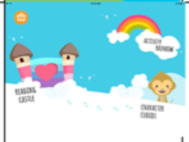
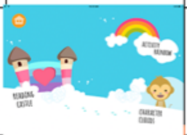
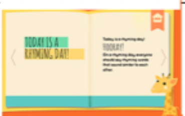
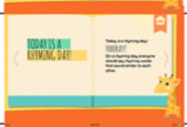
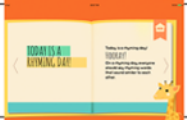
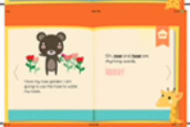
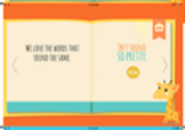
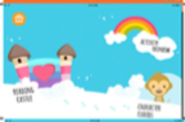
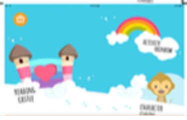
In the beginning, two children lacked in focus, tapping random options in the avatar room without a clear purpose and did not share the iPad with each other. However, from the midpoint, they were able to find the right place, because they were navigating in the rhyming day rather than the alphabet day. The teacher led them to the alphabet reading room, and they were able to finish the mission to find the first letters of their names by the teacher's assistance. This case set a prominent example that the teacher's involvement and guidance could enhance children's meaning-making process and practice emergent literacy skills.

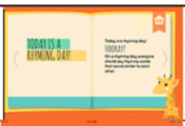
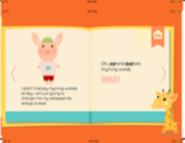
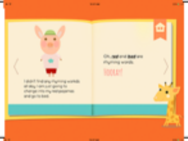
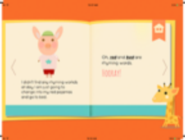
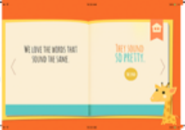
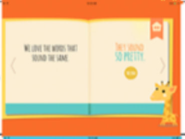
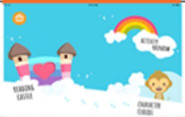
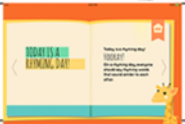
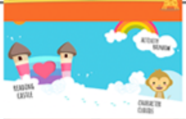
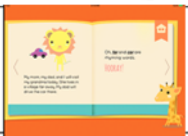
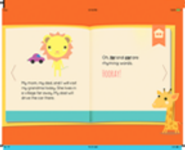
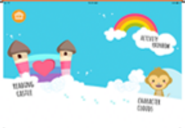
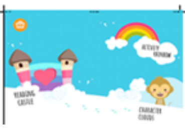
5.3.3 Example 3

Prior to starting the iPad time in Week 10 in Classroom 1, I informed everyone in the classroom that they would be receiving a special reward after they finished playing the app. I encouraged them to read books and find their favourite animals in the reading rooms. The transcription excerpt below (Table 5.10) illustrates two children’s interactions when playing the Aniland app.

Table 5.10. *Transcription from Week 10*

Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
2.37	Teacher	Ok. Right here.	Pulls chair for Britany						
2.46	Britany	(...)	Sits down				PROC	INDI	
2.49	Kelvin	This!	Sits down and presses the app button and home button	 ACTIVITY RAINBOW READING CASTLE CHARACTER CLOUDS	BGM		PROC	INDI	AF
2.51	Researcher	Find the story book. Let's see if you play well. If you all play well, you all get stickers.		 ACTIVITY RAINBOW READING CASTLE CHARACTER CLOUDS	BGM, Narration				
2.55	Britany	Oh!	Taps the activity in the rhyming	 CHOOSE THE ROCK	BGM, Narration		PROC	INDI	AF
2.57	Kelvin	(...)	Taps cat (O), car (X, many times but not response) and hat (O)	 RHYMING ROCKS	BGM, Narration		PROC	INDI	AF
2.58	Britany	(...)	Taps sun (X), car (X)	 RHYMING ROCKS	BGM, Narration		PROC	INDI	
3.02	Kelvin	Here, here, here.	Point at the bat	 RHYMING ROCKS	BGM, Narration		LA	TUTO	AF
3.03	Britany	(...)	Taps jet (X) 8 times (no response)	 RHYMING ROCKS	BGM, Narration		PROC	DOMI	

3.05	Kelvin	My turn	Taps home button > rhyming main > rhyming book		BGM, Narration		PROC	FLCI	AF
3.20	Britany	(...)	Skips through the book with the right arrow key				PROC	DOMI	
3.21	Kelvin	It's my turn	Exits the reading room				PROC	FLCI	AF
3.27	Britany	(...)	Goes into the rhyming activity room				PROC	DOMI	
3.30	Kelvin	I am first, I am first	Attempts to tap on the screen				PROC	FLCI	AF
3.32	Britany	(...)	Presses exit button to quit the activity				PROC	DOMI	
3.37	Kelvin	(...)	Taps on the reading room				PROC	INDI	
3.38	Britany	Hey!					PROC	FLCI	DA
3.41	Kelvin	Me first!	Looks at the teacher				PROC	FLCI	DA
3.51	Teacher	You can always have your turn							
3.57	Britany	(...)	Taps right arrow key to run though the rhyming book, activity				PROC	DOMI	
4.09	Kelvin	(...)	Turns all the pages to the end			exits the reading room automatically	PROC	DOMI	
4.19	Britany	(...)	Taps on home button		page didn't go to the main menu because O was tapbing together		PROC	DOMI	
4.21	Kelvin	(...)	Taps on the reading castle				PROC	DOMI	

4.28	Kelvin	I want to play.					PROC	FLCI	DA
4.30	Britany	(...)	Taps on pig				PROC	DOMI	
4.33	Kelvin	Let me play. I like pig!	Taps on the right page.				PROC	ARGU	AF
4.35	Britany	(...)	Taps right arrow key to run though the rhyming book, activity				PROC	DOMI	
4.39	Kelvin	I want to play this! I want lion!	Keeps turning till the end because he did not see the lion				PROC	DOMI	AF
4.39	Kelvin	I want to play this! I want lion!	Keeps turning till the end because he did not see the lion				PROC	DOMI	AF
4.48	Teacher	Alright, then where do we go?							
4.51	Britany	(...)	Taps the reading room				EXPO	INDI	
4.54	Teacher	Maybe you know where the lion is.							
4.56	Britany	(...)	Tap till she finds the lion				EXPO	COLL	
4.58	Kelvin	((Giggles))	Gazes at lion and tap the right arrow key until the end				EXPO	COLL	
5.09	Britany	Rainbow?	Looks at Oliver and ask for consent and taps				EXPO	COLL	Q
5.10	Kelvin	(...)	Looks elsewhere				PROC	OFF	AF

The teacher pointed at the table so Britany came to sit down first (2.36) (PROC). As soon as Kelvin sat down next to her, he shouted, “This!” and tapped on the app button and then the home button (2.49) (PROC). I asked them to find the story book and they will receive a sticker if they would play well (2.55) (PROC).

Britany said, “Oh”!” as tapping the rhyming activity room (2.55). Kelvin tapped the correct response *cat* and then the wrong one *car* many times and then another correct one *hat*. I coded this moment as PROC because I was not sure of his tapping the correct responses was whether coincident or not (2.57) (PROC). Britany chose two wrong responses in a row, *sun* and *car* (2.58). Then, Kelvin rather than tapped by himself, he pointed a correct response *bat*: “Here, here, here” (3.02) showing a tutoring behavior that could relate to LA because he was certain about his literacy knowledge. However, Britany tapped on another rock, *jet* 8 times (3.09) (PROC) but that wrong answer did not respond.

Kelvin alerted, “It’s my turn” to Britany and exited the reading room (3.21) (PROC). Britany immediately tapped back into the rhyming activity room (3.27) (PROC). Kelvin shouted, “I am first, I am first!” (3.30) (PROC) but before he tapped the screen, Britany chose the exit button to end the activity (3.32) (PROC). Kelvin then entered the reading room (3.37) (PROC). Being unsatisfied by Kelvin’s move, Britany shouted, “Hey!” (3.38) (PROC). Although the teacher reminded them to play together, Kelvin revisited “Me first!” (3.41) (PROC). Britany dominated the iPad and tapped the right arrow key to run though the rhyming book and stopped at the bear page (3.47) (PROC). Kelvin turned all the pages to the end without asking Britany (4.09) (PROC). Britany tapped on the home button to exit (4.19) (PROC) and Kelvin immediately chose to go back to the reading castle (4.21) (PROC). When Britany listened to the narration of the first page of the rhyming day closely (4.22) (PROC), Kelvin insisted, “I want to play” (4.28) (PROC). Without giving Kelvin a chance, Britany tapped to the page with Pat the pig and listened (4.30) (PROC). Kelvin shouted, ‘Let me play. I like pig!” grasping the iPad (4.33) (PROC). She tapped the left arrow key till Kelly the koala page (4.36) (PROC). As tapping the right arrow key, Kelvin said "I want to play this! I want lion!"; however, the lion was situated before the koala page so he did not see it by tapping the right arrow button (4.39) (PROC). Thus far, no meaningful joint actions were shown between the two and rather played separately on their will.

The teacher came over to the table and asked the next direction, "Alright, then where do we go?" (4.48). Again, Britany tapped the rhyming reading room (4.51) (PROC). The teacher suggested an option to satisfy Kelvin, "Maybe you know where the lion is." (4.56). Then, Britany tapped through pages to find the lion (4.56). Now she had a clear navigation purpose to search for a certain page, I coded this moment as EXPO. Kelvin giggled with a satisfaction and tapped through the pages till it exited to the main page (4.58) (EXPO). Britany asked Kelvin's opinion, "Rainbow?" (5.09) (EXPO). Then, Kelvin tapped on the monkey to enter the avatar room (5.10) (EXPO). From this moment, they entered the avatar room and spent the rest of time creating animals with a fairly good turn-taking manner.

Overall, I did not observe any clear evidence of more EXPO in the final phase than the middle phase. The frequency of getting the correct responses in the activity room was similar to the previous times. I noticed the children navigated the app far more smoothly than previous times because they had become familiar with it. Also, the gap involving being able to easily navigate or manipulate the skills needed in the app between children who did and did not use the iPads at home became narrower over time, so all of the children were able to explore the areas without any technical difficulties. The children's interactions even exhibited an instance of LA; for example, Kelvin pointed at the correct response for Britany to tap; despite she decided to choose another one. The children played with some conflicts but it was resolved at the end and they played well together in the avatar room throughout.

In these three examples, interpreting of data and evidence to respond to RQ 2 showed that children tended to wander without a specific goal or purpose (PROC), though later, as they became more familiar with the app, their level of understanding or interpretation became clearer, and they kept tapping on the areas they wanted to explore (EXPO). Furthermore, in the last phase, I observed children had become better accustomed to how to navigate in the app, take turns with partners, and solve the problems when iPads froze or stuck at the recording page. Regarding improvement in emergent literacy skills, children produced more correct answers in the activity rooms at a faster pace in comparison to the first few weeks.

Also, the teachers' roles to provide guidance was critical to maximise collaboration and to encourage meaning-making process of children. It is important to note that children had a tendency to work better and make more meaningful connections with the app when they had closer relationships with their partners, regardless of the number of weeks they had the iPad.

5.4 Analysis Summary of RQ1

In response to RQ1 (in what ways do preschoolers engage in meaning-making processes and practice emergent literacy skills when using iPads in the classroom?), I analysed a total of 9 transcriptions: 3 cases that each consists of 3 examples in the beginning (Weeks 1–3), middle (Weeks 4–6), and end (Weeks 7–10). My focus was on cognitive processing to investigate how children's interactions, literacy practising shown in the app, and meaning-making processes varied throughout the phases of the study.

In the examples during the beginning phase, PROC was prevalent and a few moments of EXPO was found. However, no clear purpose regarding navigation or the meaning-making process was visible in these examples. The children enjoyed the avatar room the most and spent the longest time on it. In the activity, they could navigate clothing, accessories, and colour options. When they entered the activity rooms involving rhyming, uppercase and lowercase matching, and letter sounds, they had a tendency to apparently randomly tap on the responses without thoughtful input. Often, the children showed conflict, e.g., constantly pushing away or dragging the iPad toward themselves.

The children's lack of collaboration and meaning-making processes may be related to their adjustment to the new environment. Also, when I compared the home use of tablets in a survey, children who had prior experiences with iPads were most likely to have more confidence operating them and wanted to lead or dominate over the ones who did not in the beginning.

In the middle phase, a combination of the PROC and EXPO modes was higher than the beginning phase, which predominantly saw PROC. The children were inclined to have more fluent navigation than the beginning phase; however, the conflict among children who wanted to control the iPad was still persisting Sometimes, they showed improvement in communication skills; they made suggestions on what others should tap or move to. The frequency of tapping on the correct answers increased in the activity rooms. This may be an indication that the children practised and attained some literacy knowledge over a few weeks.

In the end phase, the cognitive process exhibited in EXPO occurred more frequently than the previous phases in most cases when the same pairs worked together. The children navigated the app far more smoothly than previous times because they had become familiar with it. Also, the gap involving being able to easily navigate or manipulate the skills needed in the app between children who did and did not use the iPads at home became narrower over time, so all of the children were able to explore the areas without any technical difficulties. The children's interactions even exhibited some instances of IN; for example, they felt comfortable having an extended play. The children were imitating eating popcorn in Week 9. The children played well together without significant lasting conflict compared to the beginning and middle phases.

In sum, over 10 weeks of study, the children learned to work better as teams, especially exhibiting notable improvements in turn-taking, and provided the correct responses more quickly and precisely. This demonstrates that even though my focus was at that point on cognitive and literacy skills, these improvements were nonetheless social and cultural. The meaning-making processes of these children were multidimensional and dynamic, as it happens when mind, movement, and feelings come together (Wright, 2007). Moreover, the teachers' support in assisting the children increased over time, which tremendously helped enhance the children's focus and engagement because they had more time to adjust themselves to the app. In the end, it is likely their literacy skills were increasing in the period owing to their other activities in the classroom, but they could harness this expanding knowledge and understanding in the iPad activities.

CHAPTER 6
RESULTS AND ANALYSIS:
RESPONDING TO RESEARCH QUESTION 2

6.0 Introduction

To answer my second research question (“What changes in peer group interaction do children display over time when they play with the app with their peers?”), I chronologically analysed three sets of three excerpts from transcriptions taken from the beginning (Weeks 1–3), middle (Weeks 4–6), and end (Weeks 7–10) phases, as in the previous chapter. I focussed on analysing social processing and communication style to examine how the children worked together and communicated each other throughout the phases of the study.

Along with providing a descriptive walk-through of the transcriptions, I tallied the coded responses to describe the ways in which the children reacted to each other while engaging with the app, as I was following verbal and nonverbal behaviours as displayed in the coding of the transcriptions. I characterised the behaviours children exhibited to determine whether or not common patterns existed within each excerpt.

Table 6.1. *Revised analytical framework of peer group interaction – social processing and communication style*

Dimension	Analytical Categorization		Description
Social processing	Collaborative	COLL	- Joint activity characterized by equal participation and meaning making
	Individual	INDI	- Student(s) are working on individual tasks with no sharing or joint meaning making
	Off-task	OFF	- Activity not related to the task
	Confusion	FUSI	- Lack of shared understanding, student(s) do not understand the task or each other, often includes silent episodes
	Domination	DOMI	- Student dominating the work, unequal participation

	Argumentative	ARGU	- Student(s) are faced with cognitive/social conflicts which are resolved and justified in a rational way
	Conflict	FLCI	- Student(s) are faced with cognitive/social conflicts which are often left unresolved
	Tutoring	TUTO	- Student helping and assisting another student
	Problem solving	PROB	- Trying different actions to solve an issue (e.g., seeking assistance from peers or adults for desired outcome)
Communication Style	Affectional	AF	- Expressing feelings or opinions
	Agreement/disagreement	A/DA	- Expressing agreement/disagreement
	Informative	I	- Providing information
	Interrogative	Q	- Asking questions
	Experiential	E	- Expressing personal information
	Responsive	AN	- Answering questions
	Reading	RE	- Reading the text
	Repetition	RP	- Repeating spoken language

As shown in Table 6.1, types of social processing included collaborative (COLL), Individual (INDI), off-task (OFF), confusion (FUSI), domination (DOMI), argumentative (ARGU), conflict (FLCI), tutoring (TUTO) and problem solving (PROB). Categories of communication style included affectional (AF), agreement (A) /disagreement (DA), informative (I), interrogative (Q), experiential (E), responsive (AN), reading (RE) and repetition (RP). The coded data was inspected to describe variations of social interactions in the dynamics that occurred as children communicated with peers and even with their teacher and myself in the transcriptions, or surroundings of the classroom.

6.1 Beginning Phase

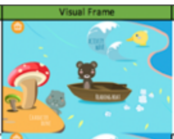
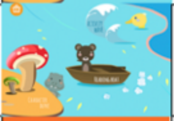
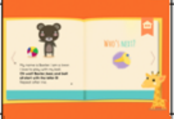
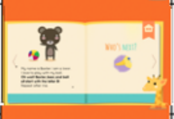
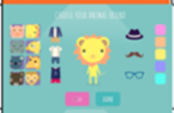
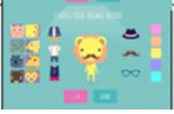
6.1.0 Preview

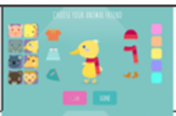
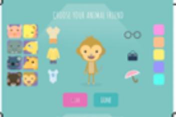
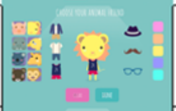
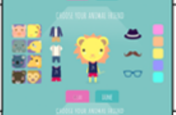
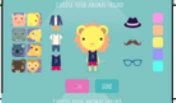
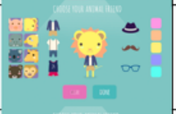
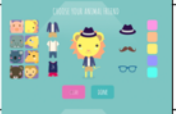
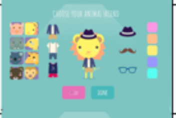
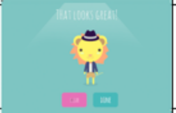
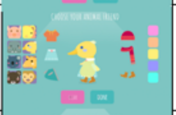
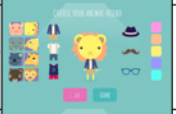
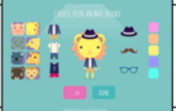
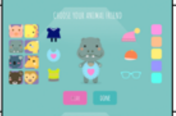
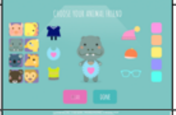
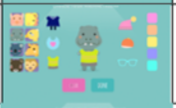
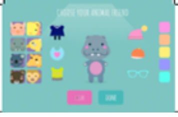
In the examples from the beginning phase (Weeks 1-3), children often exhibited individual (INDI) and occasionally exhibited collaboration (COLL) in social processing. There were moments of domination (DOMI), conflict (FLCI), and confusion (FUSI) when the children wanted to play more by themselves, declining to share or not understanding each other's requests. INDI and DOMI were differentiated by how the children positioned the iPad: children who placed the device right in front of themselves or blocked partners from using it were coded as DOMI, and children playing with the iPad positioned so as to let a partner see or interfere were coded as INDI. Children tended to remain silent when they were tapping the iPad, and children in some instances showed strong communication skills when asking for turns or opinions of their peers. Nevertheless, improvement in sharing experiences was visible each week, and the children were concentrating better within three weeks.

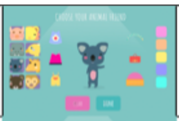
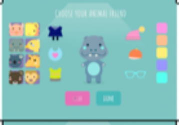
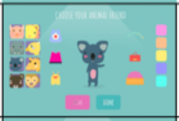
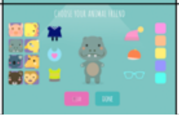
6.1.1 Example 1

The transcription below in Table 6.2 shares the children's interactions in the first week of my visit in Classroom 1. The children had reading time prior to the iPad time. After I finished setting up the equipment, the teachers called out children's names and had them sit down in pairs. Children spent their time the longest in the avatar room than in the reading rooms or activity rooms. As this was the first day, children tended to show more non-collaborative behaviours but toward the end they played better with each other.

Table 6.2. *Transcription from Week 1*

Time	Name	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additiona notes	Cognitive process	Social process	Language functions
1.17	Researcher	What is your name?			BGM				
1.18	Arron	(...)	Taps the reading room		clicking SFX, BGM		PROC	INDI	
1.19	Emma	Arron!	Answers for her partner		Alphabet sound book. Today we will meet our animal friends and find out what they love to do.	Emma signed hers earlier in the very beginning of the iPad day	PROC	PROB	AN
1.21	Researcher	Ok. Arron, are you happy playing Aniland?	To Arron		clicking SFX, BGM				
1.25	Arron	Yes!	Taps on the alphabet sound book		BGM		PROC	INDI	AF
1.26	Emma	(...)	Grasps the iPad and shows the screen to the researcher		BGM		PROC	INDI	
1.29	Researcher	You can tap on this arrow key or the other one	Points at the forward arrow key Taps the backward arrow key		clicking SFX, BGM				
1.33	Emma	(...)	Taps to bear page and back to the cover page.		Alphabet sound book. Today we will meet our animal friends and find out what they love to do.		PROC	INDI	
1.38	Arron	Arrow!			BGM		PROC	INDI	RP
1.39	Researcher	Arron, are you happy or sad playing Aniland? Can you circle a face? Iwant to know your feeling.	Shows the pictures on the sheet to Arron		BGM				
1.47	Arron	Happy!	Circles the happy face quickly and goes back to play the app.		BGM		PROC	INDI	AF
1.59	Emma	Happy!	Shouts		BGM		PROC	COLL	RP
2.01	Researcher	Happy! Thank you!	Moves to another table		BGM				
2.10	Arron	(...)	Reads the bear page with his eyes and taps on the page. Tries to listen closely by putting his ears to the screen. Taps the next button and listen to the duck and hippo. Then, taps next till exits the book		clicking SFX, BGM	Narration already happened when he was signing the consent form. Sound may have been diffucit to hear due to the classroom's noise level at the moment	PROC	INDI	
2.43	Emma	(...)	Brings the iPad closer to her, taps the character room > lion > glasses > moustache		clicking SFX, BGM		PROC	DOMI	
2.55	Arron	Let me...			clicking SFX, BGM		PROC	FLCI	AF

2.57	Emma	(...)	Taps duck > scarf > beanie	 CHOOSE YOUR ANIMAL FRIEND	clicking SFX, BGM		PROC	DOMI	
3.05	Arron	(...)	Taps monkey	 CHOOSE YOUR ANIMAL FRIEND	clicking SFX, BGM		PROC	INDI	
3.06	Emma	(...)	Taps yellow sweater > bag > lion > basketball jersey	 CHOOSE YOUR ANIMAL FRIEND	clicking SFX, BGM		PROC	DOMI	
3.23	Arron	(...)	Points at the jacket	 CHOOSE YOUR ANIMAL FRIEND	clicking SFX, BGM		PROC	INDI	
3.28	Emma	(...)	Taps the jacket	 CHOOSE YOUR ANIMAL FRIEND	clicking SFX, BGM		PROC	DOMI	
3.34	Arron	This, this.	Points at the hat	 CHOOSE YOUR ANIMAL FRIEND	clicking SFX, BGM		PROC	COLL	AF
3.37	Emma	(...)	Taps hat and done.	 CHOOSE YOUR ANIMAL FRIEND	clicking SFX, BGM		PROC	COLL	
3.43	Arron	(...)	Points at done	 CHOOSE YOUR ANIMAL FRIEND	clicking SFX, BGM		PROC	COLL	
3.45	Emma	(...)	Taps done	 THAT LOOKS GREAT!	BGM, Tada! That looks great!Let's start today's adventure.		PROC	COLL	
3.49	Arron	My turn.	Take the iPad to himself. Taps clear > lion > jacket > duck > scarf > dress > dinosuar > lion > jacket > duck > dress > boots > lion > jacket > hat	 CHOOSE YOUR ANIMAL FRIEND	clicking SFX, BGM		PROC	INDI	AF
4.21	Emma	(...)	Take the iPad to her side and taps on lion > jacket	 CHOOSE YOUR ANIMAL FRIEND	clicking SFX, BGM		PROC	DOMI	
4.33	Arron	My turn!	Taps hat	 CHOOSE YOUR ANIMAL FRIEND	clicking SFX, BGM		PROC	FLCI	AF
4.41	Emma	Yay!	Taps hippo > glasses >bib	 CHOOSE YOUR ANIMAL FRIEND	clicking SFX, BGM		PROC	DOMI	
4.50	Arron	(...)	Looks elsewhere with a frown face	 CHOOSE YOUR ANIMAL FRIEND	clicking SFX, BGM		PROC	FUSI	
4.55	Emma	(...)	Taps yellow tank top > beanie > reset hippo		clicking SFX, BGM		PROC	DOMI	
4.59	Arron	(...)	Taps pink and laughs	 CHOOSE YOUR ANIMAL FRIEND	clicking SFX, BGM		PROC	COLL	

5.04	Emma	(...)	Taps koala > hippo		clicking SFX, BGM		PROC	COLL	
5.07	Arron	((laughter))	Taps blue and laughs		clicking SFX, BGM		PROC	COLL	
5.11	Emma	(...)	Taps koala > hippo		clicking SFX, BGM		PROC	COLL	
5.14	Arron	((laughter))	Taps orange > yellow > blue > pink		clicking SFX, BGM	Same pattern of Emma selecting the animals and Arron changing the colours and assets last until the end of the iPad time	PROC	COLL	

SFX=sound effect
BGM=background music

In the beginning (Table 6.2), after walking around in a clockwise circle, I sat next to Arron and asked, “What is your name?” (1.17). However, because he was focussed on the app, he might not have heard me (1.18), and he tapped the screen, coded as individual behaviour (INDI). On the other hand, Emma, who had already responded to the consent form with a happy face, answered for her partner, “Arron!” (1.19) (PROB) (AN). In this moment, Emma did not collaborate with Arron directly but assisted me by providing information. To Arron, I asked, “Are you happy playing Aniland?” (1.21). With a slight delay, Arron answered, “Yes!” while tapping on the alphabet sound book (1.25) (INDI) (AF). Suddenly, Emma grasped the iPad and showed me the iPad with the Baxter the Bear page (1.26) (INDI). I informed them of how to use the forward and backward arrow keys, then Emma tried the backward key (1.33) (INDI), while Arron repeated after me, “Arrow!” (1.38) (INDI) (RP). To receive Arron’s consent, I asked him if he could draw a circle around the happy or sad face on the sheet of paper (1.39) (INDI). He responded, “Happy!” and circled the happy face (1.47) (INDI) (AF). Following Arron, Emma shouted, “Happy!” with a big smile (1.59) (COLL) (AF). I appreciated their positive feedback and left the table: “Happy! Thank you!” (2.01).

Placing his right ear adjacent to the iPad screen, Arron tried to listen to the narration on the Baxter the Bear page. However, the narration had already played while he was signing the consent form. He tapped through the pages until he had exited the reading room (2.10) (INDI). Without asking Arron, Emma slid the iPad toward herself and tapped the avatar room, *lion*, *glasses,* and *moustache* (2.43) (DOMI). With an unpleasant facial expression, Arron quietly asked for his chance to play: “Let me…” (2.55) (FLCI) (AF). Emma ignored Arron’s request and tapped *duck*, *scarf*, and *beanie* (2.57) (DOMI). While the iPad was still positioned toward Emma, Arron stretched his right arm to tap *monkey* (3.05) (INDI). Emma tapped *yellow sweater* and *bag*, then switched to *lion* and *basketball jersey* (3.06) (DOMI).

From here on, Arron took a slightly different approach. Instead of tapping, he pointed at *jacket* (3.23) (COLL) (AF), and Emma, following his request, tapped *jacket* (3.28) (COLL). Next, Arron pointed at hat and said, “This, this” (3.34). Without any hesitation, Emma tapped it (3.37) (COLL) (AF). Again, following the same pattern, Arron pointed at the *done* button (3.43) (COLL), and Emma tapped it promptly (3.45) (COLL).

Arron then said, “My turn,” and played by himself for about a minute by tapping clear, *lion, jacket, duck, scarf, dress, dinosaur, lion, jacket, duck, dress, boots, lion, jacket*, and *hat* (3.49) (AF). However, I coded this as INDI instead of DOMI because not only did Arron ask for his turn, but he also kept the iPad in between Emma and himself. When Arron paused, Emma took the iPad and tapped *hippo* and *bib*: “Yay!” (4.55) (DOMI) (AF). Arron seemed irritated and looked elsewhere (4.50) (FUSI).

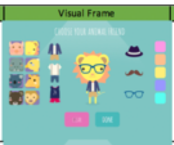
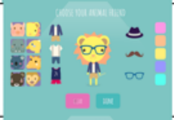
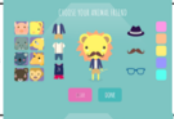
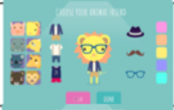
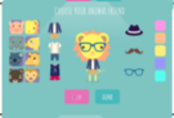
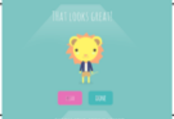
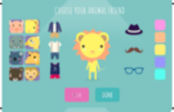
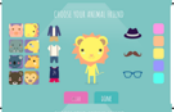
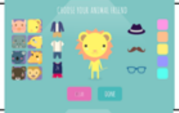
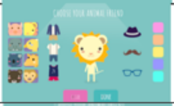
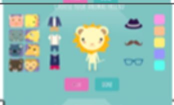
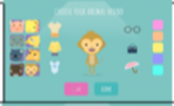
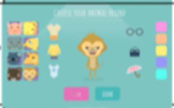
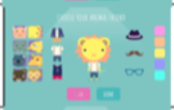
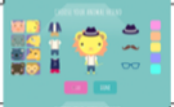
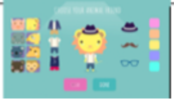
I found another pattern during a brief moment when Emma selected the animal character and Arron chose the colour. Emma tapped the screen – *tank top*, *beanie*, and *hippo* (4.55) (DOMI). Arron quickly tapped *pink* and laughed aloud at how the character looked (4.59) (COLL). Emma tapped *koala* and changed it to *hippo* (5.04) (COLL). Then, Arron tapped *blue* and laughed with joy (5.07) (COLL). Emma tapped *koala* and switched it to *hippo* (5.11) (COLL). Arron immediately changed colours: *orange*, *yellow*, *blue,* and *pink,* and let out a big laugh (5.14) (COLL). This pattern continued; hence, the two children played fairly collaboratively until the time ended.

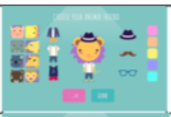
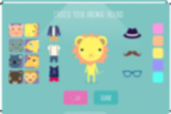
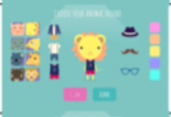
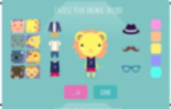
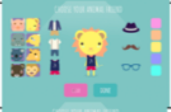
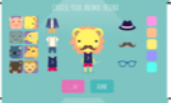
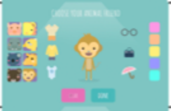
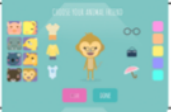
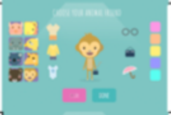
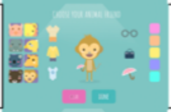
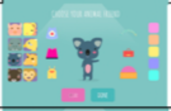
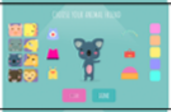
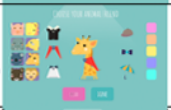
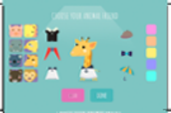
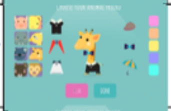
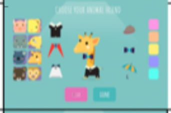
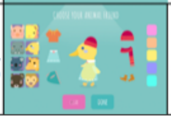
The interaction between the two children in the first week started as non-collaborative, as the children were more eager to have opportunities to play with the iPad, and the concept of collaboration in sharing the tablet in the classroom was new. The beginning and middle of the transcription depicts non-collaborative behaviours: conflict (FUSI), dominant (DOMI), or individualistic (INDI) behaviours between the children. On the other hand, they exhibited patterns of collaboration and turn-taking when Arron pointed at an item on the screen and Emma tapped it for him. Another interesting pattern toward the end was that Emma picked the animals first and Arron chose the colour from the colour palette on the right side of the screen. From a communicative perspective, informative (I) and affectional (AF) behaviours were present a few times to express the information, needs, and feelings. Also, silence was prevalent most frequently, and a few conflicts are shown in the middle point of Table 6.2. In the end, the two children changed from dominant and individual social behaviours to collaborative behaviours.

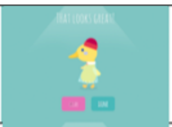
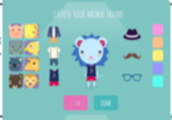
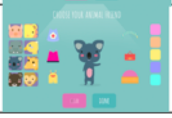
6.1.2 Example 2

The below example from Week 2 (Table 6.3) occurred in Classroom 2. In the usual routine, half of the class was ready for the iPad and the other half had already started with centre time where the children could choose to play with puzzles, to play in a sandbox, to play with dolls, to read books, to build with blocks, etc.

Table 6.3. *Transcription from Week 2*

Time	Name	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additiona notes	Cognitive process	Social process	Language functions
1.35	Joanne	(...)	Sits down and grasps the iPad. Taps on a pair of glasses.		clicking SFX, BGM	The character room is already open	PROC	INDI	
1.41	Kira	(...)	Sits down and looks at the screen and moves to another table where only one child is sitting and comes back as another child sits next to that child		clicking SFX, BGM		PROC	OFF	
1.50	Joanne	(...)	Taps on moustache > glasses > hat > moustache > glasses Keeps the iPad to herself		clicking SFX, BGM	iPad is toward herself	PROC	DOMI	
1.56	Kira	(...)	Looks elsewhere. Looks at the screen		clicking SFX, BGM		PROC	OFF	
1.59	Joanne	(...)	Taps on moustache > deselect moustache > done and raises both of her hands smiling.		clicking SFX, BGM		PROC	DOMI	
2.06	Kira	Let me hold it, ok?	Pulls the iPad to her side		BGM, Tada! That looks great! Let's start today's adventure.		PROC	ARGU	AF
2.11	Joanne	(...)	Moves her body to Kira's side		clicking SFX, BGM		PROC	DOMI	
2.15	Kira	This is lion.			clicking SFX, BGM		PROC	COLL	I
2.18	Joanne	This!	Points at yellow on the colour palette		clicking SFX, BGM		PROC	COLL	AF
2.19	Kira	Ok.	Taps yellow		clicking SFX, BGM		PROC	COLL	A
2.22	Joanne	Monkey			clicking SFX, BGM		PROC	COLL	AF
2.25	Kira	Oh, here's monkey.	Taps monkey		clicking SFX, BGM		PROC	COLL	AF
2.28	Joanne	(...)	Taps glasses and attempts to tap on hat		clicking SFX, BGM		PROC	COLL	
2.31	Kira	(...)	Pushes Joanne's finger and chooses lion > suspender/jeans		clicking SFX, BGM		PROC	DOMI	
2.33	Joanne	(...)	Taps hat		clicking SFX, BGM		PROC	INDI	
2.35	Kira	(...)	Pushes Joanne's hand		clicking SFX, BGM		PROC	FLCI	

2.37	Joanne	I do it.	Grasps the iPad and pulls it to herside. Taps purple > lion		clicking SFX, BGM		PROC	FLCI	AF
2.48	Kira	(…)	Looks around and pulls the iPad to her side.		clicking SFX, BGM	Maybe she is looking for the teacher	PROC	DOMI	
2.53	Joanne	No.	Slide the iPad to her side. Taps basketball jersey		clicking SFX, BGM	Stays in the character room in the rest of the time	PROC	FLCI	AF
3.00	Kira	(…)	Stands up and leaves the table		clicking SFX, BGM		PROC	OFF	
3.06	Researcher	You guys need to play together. Friends play together right?	Places the iPad in the middle of the two.		clicking SFX, BGM				
3.14	Kira	(…)	Sits down and taps moustache.		clicking SFX, BGM		PROC	INDI	
3.20	Joanne	(…)	Taps hat > monkey and pulls the iPad to her side		clicking SFX, BGM		PROC	DOMI	
3.29	Kira	Oh, how about this?	Leans toward Joanne's side and picks a pair of glasses		clicking SFX, BGM		PROC	COLL	Q
3.34	Joanne	(…)	Taps purse > onesie and pushes the iPad to Kira		clicking SFX, BGM		PROC	COLL	
3.49	Kira	((Giggles))	Taps umbrella looks at Joanne's face		clicking SFX, BGM		PROC	COLL	
3.56	Joanne	(…)	Taps purse, pushes Kira's hand, pulls the iPad to her side, taps koala		clicking SFX, BGM		PROC	DOMI	
4.12	Kira	((laughter))			clicking SFX, BGM		PROC	COLL	
4.15	Joanne	(…)	Griaffe is that Taps on giraffe > bowtie > hat > cape > sailor outfil and pushes the iPad to Kira		clicking SFX, BGM		PROC	COLL	
4.39	Kira	(…)	Taps on giraffe's face		clicking SFX, BGM	Nothing happens	PROC	COLL	
4.47	Joanne	(…) I do it (gentle).	Pulls the iPad to her and taps cape > black dress > bowtie and pushes the iPad to Kira's to show the screen. Then pulls it to herself again		clicking SFX, BGM		PROC	COLL	AF
5.17	Kira	(…)	Looks around		clicking SFX, BGM		PROC	OFF	
5.31	Joanne	(…)	Taps duck > dress > scarf > hoodie > dress > beanie > dress > done and pushes the iPad to Kira		clicking SFX, BGM		PROC	COLL	

6.03	Kira	Ta da! Press this right Joanne?	Turns the iPad to show the duck to the researcher. Points at the blue 'done' button'		BGM, Tada! That looks great!		PROC	COLL	Q
6.26	Joanne	(...)	Leaves the table		BGM, Let's start today's adventure.		PROC	OFF	
6.33	Kira	(...)	Keeps playing by herself Rhyming reading room > character room > lion > hat > basketball jersey >blue > hat		clicking SFX, BGM		PROC	INDI	
7.24	Joanne	(...)	Sits down and shows her little cat toy and leaves		clicking SFX, BGM		PROC	OFF	
7.31	Kira	(...)	Chooses duck > koala > lion > blue > hat Plays until the time is up		clicking SFX, BGM		PROC	INDI	

The two children began in individualistic and silent mode. Joanne sat down, grabbed the iPad, and started to play with creating avatars (1.35) (INDI). A bit later, Kira sat down, moved to another table, then came back to sit next to Joanne again (1.41) (OFF). Joanne tapped *moustache*, *glasses*, *hat*, *moustache*, and *glasses* consecutively while keeping the iPad to herself (1.50) (DOMI). Because Joanne did not give Kira a chance to play, Kira looked elsewhere and then at the screen (1.56) (OFF). Insensitively, Joanne continued tapping items to decorate the lion then raised both of her hands with a big smile (1.59) (DOMI). Finally, Kira asked Joanne for a turn: “Let me hold it, OK?” (2.06) (AF). Joanne showed collaborative action by letting Kira use the iPad and leaning towards her to watch the screen (2.11) (COLL).

At this moment, the two children were engaged in dialogue in which they understood each other’s needs. When Joanne pointed at yellow on the colour palette, stating “This!” (2.18) (AF), Kira agreed with her, stating “OK”, and tapped on the *yellow* button (2.19) (COLL) (A). In the next turn, Joanne expressed that she wanted to pick the monkey (2.22) (COLL) (AF), then Kira tapped *monkey* for Joanne: “Oh, here’s monkey” (2.35) (COLL) (AF). However, the collaborative mode did not extend any longer. Joanne attempted to tap a pair of *glasses* and *hat*, but Kira pushed

Joanne's finger away and selected *lion* and *suspender* and *jeans* for *lion* (2.31) (DOMI). Joanne stretched out her arm to tap *hat* (2.33) (INDI), but Kira pushed her hand away (2.35) (FLCI). Joanne still grasped the iPad, pulling it towards her side: "I do it". She then tapped *purple* and *lion* (2.37) (FLCI) (AF). Kira moved the iPad towards herself (2.37) (FLCI) (AF). Then, Joanne said "no", slid the iPad to her side, and tapped *basketball jersey* for *lion*. Joanne had been persistently dominant; seemingly upset, Kira stood up and left the table (3.00) (OFF). I approached the table and said, "You guys need to play together. Friends play together, right?" (3.06).

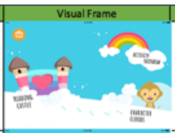
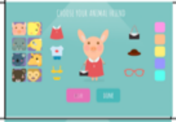
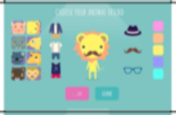
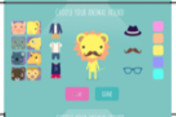
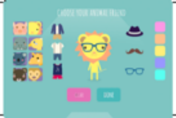
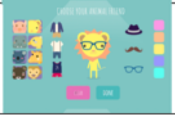
After I asked if they could play together, the mood of social behaviour and communication style instantly changed to positive. Kira came back, sat down, and tapped *moustache*. She even asked for Joanne's opinion, "Oh, how about this?" as she leaned towards Joanne's side and picked a pair of *glasses* (3.29) (COLL). Although Joanne kept the iPad on her side (4.12-4.39) (DOMI), Kira laughed and enjoyed watching Joanne's creation. At one moment, after Joanne decorated a *duck*, Joanne turned the screen towards Kira and then turned it back to her and said, "I do it (gentle)". (4.39) (COLL) (AF). When Kira lost interest and looked around the table (4.47) (OFF), Joanne pushed the iPad towards Kira to share (5.31) (COLL). Kira showed the screen to the researcher and made an effort to jointly play with her partner, "Ta da! Press this, right Joanne?" (6.03) (COLL). Without an answer, Joanne left the table (7.24) (OFF) and Kira kept playing in the avatar room (6.33). Suddenly, Joanne came back with a little cat toy to show and then left the table again (7.24) (OFF). Kira tapped on *duck*, *koala*, *lion*, *blue*, *hat*, etc. and played until the time was up.

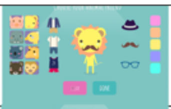
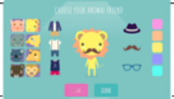
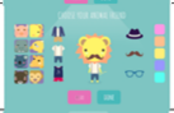
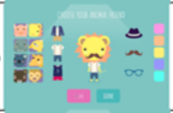
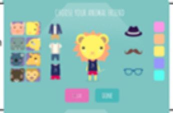
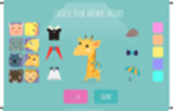
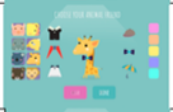
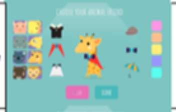
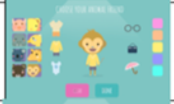
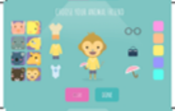
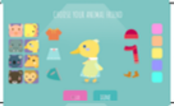
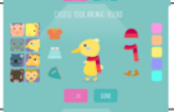
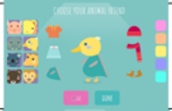
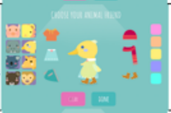
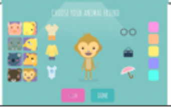
The two children showed fairly different styles of communication. Kira was inclined to express herself more verbally (e.g. asking for turns, asking for opinions), whereas Joanne expressed herself more physically (e.g. pushing hands, raising hands, etc.). However, occasionally, Joanne expressed herself in words: “I do it” (2.37), “I do it (gently)” (4.47). Kira and Joanne were able to express their feelings and opinions and some disagreements after all. During the second week, the social interaction was fairly collaborative at many moments, but in some troublesome moments, the children also presented FUSI, DOMI, ARGU, and FLCI while they were taking turns and selecting the items in the avatar room.

6.1.3 Example 3

The transcription below in Table 6.4 portrays Nora and Kylee’s interaction during the iPad time in Week 3 in Classroom 2. The children were at the stage of getting used to the idea of playing the literacy app after the reading time once a week.

Table 6.4. *Transcription from Week 3*

Time	Name	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additiona notes	Cognitive process	Social process	Language functions
2.03	Nora	(...)	Sits down		BGM	Already on the rhyming main page	PROC	INDI	
2.05	Kaylee	(...)	Sits down. Looks at the screen.		clicking SFX, BGM		PROC	INDI	
2.08	Nora	(...)	Taps the character room > pig > red dress		clicking SFX, BGM		PROC		
2.15	Kaylee	Not that. Press this.	Taps on lion		clicking SFX, BGM		PROC	FLCI	DA
2.15	Kaylee	Not that. Press this.	Taps on lion		clicking SFX, BGM		PROC	FLCI	DA
2.19	Nora	Which one?			clicking SFX, BGM		PROC	FUSI	Q
2.21	Kaylee	(...)	Taps the pair of glasses		clicking SFX, BGM		PROC	DOMI	
2.23	Nora	I want pink			clicking SFX, BGM		PROC	COLL	AF

2.24	Kaylee	(...)	Taps moustache		clicking SFX, BGM		PROC	DOMI	
2.25	Nora	I like lion			clicking SFX, BGM		PROC	COLL	AF
2.28	Kaylee	Ok.	Selects jeans and suspender for lion		clicking SFX, BGM		PROC	COLL	AN
2.32	Nora	((laughter))	Looks at the lion on the screen		clicking SFX, BGM		PROC	COLL	
2.39	Kaylee	(...)	Takes off moustache > Taps on glasses > hat > basketball jersey		clicking SFX, BGM		PROC	INDI	
2.44	Nora	(...)	Taps clear > giraffe > umbrella		clicking SFX, BGM		PROC	INDI	
2.51	Kaylee	No, no, no	Taps on bowtie > hat > black dress		clicking SFX, BGM		PROC	INDI	DA
2.58	Nora	(...)	Taps on blue > superman cape		clicking SFX, BGM		PROC	INDI	
3.01	Kaylee	Let's do... (XXX)	Picks monkey > yellow sweater and shorts > umbrealla > bag >glasses >stripe shirt > yellow sweater and shorts		clicking SFX, BGM		PROC	COLL	AF
3.35	Nora	We did already!	Taps umbrella > bag		clicking SFX, BGM		PROC	COLL	AF
3.45	Kaylee	(...)	Taps on duck > dress > scarf		clicking SFX, BGM		PROC	INDI	
3.46	Nora	Hmm... I wanna...			clicking SFX, BGM		PROC	INDI	AF
3.49	Kaylee	(...)	Taps on dinosuar outfit > dress		clicking SFX, BGM		PROC	COLL	
3.53	Nora	((Giggles)) duck!	Taps dress >scarf > boots > scarf >boots > hoodie > dinosaur > scarf > dress > boots		clicking SFX, BGM		PROC	COLL	AF
3.59	Kaylee	Ok. That's it! I want monkey!			clicking SFX, BGM		PROC	COLL	AF

When the teacher called their names, Nora and Kaylee held hands and came to the table. Nora sat down first (2.03) (INDI), followed by Kaylee, and they looked at the screen, which was on the rhyming day's main page (2.05) (INDI). Nora started to engage by tapping on the avatar room and the app items *pig* and *red dress*. Then, Kaylee disagreed with what Nora had chosen and made suggestions: “Not that. Press this” (2.15) (FLCI) (DA). To clarify the confusion, Nora asked, “Which one?” (2.19) (FUSI) (Q). In silence, Kaylee tapped the *pair of glasses* (2.21) (DOMI). Nora expressed her opinion: “I want pink” (2.23) (COLL) (AF). However, Kaylee might not have heard Nora and tapped the lion’s moustache instead (2.24) (DOMI). This time, Nora expressed, “I like lion” (2.25) (PROC) (AF), and Kylee positively responded with, “Okay.” Then she selected a pair of *jeans* and *suspenders* for the *lion* (2.28) (COLL) (AN). With heavy laughter, Nora looked at the lion on the screen (2.28) (COLL) (AF).

Keeping the iPad between them, Kaylee continued to decorate the avatar by taking off the lion’s *moustache*, and she tapped on *glasses*, *hat*, and *basketball jersey* (COLL) (INDI). Nora chose *clear* to reset and then tapped *giraffe* and *umbrella* (INDI). Expressing disagreement, “No, no, no,” Kaylee tapped *bowtie*, *hat*, and *black dress (2.51)*. Nora tapped *blue* and *superman cape* (2.58) (INDI). Then, the social processing mode changed to COLL, and Kaylee suggested “Let’s do (XXX)” (3.01) (AF). Nora responded, “We did already!” and tapped *umbrella* and *bag* (3.35) (COLL) (AF). Kaylee chose *duck* and then *dress* and *scarf* (3.45) (INDI). Kaylee thought deeply for a brief moment. She said, “I wanna…” and tapped *dinosaur outfit* and then *dress* (3.44) (INDI) (AF). Nora giggled and said aloud, “duck!” while tapping many icons in a row: *dress*, *scarf*, *boots*, *scarf*, *boots*, *hoodie*, *dinosaur*, *scarf*, *dress*, and *boots*. Kaylee had been watching Nora’s creation and suddenly shouted, “Okay. That’s it! I want monkey!” and tapped on *monkey*. They never tapped *done* to move on to another option but continued to enjoy creating and decorating the characters with a solid turn-taking the rest of the time.

Although the social interaction started with DOMI, the mode gradually changed to INDI and COLL later on. The two children were comfortable telling each other what they wanted, although it did not always translate to their preferences. They were very close friends, so I imagined their communication style would be similar if they had played with physical dolls or toys together.

6.2. Middle phase

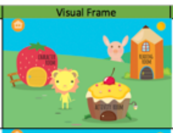
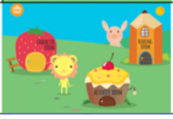
6.2.0 Preview

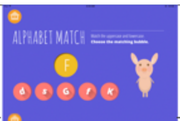
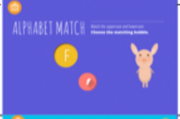
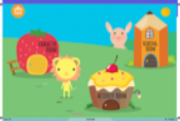
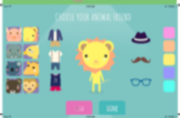
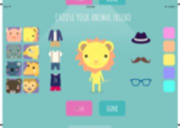
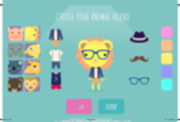
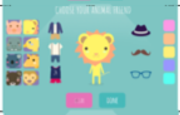
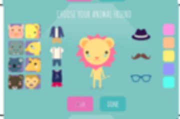
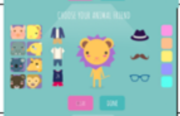
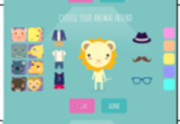
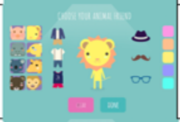
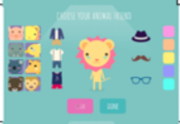
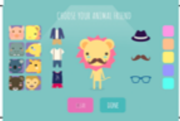
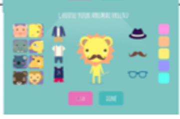
Overall, during the mid-phase, the children’s interactions were more socially collaborative and verbally expressive compared to during the beginning phase. Collaborative (COLL), individualistic (INDI), conflict (FLCI), or dominant (DOMI) behaviours were prevalent throughout. A greater variety of communications styles, including informative (I) and affectional (AF) ones, appeared when students expressed information, needs, and feelings. Some improvements upon the previous phase were apparent in that some of the children were capable of taking turns and yielding the iPad to their partners after verbal expression.

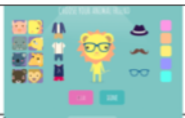
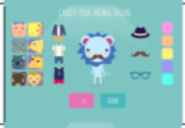
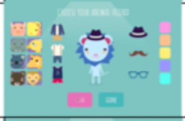
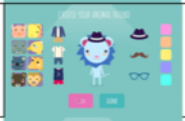
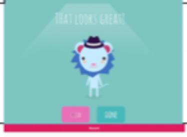
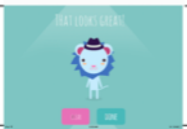
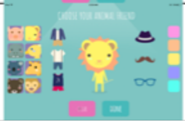
6.2.1 Example 1

The interaction between Mark and Zoe (Table 6.5) took place in Classroom 1 in Week 5. After the reading time, the children were excited to know that they would be playing on the iPad that day. All the children moved from the centre area to the table when their names were called.

Table 6.5 *Transcription from Week 5*

Time	ID	Spoken Words	Bodily conduct	Visual Frame	Sound Track	Additional	Cognitive process	Social process	Language functions
2.01	Mark	Strawberry	Gazes at the strawberry		clicking sound, BGM		PROC	INDI	AF
2.02	Zoe	(...)	Taps on the cupcake (activity room)		clicking sound, BGM		PROC	INDI	

2.03	Mark	(...) K!	Taps on the lion and the activity room. Taps K		This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase bubbles.		PROC	INDI	AF
2.04	Zoe	(...)	Scratches her head with left hand and taps on F and exits by tapping on the home button		That's right, uppercase F, and lowercase F		PROC	INDI	
2.06	Mark	Strawberry!	Taps on the strawberry (= character room)		clicking sound, BGM		PROC	INDI	AF
2.09	Zoe	(...)	Taps on the character room again		Let's choose your animal friend for today's adventure! clicking sound, BGM		PROC	INDI	
2.10	Mark	(...)	Taps between hat and glasses, nothing responds		clicking sound, BGM		PROC	INDI	
2.13	Zoe	Me. (...)	Rasises her right arm Taps on glasses and the jacket.		clicking sound, BGM	Turn-taking gesture	PROC	COLL	AF
2.17	Mark	(...)	Taps clear		clicking sound, BGM		PROC	INDI	
2.18	Zoe	(...)	Taps pink and orange		clicking sound, BGM		PROC	INDI	
2.20	Mark	(...)	Taps purple		clicking sound, BGM		PROC	INDI	
2.21	Zoe	(...)	Taps yellow		clicking sound, BGM		PROC	INDI	
2.22	Mark	(...)	Taps orange together		clicking sound, BGM		PROC	INDI	
2.23	Zoe	(...)	Taps pink > orange > pink		clicking sound, BGM		PROC	INDI	
2.24	Mark	(...)	Taps mastache		clicking sound, BGM		PROC	INDI	
2.26	Zoe	(...)	Taps orange		clicking sound, BGM		PROC	INDI	

2.28	Mark	(...)	Taps glasses > clear > moustache		clicking SFX, BGM		PROC	COLL	
2.30	Zoe	(...)	Taps blue		clicking SFX, BGM		PROC	COLL	
2.33	Mark	(...)	Taps hat		clicking SFX, BGM		PROC	COLL	
2.35	Zoe	(...)	Attempts to tap giraffe		clicking sound, BGM		PROC	COLL	
2.36	Mark	(...)	Taps done		Ta-da. That looks great! Let's start today's adventure.		PROC	COLL	
2.38	Zoe	(...)	Taps on the recording bar				PROC	INDI	
2.42	Mark	(...)	Taps back to the app				PROC	INDI	
2.48	Zoe	(...)	Clear > clear > lion				PROC	INDI	

Mark and Zoe showed individualistic than dominant social behaviours because the iPad was positioned in between them at all times. Mark sat down first and gazed at the strawberry, which is the avatar room, but did not tap it right away (2.01) (INDI). Zoe tapped on the cake, the activity room, without any hesitation (2.02) (INDI). Mark then tapped on the lion in the main room while waiting for the activity room to load and then shouted "K!" (2.03) (AF), tapping the *lowercase k* (X) that did not match the *uppercase K* (INDI). Zoe scratched her head with her left hand, tapped the correct response, *lowercase f* (O), then exited the activity room while the narrator repeated the correct answers (2.03) (INDI).

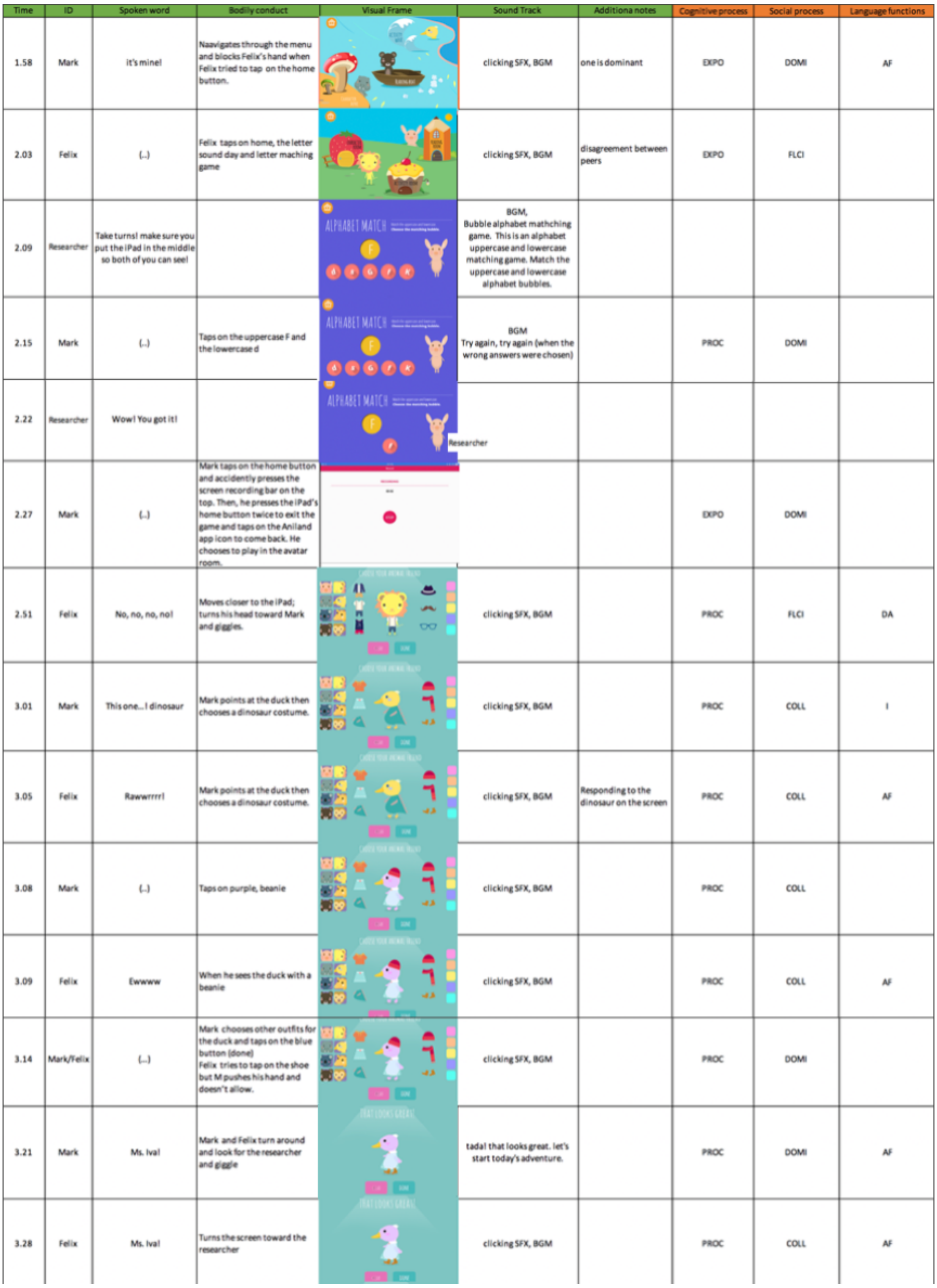
In the beginning, Mark wanted to tap on the strawberry, which is the avatar room, and he finally did it this time, shouting aloud, "Strawberry!" (2.06) (INDI). Zoe tapped again on the avatar room (2.06) (INDI). When Mark tapped on the empty space between *hat* and *glasses* (2.10) (INDI), nothing responded. Zoe raised her arm and said “me”, exhibiting a collaborative manner and letting Mark know that she wanted a turn; then she tapped *glasses* and *jacket* (2.13) (COLL). Mark tapped *clear,* which turned it to *lion* by default (2.17) (INDI). They changed colours by taking fairly good turns from here on – Zoe tapped *pink* and *orange* (2.18) (COLL), Mark tapped *purple* (2.20) (COLL), Zoe tapped *yellow*, and Mark and Zoe together tapped *orange* (2.22) (COLL). They did not have any conversation but continued solidly taking turns – Zoe tapped *pink*, *orange*, and *pink*. Mark tapped *moustache*. Zoe tapped *orange*. Mark tapped *glasses*, *clear*, and *moustache*. Zoe tapped *blue*. Mark tapped *hat*. Then, Mark did not give Zoe a turn when she tried to tap *giraffe* and tapped *done*. Zoe by accident tapped the recording bar and the recording screen appeared. Mark tapped back to the app, and Zoe tapped *clear* to reset the character to *lion*. They stayed in the avatar room the rest of the time, exhibiting a similar pattern of turn taking: one would tap one or two items and then give the other a chance to play.

This example shows that the two children were not verbally expressive but maintained the turn-taking persistently and enjoyed creating the avatars. The social processing started as INDI for both of the children in the beginning because they shared the iPad but did not exhibit any joint meaning-making at that point. Then, they changed to COLL mode when they found rhythms for each other’s tapping and did not interrupt each other while taking turns and decorating avatars.

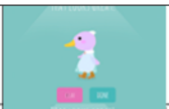
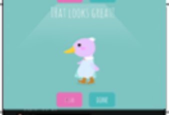
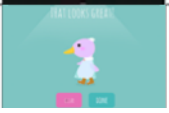
6.2.2 Example 2

The transcription below in Table 6.6 illustrates the children’s interaction during the iPad time in the sixth week in Classroom 1. All children were reading books until I finished setting up the equipment. The teachers called their names in pairs, and Mark and Felix sat down quietly in front of the iPads

Table 6.6. *Transcription from Week 6*



Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additiona notes	Cognitive process	Social process	Language functions
1.58	Mark	it's mine!	Naavigates through the menu and blocks Felix's hand when Felix tried to tap on the home button.		clicking SFX, BGM	one is dominant	EXPO	DOMI	AF
2.03	Felix	(..)	Felix taps on home, the letter sound day and letter maching game		clicking SFX, BGM	disagreement between peers	EXPO	FLCI	
2.09	Researcher	Take turns! make sure you put the iPad in the middle so both of you can see!			BGM, Bubble alphabet mathching game. This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase alphabet bubbles.				
2.15	Mark	(..)	Taps on the uppercase F and the lowercase d		BGM Try again, try again (when the wrong answers were chosen)		PROC	DOMI	
2.22	Researcher	Wow! You got it!			Researcher				
2.27	Mark	(..)	Mark taps on the home button and accidently presses the screen recording bar on the top. Then, he presses the iPad's home button twice to exit the game and taps on the Aniland app icon to come back. He chooses to play in the avatar room.				EXPO	DOMI	
2.51	Felix	No, no, no, no!	Moves closer to the iPad; turns his head toward Mark and giggles.		clicking SFX, BGM		PROC	FLCI	DA
3.01	Mark	This one... I dinosaur	Mark points at the duck then chooses a dinosaur costume.		clicking SFX, BGM		PROC	COLL	I
3.05	Felix	Rawwrrrr!	Mark points at the duck then chooses a dinosaur costume.		clicking SFX, BGM	Responding to the dinosaur on the screen	PROC	COLL	AF
3.08	Mark	(..)	Taps on purple, beanie		clicking SFX, BGM		PROC	COLL	
3.09	Felix	Ewwww	When he sees the duck with a beanie		clicking SFX, BGM		PROC	COLL	AF
3.14	Mark/Felix	(...)	Mark chooses other outfits for the duck and taps on the blue button (done) Felix tries to tap on the shoe but M pushes his hand and doesn't allow.		clicking SFX, BGM		PROC	DOMI	
3.21	Mark	Ms. Ival	Mark and Felix turn around and look for the researcher and giggle		tada! that looks great. let's start today's adventure.		PROC	DOMI	AF
3.28	Felix	Ms. Ival	Turns the screen toward the researcher		clicking SFX, BGM		PROC	COLL	AF

3.29	Mark	Ms. Ival	Both Mark and Felix turn toward to the left where R is		clicking SFX, BGM		PROC	COLL	AF
3.35	Researcher	(...)	Walking toward Mark and Felix		clicking SFX, BGM	M turns the screen toward R			
3.37	Felix	(...)	Felix looks at the researcher when the screen turns black		Tada! That looks great!	Screen up and down but student is capable of fixining it by pressing home button. F looked for R to tell the screen turned black.	PROC	INDI	
3.39	Mark	(...)	Taps the screen and comes back to the app		clicking SFX, BGM		PROC	INDI	

In the middle phase, during Week 6, the children showed some equal and some dominant behaviours. When they started the app, Felix tapped into the rhyming cloud, but Mark pressed the home button to exit while expressing his feelings— “It’s mine!” (AF)—wanting to own the iPad (2.03), which was coded as a conflict (FLCI). After I told them to put the iPads in the middle and to take turns (2.09), they shared the iPad, but Mark was dominant (DOMI) over Felix in playing the games in the activity room. Then, he accidently pressed the screen recording bar and figured out how to return to the app by himself (2.27). Although this was a dominant action, Mark managed to solve the issue and came into the avatar page. I coded the social process as collaborative (COLL) when the children took turns and shared the iPad equally in the avatar room (2.51). Felix showed conflict (FLCI) (“No, no, no, no!”) by laughing while looking at Mark; this could be evaluated as more of a joyful disagreement than a serious one. Mark explained that the image on the screen was that of a dinosaur when Felix changed the duck’s costume to that of a dinosaur (3.01); Felix responded by roaring (3.05) (COLL).

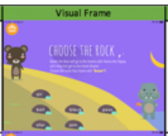
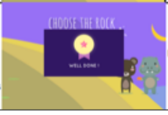
Later on, Mark changed the duck to pink, and Felix responded by saying, “Ewwwwww”; both were coded as expressions of feelings (i.e., AF). There were moments in the middle phase when Mark and Felix each tried to dominate (DOMI) the iPad (3.01), as Mark wanted to choose blue for the duck, and Felix wanted to choose another outfit (i.e., one with a pair of boots). Soon, the social process turned into a collaborative (COLL) one, as both children began to call me to share the avatar they had created on the screen (3.21). When Mark (3.28) and Felix (3.29) alternatively called my name, they expressed their desire to share the purple duck with a dress on the screen (COLL).

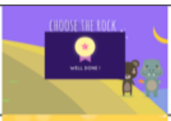
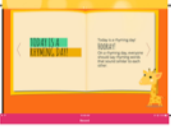
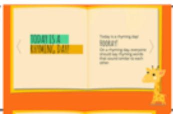
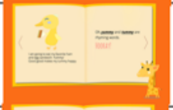
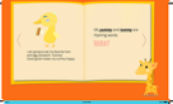
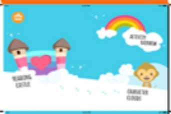
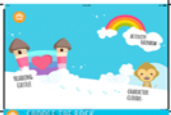
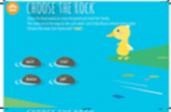
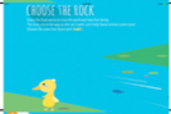
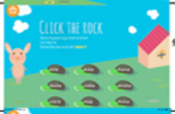
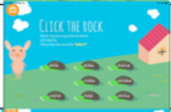
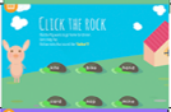
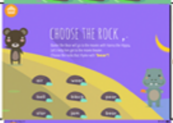
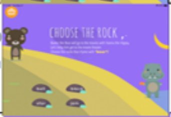
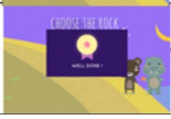
In this example, the two children showed non-collaborative and dominant behaviours in the beginning. They stayed in the avatar room for most of the duration. No significant pattern was found in social behaviour. Other than positive collaborative (COLL) behaviour, conflict (FUSI), dominant (DOMI), or individualistic (INDI) behaviours were prevalent throughout. Their communication style included informative (I) and affectional (AF) styles to express information, needs, and feelings.

6.2.3 Example 3

The example below (Table 6.7) illustrates Karen and Marion's interaction while engaging with Aniland during the sixth week in Classroom 1. The iPad was not reset to the main page in the beginning, and they picked up from the third rhyming activity quiz. The previous team in Classroom 2 that had played with this iPad had left off there.

Table 6.7. *Transcription from Week 6*

Time	Name	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additiona notes	Cognitive process	Social process	Language functions
3.03	Karen	(...)	Taps on the app air (O) > bear (O) > wear (O) > care (O)		BGM, air, bear, wear, care	Page was on the third question of the rhyming activity, continued from the previous team	LA	DOMI	
3.06	Marion	(...)	Taps on black (X)	CHOOSE THE ROCK	BGM		PROC	INDI	
3.07	Karen	(...) Yes!	Taps pear and keep tapping on the screen until hearing the narration. Shouts when the narration starts		BGM, pear, air, wear, care, pear, bear. Bravo! Now Hannah can go to the movies with Baxter.	iPad is toward herself	EXPO	DOMI	AF

3.16	Marion	(...)	Crosses her arms		You've earned today's award! Well done!		PROC	FLCI	
3.18	Karen	(...)	Accidently exits the app and re-enters. Goes into the rhyming reading room. Pulls the iPad towarfd herself.				PROC	DOMI	
3.26	Marion	(...)	Looks elsewhere		Today is a rhyming day! Woohoo!		PROC	OFF	
3.28	Karen	(...)	Taps the recording bar by exident and re-enters. Back to the letter sound reading room.				PROC	DOMI	
3.34	Marion	(...)	Bitting her nails		Today is a rhyming day! Woohoo!		PROC		
2.22	Karen	(...) Look here	Taps through the pages and stops at the duck page. Looks at Marion's face		clicking SFX, BGM		PROC	COLL	AF
3.40	Marion	(...)	Looks at Karen's face		clicking SFX, BGM		PROC	COLL	
3.48	Karen	(...)	Exits the reading room		clicking SFX, BGM		PROC	COLL	
3.49	Marion	(...)	Taps on the rainbow activity room		clicking SFX, BGM		PROC	COLL	
4.53	Karen	(...) Yes! We did it!	Taps cat (O), hat (O), car (X), jet (X), mat (O), fat (O) Raises her arms and looks at Marion		Choose the rocks that rhyme with 'rat.' Remember, rhyming words sound similar, cat, hat, mat, fat		EXPO	COLL	AF
4.14	Marion	(...)	Raises both of her arms		Cat, hat, bat, fat, mat. Great job! You helped Diana the Duck cross the pond safely and meet her family.		EXPO	COLL	AF
4.18	Karen	(...)	Pushes the iPad to Marion		Pat the Pig wants to go home for dinner. Let's help Pat choose the rocks that rhyme with 'lake'. Remember, rhyming words sound similar!		EXPO	COLL	
4.21	Marion	(...)	Taps bake (O)		BGM, bake		EXPO	COLL	
4.25	Karen	(...)	Taps cake (O) and snake (O)		BGM, cake, snake, Bake, cake, snake. Wonderful! You helped Pat home safe for dinner.		EXPO	COLL	
4.32	Marion	(...)	Taps care (O)		BGM, Baxter the bear will go to the movies with Hanna the hippo. Let's help him get to the movie theater. Choose the rocks that rhymes with 'bear'! Remember, rhyming words sound similar!		EXPO	COLL	
4.38	Karen	(...)	Taps wear (O) > black (X) > air (O) > star (X) > pear (O) > bear (O) and claps hands when the virtual reward pops up		Now, Baxter the bear can go to the movies with Hanna the hippo		EXPO	COLL	
4.57	Marion	(...)	Clap hands		Well done! You earned a medal! Woohoo!	Stays in the character room in the rest of the time	EXPO	COLL	

Karen sat down first and started to guess the rest of the third question of the rhyming activity: they tapped all the correct answers (*air*, *wear*, and *care*) consecutively (3.03) (INDI). Marion tapped an incorrect response, *black* (3.06) (INDI). Pulling the iPad towards herself, she tapped the last correct answer, *pear,* and continued to tap the screen until hearing the narration. Then she shouted "Yes!" when the virtual medal appeared (3.07) (DOMI) (AF). Marion had a dissatisfied look on her face and crossed her arms (3.16) (FLCI). Karen dominantly played: She exited the app, re-entered, tapped the rhyming reading room, and pulled the iPad even closer to herself. After losing interest in participating, Marion looked elsewhere (3.26) (OFF).

Karen tapped the recording bar unintentionally and re-entered the app. She returned to the reading room of letter sound (3.28) (DOMI). Marion just bit her nails and did not participate (3.34) (OFF). Karen attempted to get Marion's attention by saying, "Look here," and she showed the duck page of the rhyming book (3.37) (COLL). Marion gazed at Karen's face briefly (3.40) (COLL). Karen exited the reading room (3.49) (COLL). Marion tapped the rainbow activity room, specifically the rhyming games, and started from the third question of that day (4.53) (COLL). Karen first tapped two correct responses (*cat* and *hat*), a wrong one (*car*), and three correct ones in a row (*jet*, *mat*, and *fat*). Then she shouted, "Yes! We did it!" while raising both of her arms to show contentment. Marion also raised her arms and looked at Marion, smiling. I noticed that Karen counted her achievement as teamwork, and Marion expressed happiness when her partner finished the task.

The two children's collaborative social interaction became more apparent at this moment. Karen pushed the iPad towards Marion to take a turn (4.18) (COLL). Marion tapped the correct answer, *bake* (4.21) (COLL). Then, Karen chose the rest of the correct responses, *cake* and *snake* (4.25) (COLL). For the next question, Marion first tapped the correct answer, *care*. Then, Karen tapped a correct answer (*wear*), an incorrect one (*black*), a correct one (*air*), an incorrect one (*star*), and two correct ones (*pear* and *bear*). Then she clapped her hands when the virtual reward popped up (4.38) (INDI). Marion clapped her hands to cheer them on for finishing the game and attaining the award (4.57) (COLL). Afterwards, they chose to stay in the avatar room and played fairly well together in terms of taking turns; however, Karen usually spent a longer time decorating the characters, and she spent more time in the rhyming room, as shown in this example.

This mid-phase example initially portrayed INDI and DOMI interactions. The less active child, Marion, demonstrated some FLCI and OFF because she lost interest due to the less frequent chance to play. This is compared to Karen, who pulled the iPad towards herself in the beginning. They remained silent, except for three occasions that included cheering: “Yes” (3.07) and “Yes! We did it!” (4.53). They also explained what was on the screen: “Look here” (3.37). However, the silence did not mean that they were not interacting or communicating well. Turn-taking was quite smooth without having to verbally express “My turn.”

6.3 End phase

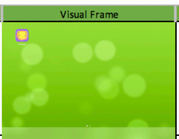
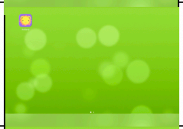
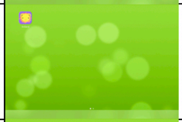
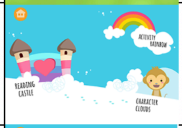
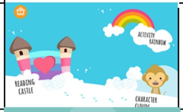
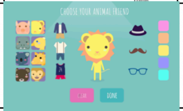
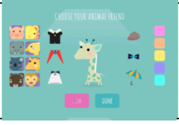
6.3.0 Preview

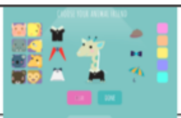
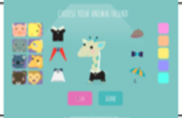
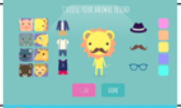
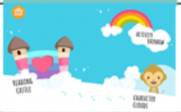
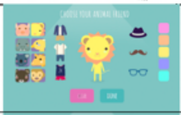
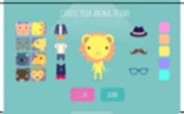
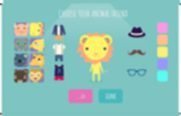
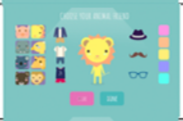
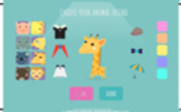
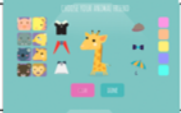
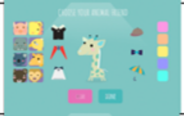
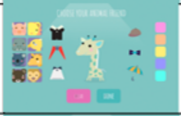
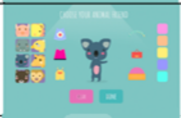
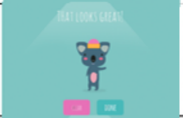
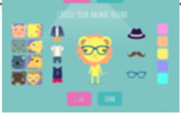
In the final phase, the children engaged in conversation more frequently than in the beginning and middle phases. They exhibited more calmness and utilized language in various ways, such as communicating affection (AF), repeating (RP), informing (I), and answering (AN). Occasionally moments of DOMI, INDI, and FUSI were spotted, but these were resolved in a quick manner, and children practised thorough, consistent turn-taking and respect for each other’s choices. Additionally, cases were increasingly seen of children complimenting each other when their partners got answers correct.

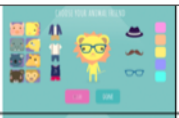
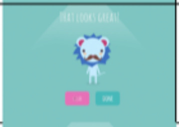
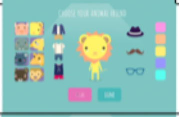
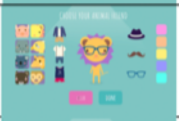
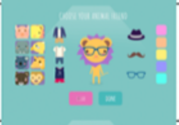
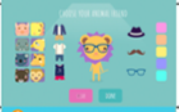
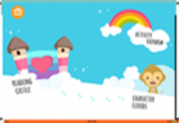
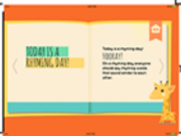
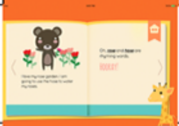
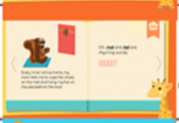
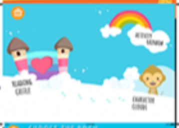
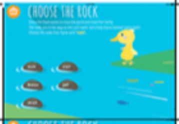
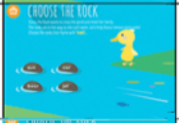
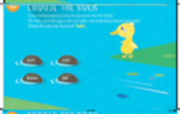
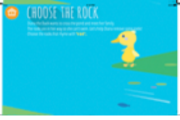
6.3.1 Example 1

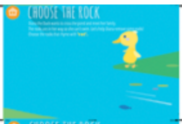
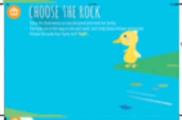
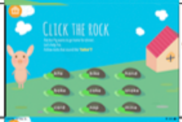
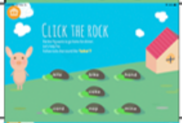
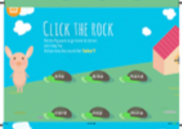
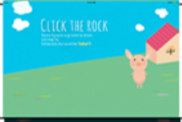
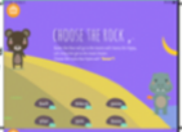
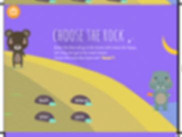
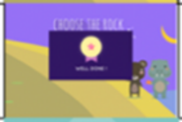
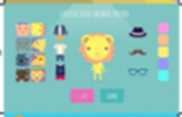
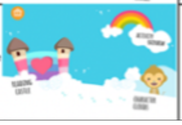
The following example shown in Table 6.8 took place in Classroom 1 in Week 8. The teacher was reading *Hondo and Fabian* by McCarty (2007), a heart-warming story about the two good friends, a dog and a cat, spending a day separately and joyfully meeting again at the end. This was a book about animals so I felt it somewhat connected to the Aniland contents. After the reading time, the children were placed in groups of two or three and sat down at the tables.

Table 6.8. *Transcription from Week 8*

Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
Bridget	6.40	(...)	Sits down				PROC	INDI	
Oliver	6.41	I will sit here. We got the green iPad.	Sits down				PROC	INDI	I
Researcher	6.49	That's right. Is green your favourite colour?							
Oliver	6.25	Yes! Let me hang my vest	Hangs it at the back of the chair				PROC	INDI	AN
Researcher	6.55	good job!							
Oliver	7.06	Hello! (to Briget)! The reading castle! Ah! Look ! Look! Look, Janice (teacher's name)!	Taps the character room.	 ACTIVITY RAINBOW READING CASTLE CHARACTER CLOUDS	BGM	He talked as if he wanted to enter the reading castle, but selected the character room	PROC	INDI	AF
Teacher 1	7.09	Aha!	Looks at the screen	 ACTIVITY RAINBOW READING CASTLE CHARACTER CLOUDS	BGM				
Oliver	7.20	I get you mouse. I want lion	Taps Koala > purse > Ok on the koala page Picks the lion	 CHOOSE YOUR ANIMAL FRIEND CLEAR DONE	Let's choose your animal friend for today's adventure!	Keeps the iPad in the middle	PROC	INDI	AF
Bridget	7.26	(...)	Taps blue lion > giraffe > blue giraffe	 CHOOSE YOUR ANIMAL FRIEND CLEAR DONE	clicking sound, BGM		PROC	INDI	

Oliver	7.33	((Scream)) Look!	Taps hat > dress for the giraffe		clicking sound, BGM		PROC	COLL	AF
Bridget	7.39	((laughter))			Ta-da. That looks great! Let's start today's adventure.	Responds to Oliver with a laughter	PROC	COLL	AF
Oliver	7.56	Is this broken? (in Cantonese) This is lion (in Cantonese)	Taps Lion many times until it changes Taps moustache		BGM		PROC	INDI	I
Bridget	8.22	(...)	Taps on done > main room > reading room> main room		Tada! That looks great! Let's start today's adventure!		PROC	INDI	
Oliver	8.35	Look! Lion! This is lion!	Taps the character room and calls the researcher		clicking sound, BGM	Moves iPad toward himself	PROC	DOMI	I
Researcher	8.38	That's right			clicking sound, BGM				
Bridget	8.42	(...)	Looks elsewhere		clicking SFX, BGM		PROC	OFF	
Teacher 2	8.56	Oliver, are you sharing?			cat, hat, bat, fat, mat				
Bridget	8.59	Giraffe!	Taps on giraffe		clicking SFX, BGM	Moves the iPad to the middle	PROC	INDI	I
Researcher	9.02	What's giraffe's gonna wear?			Let's start today's adventure.				
Bridget	9.06	Blue!	Taps blue		clicking SFX, BGM		PROC	COLL	AN
Oliver	9.11	Blue, yellow, orange			clicking SFX, BGM		PROC	COLL	AN
Bridget	9.13	Maybe this. Koala, hippo, koala, hippo	Taps on koala > hippo > koala > hippo > done Says the animals that Bridget selects on the tablet		clicking SFX, BGM		PROC	INDI	AF
Oliver	9.16	koala? I am not finished			Ta-da. That looks great! Let's start today's adventure.		PROC	FLCI	AF
Bridget	9.32	(...)	Taps on lion > blue > glasses > moustache >		BGM, bake, cake, snake...		PROC	INDI	

Oliver	9.41	Bridget plays too much			clicking SFX, BGM		PROC	ARGU	DA
Researcher	9.43	ok, do another one.	To Oliver		Ta-da. That looks great! Let's start today's adventure.				
Oliver	9.46	I want yellow hair and orange hair	Taps lion		clicking SFX, BGM		PROC	COLL	AF
Bridget	9.51	(...)	Yellow > glasses > purple hair		clicking SFX, BGM	Picks yellow for Oliver and then changes to purple	PROC	INDI	
Oliver	9.58	I want other colour!			clicking SFX, BGM		PROC	ARGU	AF
Teacher 1	10.02	Then, you should tell her that. She can't read your mind.			clicking SFX, BGM				
Oliver	10.08	I want to play something else. Castle!	Taps the rhyming castle		clicking SFX, BGM		PROC	INDI	AF
Bridget	10.18	(...)	Taps out of the reading room		Today's a rhyming day! Hooray!		PROC	DOMI	
Oliver	10.22	(...)	Goes back into the castle and taps through all the pages quickly		I love my rose garden. I am going to use the hose to water my roses. Oh, rose and hose are rhyming words. Hooray!		PROC	DOMI	
Teacher 1	10.27	(...)	Ties Bridget's hair		Every time I arrive home, my mom tells me to wipe the shoes on the mat and hang my hat on the peg behind the door. Oh, mat and hat are rhyming words! Hooray!				
Bridget	10.29	(...) There!	Looks elsewhere Shouts and points at the activity rainbow when the page turns to the main page		clicking SFX, BGM	The screen turns to the main page	EXPO	COLL	AF
Oliver	11.06	(...)	Taps into the rhyming game. Taps bat (O) > cat (O) > hat (O) > fat (O) > bear (X)		Choose the rocks that rhyme with 'rat.' Remember, rhyming words sound similar		EXPO	INDI	
Bridget	11.22	(...)	Moved her head close to the iPad and taps mat (O)				LA	INDI	
Teacher 2	11.23	Good taking turns guys. Good job!			BGM				
Oliver	11.28	Hey Bridget here. I am done!	Pushes the iPad to Bridget		Great job!		EXPO	COLL	AF

Teacher 2	11.31	We have to wait till everyone's done to get the sticker, ok?		 CHOOSE THE ROCK	Great job!				
Bridget	11.39	(...)	Taps on the duck	 CHOOSE THE ROCK	You helped Diana the Duck cross the pond safely and meet her family.		EXPO	INDI	
Teacher 2	11.45	Show me how you do this!	Sits next to the kids.	 CLICK THE ROCK	Pat the Pig wants to go home for dinner. Let's help Pat choose the rocks that rhyme with 'lake'. Remember, rhyming words sound similar!				
Bridget	11.49	(...)	Taps snake and bake	 CLICK THE ROCK	BGM, snake, bake		LA	INDI	
Oliver	11.54	(...)	Taps cake	 CLICK THE ROCK	BGM, cake		LA	INDI	
Oliver/Bridget	11.57	(...)	Keeps tapping on pig together	 CLICK THE ROCK	BGM, bake, cake, snake. Wonderful! You helped Pat home safe for dinner.		EXPO	COLL	
Oliver	12.02	(...)	Activates siri by accident				PROC	OFF	
Teacher	12.04	(...)	Closes the siri tab	CLICK THE ROCK					
Bridget	12.08	(...)	Scraches her hair with right hand and tap with left on air (O), care (O), wear (O)	 CHOOSE THE ROCK	BGM, air, care, wear	Good at taking turns	LA	COLL	I
Oliver	12.23	(...)	Taps bell (X) bear (O) pear (O)	 CHOOSE THE ROCK	Air, wear, care, pear, bear. Bravo! Now Lawrence can go to the movies with Baxter.	Good at taking turns	EXPO	COLL	
Researcher	12.47	You guys got the medal!	Checks every table what pages the childrens are on	 CHOOSE THE ROCK WELL DONE!	You've earned today's award! Well done!				
Oliver	12.51	No more lion!	Goes back to the character room and taps out		clicking SFX, BGM		EXPO	INDI	
Researcher	12.56	No more lion?			BGM				
Oliver	12.57	No more lion sticker.			BGM		PROC	INDI	AN
Researcher	12.58	Oh, you want different stickers			BGM		PROC	INDI	
Oliver	13.06	(...)	Nods and hands the tablet to the researcher.		BGM	The end of the session	PROC	INDI	

When their names were called, Bridget sat down first (6.40) (INDI) and then Oliver sat down: "I will sit here. We got the green iPad". He said this with a pleasant facial expression (6.41) (INDI). I said, "That's right. Is green your favourite colour?" (6.49) (INDI). He answered, hanging his vest on the back of the chair, "Yes! Let me hang my vest" (6.25) (INDI) (AN). Oliver was friendly to his partner, greeting her first, "Hello! [to Bridget] The reading castle! Ah! Look! Look! Look, Janice [teacher]!" He pointed at the castle (7.06) (PROC) (AF). Before picking his favourite, *lion*, Oliver tapped *koala* and told Bridget, "I get you *mouse*". (7.20) (INDI) (AF). Because the two had been partners prior to this, Oliver seemed to remember that Bridget's favourite character was the koala, despite the fact that he mistakenly said "mouse" instead. Bridget quietly took her turn and chose *lion*, *giraffe*, and *blue* (7.26) (INDI). Oliver added *hat* and *dress* for the giraffe and screamed, "Look!" (7.33) (COLL) (AF). Bridget let out happy laughter at the giraffe that Oliver had created (7.39) (COLL).

At one point, Oliver asked in Cantonese, "Is this broken?" while tapping on *lion.* The iPad responded slowly, and when he saw the lion on the screen, he said, "This is lion" in Cantonese (7.56) (INDI) (I). Bridget tapped on *done*, the rhyming main room, and the reading room, then exited the reading room and went back to the rhyming main room (8.22) (INDI). Then, Oliver pulled the iPad towards himself (8.35) (DOMI) and chose the avatar room again while calling out, "Look! Lion! This is lion!" (AF). I responded, "That's right!" (8.38), but Bridget seemed to have lost interest and looked elsewhere (8.42) (OFF). One of the teachers asked Oliver, "Are you sharing?" (8.56). Then Bridget moved the iPad to the middle and tapped *giraffe,* shouting, "Giraffe!" (8.59) (INDI). I asked Bridget, "What's the giraffe going to wear?" She answered, "blue!" and chose *blue* (9.06) (AN). Oliver also answered: "Blue, yellow, orange" (9.11) (AN). Bridget said, "Maybe this", and tapped on *koala*, *hippo*, *koala*, *hippo*, while speaking the names aloud. Finally, she tapped *done* (9.13) (AF). With a dissatisfied tone, Oliver said, "Koala? I am not finished" (9.16) (FLCI). Bridget tapped *lion*, *blue*, *glasses*, and *moustache* (INDI) (9.32). Oliver complained and disagreed with the fact that he had less time to engage: "Bridget plays too much" (9.41) (ARGU) (DA). I suggested, "Ok, do another one". He started to create another one (9.43).

Oliver tapped *lion* and then said aloud, "I want yellow hair and orange hair" (9.46) (COLL). Bridget listened to Oliver's request to tap *yellow* first and then changed to what she preferred: glasses and purple hair (9.51) (COLL). Angrily, Oliver shouted, "I want other colour!" (9.58) (ARGU). A teacher was passing by and told him, "Then you should tell her that. She can't read your mind" (10.02), encouraging better communication with his partner. Oliver responded, "I want to play something else. Castle!" and tapped the reading castle that led to the rhyming book (10.08) (INDI) (AF). However, Bridget exited the reading room right away without asking Oliver (10.22) (DOMI). Oliver re-entered the reading room and tapped through the pages until the squirrel showed (10.22) (DOMI). Collaboration and communication did not result in any fruitful progress in the reading room.

Social interaction and collaboration enhanced after they started to play the rhyming games. Bridget pointed and shouted, "There!" (10.29) (COLL) (AF), and Oliver tapped the rhyming castle and then tapped correct responses – *bat*, *cat*, *hat*, and *fat* – except *bear* (11.06) (COLL). Bridget moved her face close to the screen and tapped the correct answer, *mat*. The teacher praised their teamwork: "Good taking turns, guys. Good job!" Oliver pushed the iPad towards Bridget: "Hey Bridget, here. I am done!" (11.28) (CALL) (AF). The teacher stopped Oliver from leaving the table: "We have to wait till everyone's done to get the sticker, ok?" (11.31). Meanwhile, Bridget was tapping the duck many times to move on to the next quiz (11.49) (INDI).

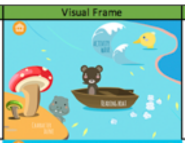
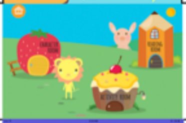
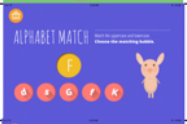
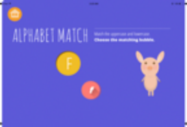
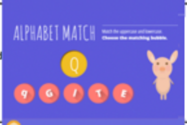
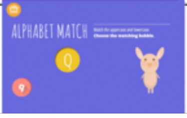
The teacher encouraged the children's engagement: "Show me how you do this!" (11.45). Bridget tapped two correct answers in a row: *snake* and *bake* (11.57) (INDI). Oliver immediately tapped the last correct one, *cake* (11.54) (COLL). As they were listening to the narration, they both tapped on the screen and accidently activated Siri (12.02) (OFF). After the teacher helped close Siri, Bridget tapped the correct responses on the third quiz without hesitation – tap with her left hand on *air* (O), *care* (O), and *wear* (O). Oliver got the first one wrong, *bell*, but guessed the rest correctly *bear* and *pear* (12.23) (COLL). After attaining the virtual medal, Oliver tapped the avatar room again and said "No more lion!" when he saw the lion, the default avatar (12.51) (INDI). I was surprised to hear that he did not want his favourite lion anymore and asked, "No more lion?" (12.51). He meant he wanted other stickers but "no more lion stickers". He handed me the tablet (13.06). I gave him a giraffe sticker, and then other children at the table came to me and asked for stickers.

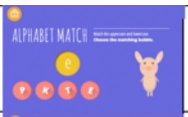
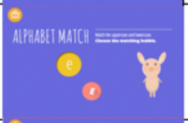
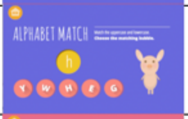
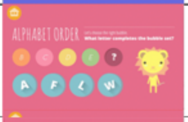
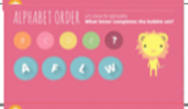
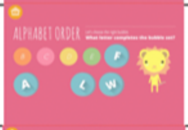
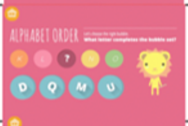
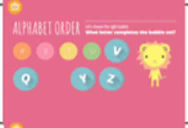
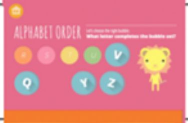
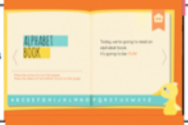
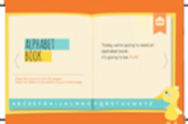
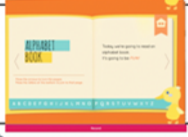
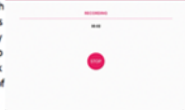
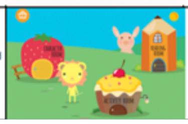
The Week 8 communication style was quite vibrant because Oliver was expressive about what he wanted and told his partner his opinions. There was no major trouble except when Oliver complained that Bridget spent more time on her turn than usual. The conflict lasted only for a brief time, and they engaged in thorough consistent turn-taking in the avatar room and the activity room, respecting each other's choices. They did not make many mistakes in the activity room, showing an increase in instance of literacy acquisition, and they complemented each other by tapping on the answers that they were sure of and giving one another turns. The teacher's guidance and involvement with the two children made a difference in heightening their social interactions, communication, and focus in this example.

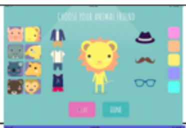
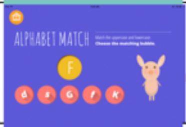
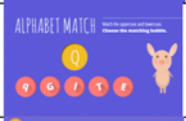
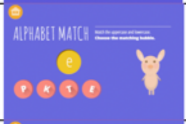
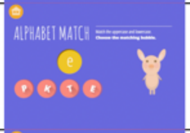
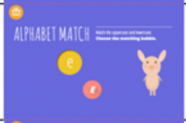
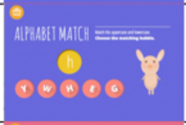
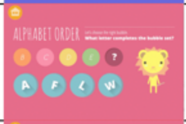
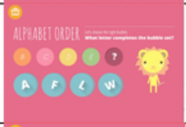
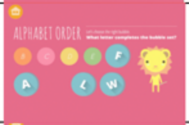
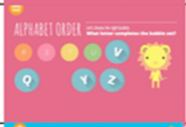
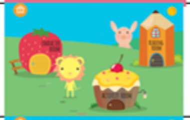
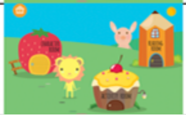
6.3.2 Example 2

The transcription below in Table 6.9 portrays Arron and Mila’s interaction in the eighth week in Classroom 2. The children participated in a dancing activity. After I finished setting up the equipment, I went to the centre area and sat down with the children. In the past few weeks, the children visited the reading rooms less than the avatar room and avatar room. Therefore, I showed them how I navigated to the rhyming room and read the giraffe page: “I am super excited because I am going to bake a cake today. Oh, ‘bake’ and ‘cake’ are rhyming words. Hooray!” I encouraged them to find this book and read it. The teacher called out the children’s names and had them sit down.

Table 6.9. *Transcription from Week 8*

Time	ID	Spoken Words	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
10.10	Arron	(..)	Taps the alphabet grassland		clicking sound, BGM		PROC	INDI	
10.14	Mila	(..)	Tries to tap chracter room		clicking sound, BGM		PROC	INDI	
10.16	Arron	(..)	Taps alphabet activity room. Pushes Mila’s hand away		This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase bubbles.		PROC	DOMI	
10.19	Mila	F, f!	Taps lowercase f (O)		That’s right, uppercase F, and lowercase F		LA	INDI	I
10.20	Arron	Good job. My turn Oh yeah!	Thumbs up to Mila Pulls the iPad toward himself and chooses lowercase q (O) Raises his both arms		clicking sound, BGM		EXPO	COLL	AF
10.34	Mila	I will do it!	Taps lowercase q (O)		That’s right, uppercase Q, and lowercase q		LA	COLL	AF

10.36	Arron	(..) E, e!	Pushes the iPad to Mila points at the answer	 ALPHABET MATCH	clicking sound, BGM		EXPO	TUTO	I
10.43	Mila	(..)	Taps lowercase e, smiles and pushes the iPad to Arron	 ALPHABET MATCH	That's right, uppercase E, and lowercase e		EXPO	COLL	
10.50	Arron	H	Taps H quickly and hands the iPad to Mila	 ALPHABET MATCH	That's right, uppercase H, and lowercase		EXPO	COLL	I
11.02	Mila	(..)	Taps the screen till the next question appears. Taps L	 ALPHABET ORDER	This is an alphabetical order game. Let's put the bubbles in alphabetical order.		EXPO	INDI	
11.09	Arron	No, no, F	Advises Mila	 ALPHABET ORDER	clicking sound, BGM		EXPO	TUTO	I
11.13	Mila	(..)	Taps F	 ALPHABET ORDER	That's correct. B, C, D, E, F		EXPO	COLL	
11.16	Arron	My turn. M. Yay! Your turn!	Drags the iPad toward himself Taps M Raises his both arms Pushes the iPad to Mila	 ALPHABET ORDER	BGM		EXPO	COLL	AF
11.37	Mila	(..)	Taps Q and then V (O)	 ALPHABET ORDER	You got it! K, L, M, N, O		EXPO	INDI	
11.49	Arron	That's right! My turn.	Pulls the iPad to himself	 ALPHABET ORDER	That's correct. R, S, T, U, V		EXPO	INDI	AF
12.09	Mila	(..)	Takes the iPad toward her. Taps the reading room.	 ALPHABET BOOK	BGM		PROC	INDI	
12.16	Arron	Teacher, Mila is not sharing	Looks at the researcher	 ALPHABET BOOK	clicking SFX, BGM		PROC	FUSI	AF
12.21	Researcher	When Mila is done with this part, then it's Arron's turn.	Talks to both	 ALPHABET BOOK	clicking SFX, BGM				
12.26	Arron	(..)	Arron blocks Mila's left arm with his right arm, taps a and b pages in the alphabet book. Accidently touches the screen recording tap on the top but he soon gets back to the app, taps the main page of the reading room and exits	 RECORDING STOP	clicking SFX, BGM		PROC	DOMI	
12.45	Mila	(..)	Mila exits the reading room and enters the character room		BGM		PROC	INDI	

12.53	Arron	My turn, ok?	Looks at Mila's face He taps on lion>jacket>glasses>hat >yellow >done Then, he hands off the iPad and gives a turn to Mila	 CHOOSE YOUR ANIMAL FRIEND	Let's choose your animal friend for today's adventure!		EXPO	INDI	AF
13.10	Mila	(..)	Taps on the activity room. Taps f(o).	 ALPHABET MATCH	This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase bubbles. That's right, uppercase F, and lowercase F	Arron does not have his hands on the iPad anymore	EXPO	INDI	
13.33	Arron	F, good job, my turn. I will do it.	Taps q and pushes the iPad to Mila	 ALPHABET MATCH	That's right, uppercase Q, and lowercase q		EXPO	COLL	AF
13.44	Mila	Umm...	Thinks about what to tap	 ALPHABET MATCH	clicking SFX, BGM		EXPO	INDI	
13.50	Arron	E, e		 ALPHABET MATCH	clicking SFX, BGM		LA	TUTO	I
13.53	Mila	Taps e (o)		 ALPHABET MATCH	That's right, uppercase E, and lowercase e		EXPO	COLL	
13.56	Arron	H. Your turn. Ok?	Taps h	 ALPHABET MATCH	That's right, lowercase h and uppercase H		LA	COLL	Q
14.10	Mila	ok.	Taps L(X) 2 times, W(X) 2 times	 ALPHABET ORDER	This is an alphabetical order game. Let's put the bubbles in alphabetical order.		EXPO	COLL	AN
14.16	Arron	This, F, F	points at F	 ALPHABET ORDER	clicking SFX, BGM		EXPO	TUTO	I
14.19	Mila	(..)	taps F (O).	 ALPHABET ORDER	That's correct. B, C, D, E, F		EXPO	COLL	
14.34	Mila	My turn.	Taps Z (X) twice and taps V (O)	 ALPHABET ORDER	That's correct. R, S, T, U, V	Arron lets her have another turn	EXPO	COLL	AF
14.53	Arron	My turn!			clicking SFX, BGM		PROC	COLL	AF
14.54	Researcher	Ok, Arron's turn			clicking SFX, BGM				

First, Arron tapped the alphabet grassland (10.10) (INDI). Mila attempted to tap the avatar room (10.14) (INDI), but Arron quickly tapped on the activity room (10.16) (DOMI). When the first question was displayed, Mila chose lowercase "f," which matched the uppercase letter, as she spoke "F, f!" (10.19) (INDI) (I). Arron gave a thumb’s up to praise Mila: “Good job! My turn!” He correctly guessed the lowercase “q” that matched its uppercase letter and raised his arms, shouting, “Oh yeah!” (10.20) (COLL) (AF). Mila said, “I will do it!” and tapped the lowercase “q” that matched its uppercase letter (10.34) (COLL) (AF). They both demonstrated pleasant, playful, and social interactions, as well as particularly smooth turn-taking.

From this point, they demonstrated tutoring behaviour (TUTO) (i.e., one helping the other find the correct answers), as well as effective collaboration. During Arron’s turn, he pushed and yielded the iPad to Mila, and he only guided her towards the answers: “E, e” (10.36) (TUTO) (I). As instructed by Arron, Mila tapped lowercase “e,” smiled, and pushed the iPad back to Arron’s side (10.43) (COLL). Arron said “H,” tapped uppercase “H” quickly, and handed the iPad to Mila (10.50) (COLL). Mila tapped “L” when instructed to choose an alphabet letter that came after “E” (11.02) (INDI), and Arron corrected her by saying, “No, no, F” (11.09) (TUTO) (I). After listening to Arron’s advice, Mila tapped the correct response, uppercase “F” (11.13) (COLL). Arron shouted, “My turn. M,” and tapped the correct answer, uppercase “M,” while raising both hands and yelling, “Yay!” Then she immediately handed the iPad to Mila and said, “Your turn!” (11.26) (COLL) (AF).

The two children maintained fair and kind interactions by taking turns at the right times, but their behaviour changed after Mila tapped the uppercase “Q” and the correct answer, which was an uppercase “V” (11.37) (INDI). Arron praised Mila with, “That’s right! My turn,” and pulled the iPad to his side (11.49) (INDI). However, Mila pulled the iPad away from Arron and entered the alphabet reading room (12.09) (DOMI). An upset Arron told me, “Teacher, Mila is not sharing” (12.16) (FUSI). So I told them, “When Mila is done with this part, then it’s Arron's turn” (12.21). Unlike the gentle sharing behaviours shown before, this time Arron blocked Mila’s left arm with his right arm, tapped the letter “A” and “B” pages in the alphabet book, and then accidently touched the screen recording option at the top. Then she returned to the app’s main page for the reading room (12.26) (DOMI). Mila exited the reading room and chose the avatar room (12.45) (DOMI). Arron gently asked, “My turn, okay?” He looked at Mila’s face and tapped on *lion, jacket, glasses, hat, yellow,* and *done*. Then he handed off the iPad for Mila’s turn (12.53) (INDI) (AF). Upon receiving the iPad from Arron, Mila tapped the activity room and chose the correct response, the lowercase “f,” for the first quiz.

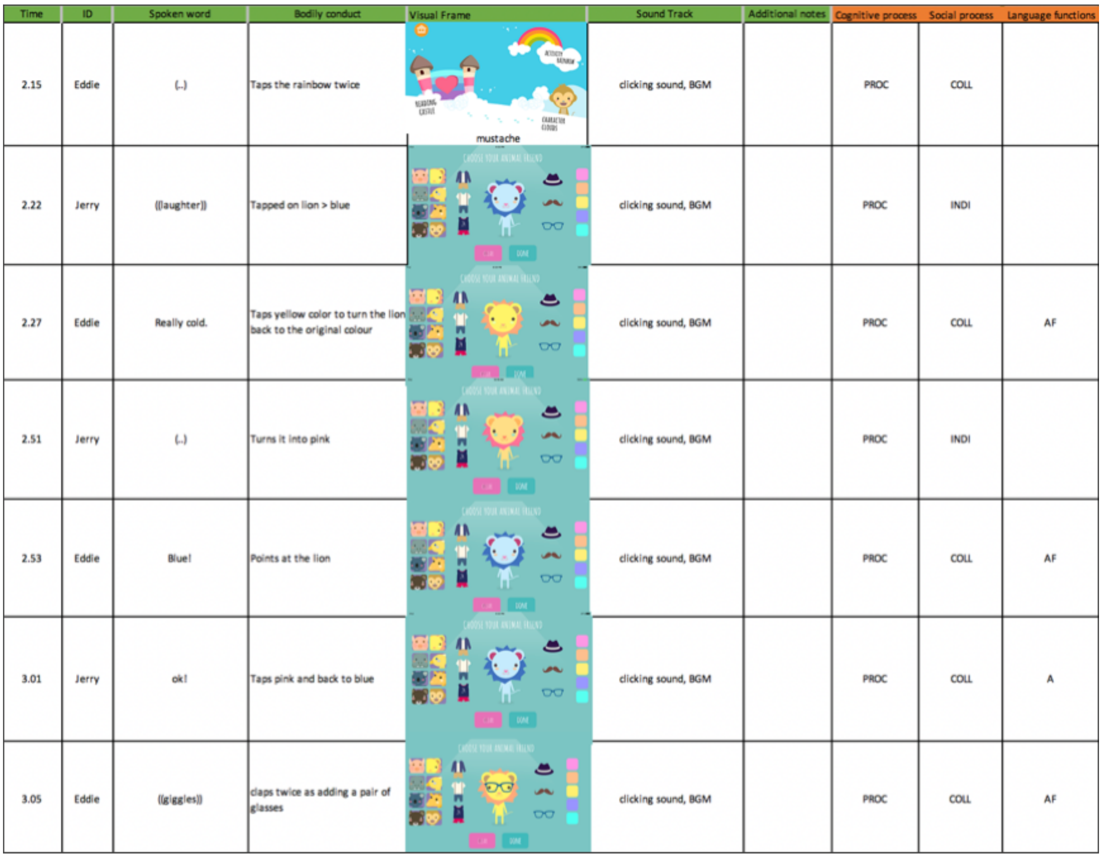
At this point, the mode of social processing changed to COLL when Arron cheered Mila for getting the correct response: “F, good job.” Then he requested his turn: “…My turn. I will do it” (13.33) (COLL) (AF). When Mila was hesitant in choosing the responses (13.44) (INDI), Arron suggested “E, e” (13.50) (TUTO) (I). Then, Mila tapped the right answer, lowercase “e” (13.53) (COLL). Arron tapped the lowercase “h” and said, “Your turn. Okay?” (13.56) (COLL) (AF). “Okay,” Mila answered (AN), and she tapped incorrect responses to an alphabet letter that should come after “E”: “L” two times and “W” two times (14.10) (COLL). Arron advised the correct answers by pointing at the uppercase “F”: “This, F, f” (14.16) (TUTO) (I). Mila followed his advice and tapped the correct answer (14.34) (AF). Mila shouted, “My turn” (14.34), even though she just had her turn. Arron did allow her, and she tapped the incorrect response uppercase “Z” twice, as well as uppercase “V,” which should come after “U” (14.43) (INDI) (AF). When the page turned to the main screen, Arron asked for his turn by saying, “My turn!” (14.54) (COLL) (AF). I responded, “Okay, Arron’s turn” (14.54), and they continued playing in the avatar room in a collaborative mode.

The social interaction between the two was interesting, as they yielded and helped each other, but then they stopped doing so at one point. The conflict did not extend long, and they continued to collaborate again towards the end. Arron exhibited tutoring behaviour by suggesting which response Mila should choose, and Mila accepted his advice. They took part in effective communication by asking, answering, and expressing opinions. Overall, compared to the previous example from the beginning and middle phases, their communication style and social interaction were more advanced.

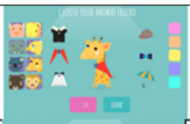
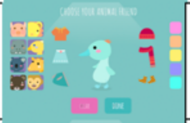
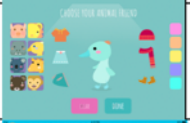
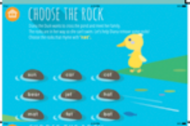
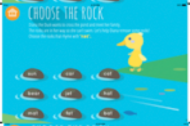
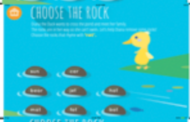
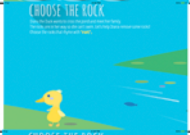
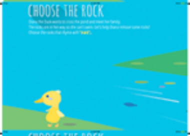
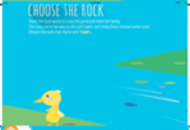
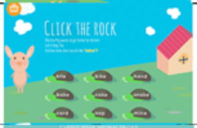
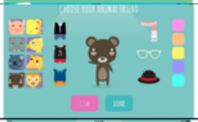
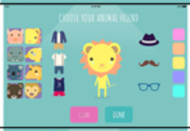
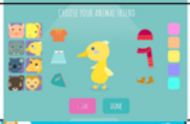
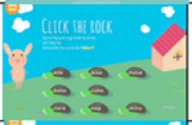
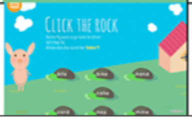
6.3.3 Example 3

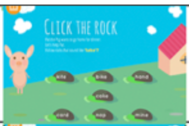
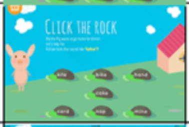
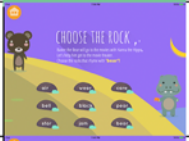
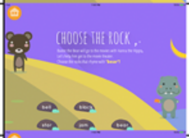
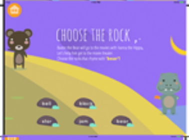
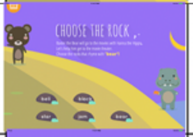
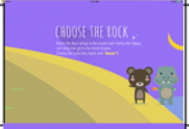
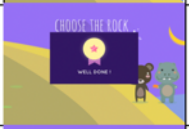
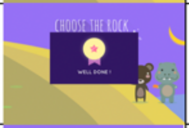
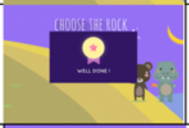
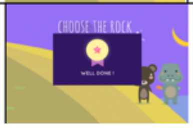
As shown in the transcription and coding from Week 10 in Classroom 2 (Table 6.10), from the beginning, the children’s interactions were more stable and more intricate than in the middle phase. Prior to starting the iPad time, I informed everyone in the classroom that they would be receiving a special reward after they finished playing the app.

Table 6.10. *Transcription from Week 10*



Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
2.15	Eddie	(..)	Taps the rainbow twice	mustache	clicking sound, BGM		PROC	COLL	
2.22	Jerry	((laughter))	Tapped on lion > blue		clicking sound, BGM		PROC	INDI	
2.27	Eddie	Really cold.	Taps yellow color to turn the lion back to the original colour		clicking sound, BGM		PROC	COLL	AF
2.51	Jerry	(..)	Turns it into pink		clicking sound, BGM		PROC	INDI	
2.53	Eddie	Blue!	Points at the lion		clicking sound, BGM		PROC	COLL	AF
3.01	Jerry	ok!	Taps pink and back to blue		clicking sound, BGM		PROC	COLL	A
3.05	Eddie	((giggles))	claps twice as adding a pair of glasses		clicking sound, BGM		PROC	COLL	AF

3.28	Eddie	Super hero!	Raises left arm high		clicking sound, BGM		IN	COLL	AF
3.35	Jerry	Nope!	Taps a duck and then blue		clicking sound, BGM		PROC	ARGU	DA
3.37	Eddie	Again?	Looks at the blue duck. Enters the rhyming room		clicking sound, BGM		PROC	ARGU	Q
3.48	Jerry	Yes!	Chooses home, rhyming world > game	 CHOOSE THE ROCK	BGM		EXPO	DOMI	A
3.54	Jerry/ Eddie	(..)	Play/press together and take turns fairly well	 CHOOSE THE ROCK	BGM		EXPO	COLL	
4.01	Eddie	Yess!	Both feasts up	 CHOOSE THE ROCK	Cat, BGM	Cat	EXPO	COLL	AF
4.02	Jerry	Yay!	Raises both arms	 CHOOSE THE ROCK	BGM		EXPO	COLL	AF
4.08	Eddie	Look at the fish!...Nothing happens!	Taps the fish in the background. Keeps tapping fish. Shake off the shoulder when nothing happens	 CHOOSE THE ROCK	BGM; Cat, hat, bat, fat, mat		EXPO	FUSI	AF
4.11	Jerry	It wasn't stopped!	Taps everywhere on the screen	 CHOOSE THE ROCK	BGM		EXPO	PROB	AF
4.13	Eddie	(..)	Taps snake (correct answer)	 CLICK THE ROCK	clicking SFX, BGM		EXPO	COLL	
3.08	Jerry	Let me do it. Let me do it!	Taps bowtie for lion and chages to bear		clicking sound, BGM		PROC	DOMI	AF
3.09	Eddie	(..)	Taps and changes to lion		clicking sound, BGM		PROC	INDI	
3.14	Jerry	no, no, no!	Taps a duck and then blue, outfit to orange top > blue skin > clear > add cape		clicking sound, BGM		PROC	FLCI	DA
4.15	Jerry	(..)	Keeps taping incorrect answers and tilt the ipad toward himself	 CLICK THE ROCK	clicking SFX, BGM		EXPO	DOMI	
4.20	Eddie	(..)	Taps 'bake' (correct)	 CLICK THE ROCK	clicking SFX, BGM		EXPO	COLL	

4.23	Jerry	(..)	Holds ipad with two hands and block Eddie's view a bit	 CLICK THE ROCK	clicking SFX, BGM	not happy that Eddie finished the game	EXPO	DOMI	
4.29	Eddie	(..)	Taps 'cake' (correct answer)	 CLICK THE ROCK	clicking SFX, BGM		EXPO	INDI	
4.41	Jerry	Hmmm...	Crosses his arms and leans against the desk	CLICK THE ROCK	BGM, bake, cake, snake...	not happy that Eddie finished the game	EXPO	DOMI	Jd
5.04	Eddie	Hmmm... You call that (XXX)!	Checks on Jerry's face Points at the screen	CLICK THE ROCK	BGM	cares Jerry's feelings	EXPO	COLL	AF
5.11	Jerry	Hmmm...	Rests his chin on his hands	CLICK THE ROCK	BGM	not happy that Eddie finished the game	EXPO	DOMI	AF
5.24	Jerry	(..)	Dominates the ipad, taps on air, wear, and care(O) in a row but bell (X) four times	 CHOOSE THE ROCK	BGM, air, wear, care		EXPO	DOMI	
5.29	Eddie	That one!	Taps on pear (O)	 CHOOSE THE ROCK	BGM		EXPO	INDI	I
5.37	Jerry	(..)	Taps on black (X) three times	 CHOOSE THE ROCK	clicking SFX, BGM		EXPO	DOMI	
5.39	Eddie	This one	Pointing at bear	 CHOOSE THE ROCK	clicking SFX, BGM		EXPO	TUTO	I
5.45	Jerry	Yeah, I did it, I did!	Taps on bear. Raises his right arm	 CHOOSE THE ROCK	BGM, Air, wear, care, pear, bear!		EXPO	COLL	AF
5.47	Eddie	Look at here, money over here!	Points at the ticket on hippo's hand	 CHOOSE THE ROCK WELL DONE!	BGM		EXPO	COLL	I
5.49	Jerry	Yeah		 CHOOSE THE ROCK WELL DONE!	BGM		EXPO	COLL	AF
5.55	Jerry	(...)	Taps on the medal for six times	 CHOOSE THE ROCK WELL DONE!	You've earned today's award! Well done!		EXPO	INDI	
5.57	Eddie	(...)	Waits for medal but looks elseswhere so he misses it	 CHOOSE THE ROCK WELL DONE!	You've earned today's award! Well done!		EXPO	OFF	

They started collaboratively by positioning the iPad in the middle, and Eddie tapped the avatar room (2.22) (COLL). Jerry took a turn and tapped *lion* and then *blue* with laughter (2.32) (COLL). In terms of the language function mode, Jerry and Eddie showed an interesting variety in conversation. When Jerry tapped on *lion* and then *blue* (2.22) (INDI), Eddie responded, “Really cold” (2.27) (AF), associating blue with coldness or ice. After Jerry made the lion pink (2.51) (INDI), Eddie suggested “blue” (2.53) – coded as AF because Eddie expressed his opinion. Jerry answered “OK” and proceeded to tap the *blue* button (3.01) (COLL). When Eddie started giggling (3.05), Jerry dominated the iPad: “Let me do it. Let me do it.” (3.08) (DOMI).

Although the iPad was positioned in the middle of the two, Jerry and Eddie showed some tension, each wanting to have more play time. Eddie chose lion (3.09) (INDI) and Jerry strongly disagreed with his decision (DA): “No, no, no!” (3.14) (FLCI). Despite Jerry denying his previous decision, Eddie made an effort to collaborate and suggested “super hero” cape and posed like superman (3.28) (COLL) (AF). However, Jerry did not agree with his suggestion; he shouted “Nope” and selected the duck and blue (3.35) (DA) (DOMI).

Then, the social mode changed to COLL and became more dynamic at this point. Eddie asked, “Again?” to enter the rhyming activity room, which they visited at the very beginning of the iPad day, not included in Table 5.12. Jerry agreed with Eddie (3.48) – coded as agreement (A) – saying “yes” and supporting what each other chose to put on the screen. When Eddie selected the “cat” answer (3.54), both raised their fists, and when they finished the activity, both raised their arms as the narration summarized the correct answers that they had chosen; I categorized this as an expression of feeling (i.e., AF) regarding their achievements (4.02). The children then showed problem-solving (PROB) skills that were not apparent in the earlier weeks; they expressed information (I).

When the screen reacted slowly (4.08), they waited for a bit without having an argument or experiencing confusion (4.11) (FUSI), and when they tried to solve the issue, they found that the iPad was fine; Jerry said, "It wasn't stopped" (4.11) (PROB). Eddie tapped on the correct response, *snake,* and gave Jerry a turn (4.13) (COLL). However, at one moment (4.14), Jerry kept selecting incorrect answers and tilted the device toward himself. I coded this as dominant (DOMI); however, no pushing or bodily complications were apparent. Eddie waited for his turn and tapped the correct answer, *bake*. Then, Jerry hit the iPad with both hands and blocked Eddie's view as he tried to keep the iPad to himself (4.23) (DOMI). Eddie tapped the correct answer, *cake* (4.29) (INDI). When the page turned to the third question, Jerry pulled the iPad to himself and tapped the correct responses air (O), wear (O), care (O) and then the incorrect one, bell (X), four times (5.24) (DOMI). Eddie stretched his arm and tapped on pear (O): "That one!" (5.29) (INDI) (AF). Again, Jerry dominated the tablet and tapped the wrong answer, *black* (X), three times. Eddie, rather than tapping the correct answer himself, pointed at *bear* (O) (5.29) (TUTO) (I). Jerry tapped on *bear* and shouted, "Yeah, I did it, I did!" Eddie added, "Look at here, money over here!" when the medal popped up on the screen (5.47) (COLL). Jerry responded, "Yeah!" with a joyful expression (5.49) (COLL). With some ups and downs, in the end, the children returned to collaborative (COLL) participation.

In this example from Week 10, the children exhibited a better understanding of the tasks, and their collaboration was prevalent from beginning to end, aside from a few moments of DOMI, INDI, and FUSI. I observed that the social interactions had advanced: For, example, TUTO was not seen in the previous example; however, in this one, at 5.39, Eddie assisted Jerry with the correct answer rather than directly tapping the answer himself. Eddie always waited for Jerry to finish and took his turn when Eddie was not tapping. In short, the core mode of the social process was collaborative due to one child understanding and supporting his partner, so they were able to take turns without major conflicts.

6.4 Analysis Summary of RQ2

In response to RQ2 (*What changes in peer group interaction do children display across time when engaging in the app with peers?*), I analysed a total of nine transcriptions: three examples each from the beginning, middle, and end phases. I observed how children used the app while interacting and collaborating with peers of a similar level in a classroom setting. More specifically, I analysed their social processing and communication styles to examine how the children worked together and communicated with each other throughout the phases of the study.

The key findings from the beginning, middle, and end include the following:

In the examples during the beginning phase, the interaction among peers began with either DOMI or INDI, and the peers showed conflicting moments (FUSI) and arguments (ARGU) in finding the right balance in turn-taking. Most of the time, the children spent time in the avatar room decorating the animal characters. They wanted more time for themselves. However, through the process of expressing their feelings and opinions, including some disagreement, the social processing mode changed to COLL towards the end of the iPad day in all examples. If one child was more active and led another with, “I do it,” “My turn,” or “Your turn,” the collaborative moment came more rapidly. The two who had a closer friendship took less time collaborating and communicating with each other in the app.

In the examples during the middle phase, similar to the beginning phase, the children also experienced difficulty collaborating in the beginning, thus showing INDI and DOMI. The children mainly preferred to play with the avatar room and visited the activity room and reading room for shorter times. The informative (I) and affectional

(AF) frequency in expressing the information, needs, and feelings improved in the communication style compared to the beginning phase. The ease of turn-taking was similar to the beginning phase. However, occasionally a child in a pair who had less chance of engaging in the app lost interest or complained, and he or she became more socially collaborative and verbally expressive compared with the examples from the beginning phase.

In the examples during the end phase, the children showed broader interests in spending time with the rhyming games, alphabet order game, and rhyming reading room than just the avatar room. In a social processing perspective, they had a better understanding of the tasks and showed collaboration, and the fewer moments of DOMI, INDI, and FUSI still existed. Turn-taking and yielding the iPad to each other in the avatar room and activity room were so much smoother than the previous times, as they showed respect for each other's choices. Generally, the children appeared calmer and used various language forms such as AF, RP, I, Q, and AN. Furthermore, in some instances, the children showed TUTO behaviour in suggesting advice to better choose the correct answers. The frequency of verbal communication had increased compared to the beginning and middle phases.

Although such development was not entirely linear, the children's verbal interactions were based on the linguistically simple forms of self-expression, like showing feelings or agreeing/disagreeing. When they became more comfortable with the app in the later weeks, they sometimes expressed their ideas or suggestions in more complex verbal forms. Determining the most sufficient way to interpret such silence is necessary for more accurate analysis. When they became more comfortable with the app in the later weeks, they were able to present their ideas and suggestions in more complicated verbal forms although the development was not smooth linear line.

In the analysis of the social process, I realised the dynamic can fluctuate moment by moment. At the beginning, one student was persistently dominant in the iPad activity and the other one gradually lost interest. Then they become collaborative as the previously dominant child became better at turn-taking. In the end phase, some collaborated and showed tutorial behaviours through informing his or her partner of the correct answer. The essential focus of the social process should be on when the participants are socially equal or when they lose their mutual understanding; the learning outcome of the nonparticipating child may suffer at these times.

With ups and downs of sharing and collaborative moments, the dynamic of social interaction improved over the 10 weeks of the analysis. I came to believe that the structure of the interaction evolved as the participants interacted with their peers (Edwards & Potter, 1992). The peer relations were complicated, as the children's interest levels, social and cultural backgrounds, knowledge, and closeness varied (Newcomb & Bagwell, 1995). In addition to the explorations of the first research question on how to improve a group's learning outcomes, mutual understanding, goals and collaboration among peers all seem to be critical. For this age group, coding the verbal interactions was challenging, as they tended not to frequently express or share thoughts during their play.

CHAPTER 7
RESULTS AND ANALYSIS:
RESPONDING TO RESEARCH QUESTION 3

7.0 Introduction

To answer my third research question ("Are there any literacy practices with Aniland that reappear in the classroom context?"), I analysed excerpts of transcripts from the beginning (Weeks 1-3), middle (Weeks 4-6) and end (Weeks 7-10) phases in a chronological order, as in the two previous analysis chapters.

Throughout the phases of the study, I focussed on analysing connections between online and offline learning relative to how the children perceived or reflected on how they played with the app. I provided a descriptive walkthrough of the transcription to take the reader through the children's meaning-making process when using Aniland.

Table 7.1 *Revised analytical framework of peer group interaction – cognitive processing*

Dimension	Analytical categorisation		Description
Cognitive processing	Exploratory	EXPO	- Interpreting the app's contents thoroughly with reflective analysis and problem-solving
	Procedural	PROC	- Random navigation of the app without reflective analysis
	Literacy acquisition	LA	- Showing any new literacy acquisition
	Innovation	IN	- Use an app to extended play or pretend play

In the following excerpts, I examined whether the mode of children's engagement with iPads changed between exploratory use (coded as EXPO), navigating meaning with reflective analysis and problem solving (i.e., procedural; coded as PROC), and seemingly random navigation without reflective analysis and modes; this is the same format as the analysis for RQ 1. I then go on to analyse any evidence of literacy acquisition (LA) that was visible in the children's interactions or innovation (IN) and whether the children were using the app as a means of extended play or pretended play as portrayed in Table 7.1.

For these examples, I particularly focussed on investigating the nature of interactions between children and teachers and any connections between offline and online learning. The analysis is not limited to the learning outcomes but rather includes communication and the culture around the classroom. In this ethnographically informed investigation, these factors were recognised as important contributors to children's learning of literacy practices.

In this chapter, I presented the coded responses to determine the manner in which children interacted with the app, made meaning out of their experiences, practised new literacy information, or even attempted to engage in extended play during the iPad activity day. Since the nature of RQ3 was different than RQ1 in terms of investigating real world connections, I explored any connection between online and offline spaces—in other words, the iPad activity and regular classroom activities, such as reading time, story time, centre time, atrium time, etc. Furthermore, slightly different from the previous two chapters that respond to research questions 1 and 2, I chose to present the transcription in various ways according to my purposes (Gillen & Cameron, 2019), in order to describe the dialogue with fluidity, particularly in the third example of the final phase. Also, I used images taken in the classrooms during and on other days than the iPad time, in addition to the transcripts, to enrich my points in the instances that appeared during the study, such as animal sounds, animal imitations, stickers, print books, and curriculum on living things.

7.1 Beginning phase

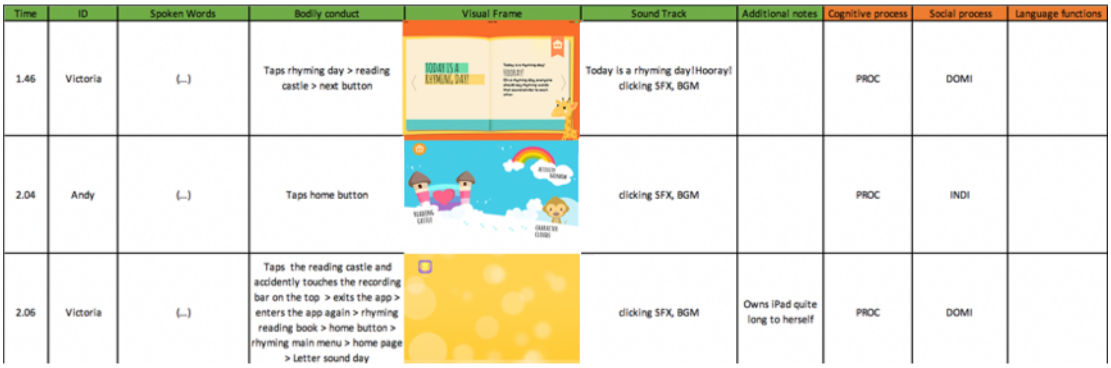
7.1.0 Preview

In the beginning phase, the children spent most of their time on creating avatars and exploring the app without any purpose (PROC). Online and offline contents did not necessarily seem to be directly connected at this point; the children seemed to enjoy having extra literacy experiences with an app, according to a teacher's comment about children wanting more days to use the iPads. Use of reward stickers with Aniland characters on the tops of their water bottles or on their bodies could be interpreted as the children's appropriation of the iPad activities into their lives. All in all, the cheerful moods of the children before, during, and after their iPad time lent a positive learning energy to the classroom.

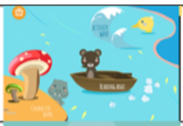
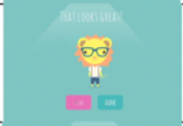
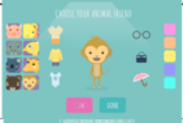
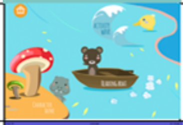
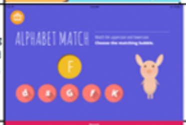
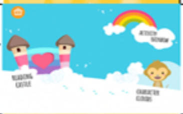
7.1.1 Example 1

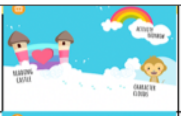
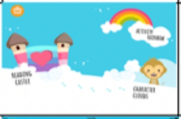
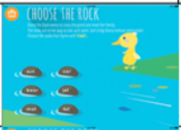
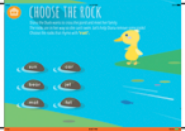
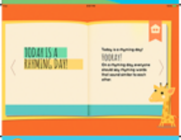
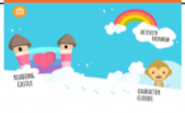
The transcription excerpt below (Table 7.2) illustrates two children's interactions when playing Aniland in the second week in Classroom 1. The children were having a story time with the teacher prior to the iPad time. As soon as the teacher called Victoria and Andy's names, they moved rapidly to the table and sat down.

Table 7.2. *Transcription from Week 2*



Time	ID	Spoken Words	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
1.46	Victoria	(...)	Taps rhyming day > reading castle > next button		Today is a rhyming day! Hooray! clicking SFX, BGM		PROC	DOMI	
2.04	Andy	(...)	Taps home button		clicking SFX, BGM		PROC	INDI	
2.06	Victoria	(...)	Taps the reading castle and accidently touches the recording bar on the top > exits the app > enters the app again > rhyming reading book > home button > rhyming main menu > home page > Letter sound day		clicking SFX, BGM	Owns iPad quite long to herself	PROC	DOMI	

2.35	Andy	(...)	Taps on the reading boat		clicking SFX, BGM		PROC	INDI	
2.39	Victoria	(...)	Exits the reading room > enters the character room > lion > hat >moustache > jacket > glasses		clicking SFX, BGM		PROC	INDI	
3.04	Andy	(...)	Taps done		clicking SFX, BGM		PROC	INDI	
3.09	Victoria	How about this?	Taps clear and blue.				PROC	COLL	Q
3.13	Andy	Lion. Rawrrrr!	Taps clear and blue.				IN	COLL	AF
3.15	Victoria	(...)	Taps monkey				PROC	INDI	
3.19	Andy	(...)	Taps clear and exits then taps back in to the character room. Taps duck > beanie			Keeps the iPad to himself	PROC	DOMI	
3.28	Victoria	(...)	Taps koala > dress >purse				PROC	INDI	
3.34	Andy	(...)	Taps done and enters the activity room				PROC	DOMI	
3.40	Victoria	(...)	Taps done > main room > reading boat > main room > letter sound activity room and blocks Andy's hand		This is an alphabetical order game. Let's put the bubbles in alphabetical order.	Keeps the iPad to herself	PROC	DOMI	
4.07	Andy	(...)	Taps g > f > s and taps home button before hearing the narration > taps the recording bar > recording page pops up > closes the recording page				PROC	DOMI	
4.22	Victoria	(...)	Taps back into the app >main page > letter sound game > taps the recording bar again		This is an alphabetical order game. Let's put the bubbles in alphabetical order.		PROC	DOMI	
4.31	Researcher	(...)	Taps the app icon						
4.44	Victoria	(...)	On the rhyming day main page > rhyming book > main page > exits the app		clicking SFX, BGM		PROC	DOMI	
5.24	Andy	Share, share	Tries to tap				PROC	FUSI	AF

5.37	Victoria	(...)	Blocks Andy's hand and taps the app icon		clicking SFX, BGM		PROC	DOMI	
5.42	Andy	(...)	Looks around		clicking SFX, BGM	Looks for a teacher?	PROC	OFF	
5.46	Victoria	(...)	Taps the rhyming book > main > rhyming activity room > sun (X) > cat (O) > hat (O) > bat(O)		BGM, Cat, hat, bat		PROC	DOMI	
6.28	Andy	(...)	Pushes Victoria's hand and taps car (x) four times		BGM		PROC	FUSI	
6.45	Victoria	(...)	Taps on home button > main > rhyming book		Today is a rhyming day!Hooray! clicking SFX, BGM		PROC	DOMI	
7.08	Andy/ Victoria	(...)	They stand up and looks for a button around the iPad to turn off. Then, leaves the table to receive the stickers.		BGM		PROC	COLL	

SFX=sound effect
BGM=background music

Victoria settled first and tapped rhyming day, reading castle that led to a rhyming reading book, next button once (1.46) (PROC). As soon as Andy sat, he took over using the iPad and exited the reading room (2.04) (PROC). Victoria dominated the iPad and randomly tapped: chose the reading castle and accidently touched the recording bar on the top, exited the app, entered the app again, tapped rhyming reading book, home button, rhyming main menu, home page, and letter sound main menu (PROC) (2.06). No thoughtful meaning-making in her navigation was shown, rather she explored different areas of the app.

Andy entered the reading room (PROC) (2.35); however, Victoria exited the reading room, entered the avatar room, and tapped *lion*, *hat*, *moustache*, *jacket*, and *glasses* (PROC) (2.39). When Victoria paused from tapping the screen, Andy tapped *done* (PROC) (3.04). They did not navigate with any discernible purpose; hence, I coded all actions as PROC. At this moment, “How about this?”, Victoria asked Andy’s opinion as tapping *clear* and *blue* (3.06) (PROC). Although it was a brief, Andy imitated a lion’s sound, “Lion. Rawrrrr!” showed a possibility of an extended play relating to what was on the app (3.31); therefore, I coded IN. Victoria did not respond to Andy's animal sound mimicking, tapped *monkey* (3.28) (PROC). Then, Andy tapped *clear*, exited the avatar room, then tapped back in to the avatar room again, and chose *duck* and *beanie* (3.19) (PROC). Victoria tapped *koala*, *dress*, and *purse* (3.28) (PROC). Then, casually browsing the options (PROC), Andy tapped *done* and entered the activity room of alphabetical order (3.34).

I had not found any congruency in terms of navigation purpose. Victoria, keeping the iPad to herself and blocking Andy's hand, and tapped *done*, entered reading boat in the main room of letter sound day and exited the reading room again and tapped activity room (3.40). (PROC). In the activity room, Andy tapped g, f, s and home before hearing the narration and then accidently touched the recording bar and the recording page popped up, closed the recording page (4.07) (PROC). Victoria tapped back into the app, main page, letter sound activity room and accidently touched the recording bar again like Andy did (4.22) (PROC). I saw they were struggling so helped them to enter the app (4.31). Victoria chose to enter the rhyming book in the main page of rhyming day, back to main page, and exited the app (4.44) (PROC). Andy finally complained "Share, share!" and attempted to tap on the screen (5.24) (PROC). But Victoria blocked Andy's hand (5.37) (PROC) similar to the previous moment (3.40). Andy looked around looked lost in interest or looked for a teacher (5.42) (PROC).

Meanwhile Andy was off paying attention, Victoria tapped the rhyming book, exited the book and returned to the main page of rhyming day and tapped rhyming activity room. When she entered the rhyming room: chose a wrong response, *sun*, and three correct answers, *cat*, *hat*, and *bat* (5.46) (PROC). Andy suddenly turned back, pushed Victoria's hand and tapped a wrong response *car* four times (6.28) (PROC). Victoria exited the activity room by tapping on the home button and chose the rhyming book from the main page of the rhyming day. As the other team on the other side of the same table left, they stood up and looked for a button around the iPad to turn off, then they left the table to where other children were, to receive the animal stickers (7.08) (PROC).

For this example, I coded all of the cognitive processing as PROC except one, because Victoria and Andy did not show any consistency in reflective analysis or LA from the app contents. However, I spotted one instance of IN when Andy imitated the lion roaring upon Victoria's creation of blue lion in the avatar room (3.13). Although Victoria did not react to the IN, the moment showed the possibility of making connection between the app and the real lives of children. On this day, these two children were exploring different activities in both letter sounds day and rhyming day, familiarising themselves with the app's basic features and structures until they stopped playing the app and attaining the stickers.

Like I observed in the first week, one of the best parts for this week's iPad time for the children was getting stickers after they finished playing Aniland, approximately 10–15 minutes.

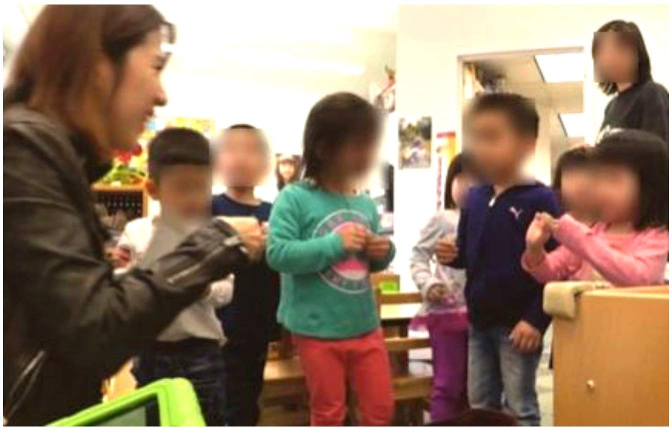


Figure 7.1. Children receive the reward stickers at the end of the iPad time

With a help of the teachers, they lined up in the middle of the classroom (Figure 7.1). I asked them "Did you enjoy playing today?" and they shouted "Yes!". When I handed the sticker to each children, they said "Thank you, Ms Iva!" and I said. "Thank you guys for playing. We will play again next week." I noticed they were giggling and peeking on each other's stickers to find out what others received.

The children exhibited joy when they received the stickers after playing with the app. Every week, children stayed in their chairs and waited for the others to finish playing Aniland to attain the stickers. Even on the days without iPad activities, they talked about the Aniland characters. During one of my visits during the early phase, I noticed that some students used the stickers on their water bottles (first image in Figure 7.2), even after the iPad activity time was over. When I visited them on another day for classroom observation, one of the students (right image in Figure 7.2) had the giraffe sticker on his forehead, unsolicited, and he did not expect me to be present that time.

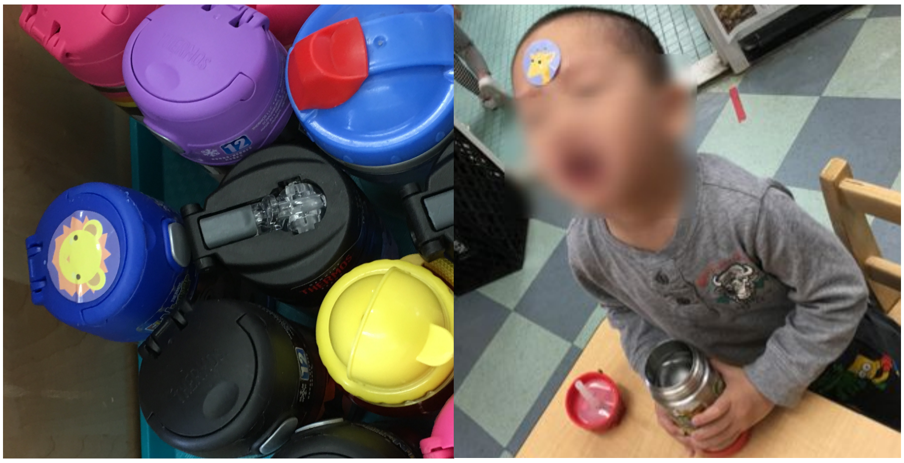


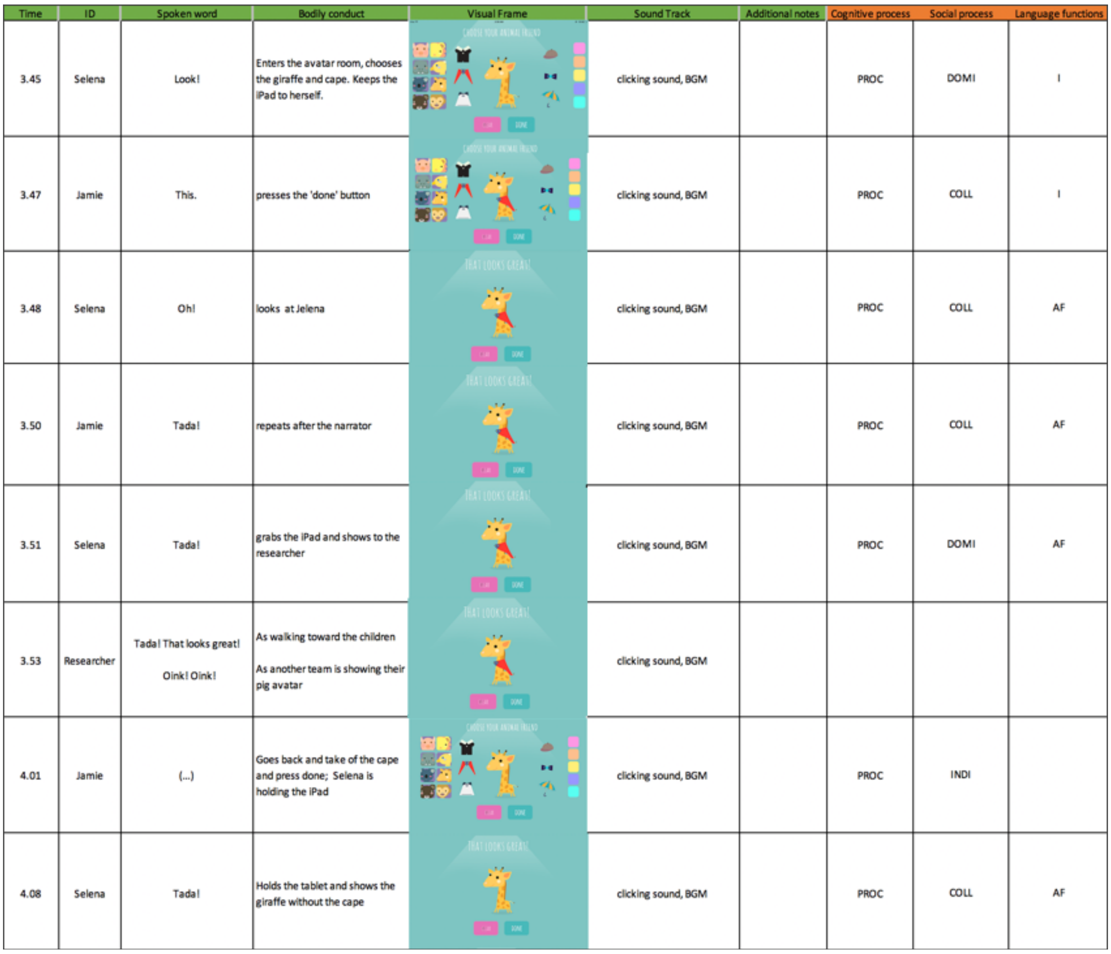
Figure 7.2. A variety of sticker usage in the classroom

Furthermore, the teacher informed me that the children asked when the next 'iPad day' would be again multiple times throughout the week. Although I did not find any direct literacy learning in the first few weeks, I was pleased that the children were enjoying the app and saw the potential in connecting the online and offline spaces. In general, the children's interactions with the app and with each other did not particularly show any literacy information transferred from or related to Aniland and offline space in the beginning phase. Nonetheless, the cheerful mood of the children during and after the iPad time was foreseen as a positive learning opportunity in the upcoming weeks.

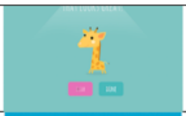
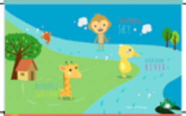
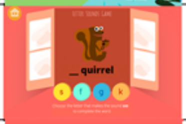
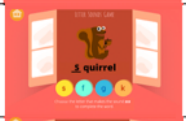
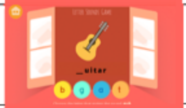
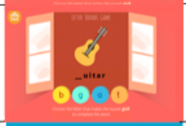
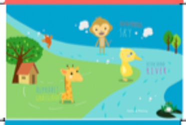
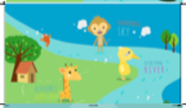
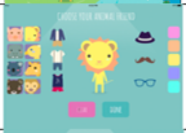
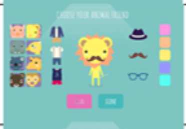
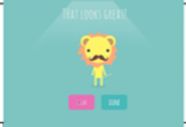
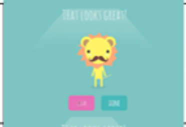
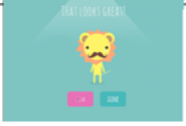
7.1.2 Example 2

The below example from Week 2 (Table 7.3) occurred in Classroom 2. In the usual routine, half of the class was ready for the iPad and the other half had already started with centre time where the children could choose to play with puzzles, to play in a sandbox, to play with dolls, to read books, to build with blocks, etc.

Table 7.3 *Transcription from Week 2*



Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
3.45	Selena	Look!	Enters the avatar room, chooses the giraffe and cape. Keeps the iPad to herself.		clicking sound, BGM		PROC	DOMI	I
3.47	Jamie	This.	presses the 'done' button		clicking sound, BGM		PROC	COLL	I
3.48	Selena	Oh!	looks at Jelena		clicking sound, BGM		PROC	COLL	AF
3.50	Jamie	Tada!	repeats after the narrator		clicking sound, BGM		PROC	COLL	AF
3.51	Selena	Tada!	grabs the iPad and shows to the researcher		clicking sound, BGM		PROC	DOMI	AF
3.53	Researcher	Tada! That looks great! Oink! Oink!	As walking toward the children As another team is showing their pig avatar		clicking sound, BGM				
4.01	Jamie	(...)	Goes back and take of the cape and press done; Selena is holding the iPad		clicking sound, BGM		PROC	INDI	
4.08	Selena	Tada!	Holds the tablet and shows the giraffe without the cape		clicking sound, BGM		PROC	COLL	AF

4.13	Researcher	Tada That looks great! You can go out by pressing the home button! Then go to the different places.			clicking sound, BGM				
4.20	Selena	(...)	Owns the iPad to herself, tab letter sound activity room		BGM		PROC	DOMI	
4.33	Researcher	You guys need to share !			BGM				
4.43	Selena	I have a trouble...	Drops the iPad		BGM	the iPad cover is not stable so it falls down when not held by hands	PROC	NCOLL	I
5.01	Researcher	Yes	Walks toward them from the other side of the table		BGM				
5.03	Researcher	You have to find a correct letter. Guh. Guitar.			BGM				
5.08	Selena	(...)	Taps G, A, and T and nothing happens. So she goes out.		clicking SFX, BGM	they need to wait until the narrator says the answer	PROC	DOMI	
5.16	Researcher	Ok. You can always go out pressing the home button.			clicking SFX, BGM				
5.21	Selena	(...)	Enters the avatar room; select lion; add mastache looks at Jamie		clicking SFX, BGM		PROC	COLL	
5.25	Jamie	Tada!	Taps 'done' and repeats when she hears the narrator saying 'Tada'		clicking SFX, BGM		PROC	COLL	AF
5.28	Selena	Look! Look!	Shows the screen to the researcher		clicking SFX, BGM		PROC	INDI	RP
5.29	Jamie	Tada!			clicking SFX, BGM		PROC	COLL	AF
5.31	Selena	Wow, look! tada! Tada!	Talks to the researcher		clicking SFX, BGM	creating avatars and showing to the researcher repeats	PROC	DOMI	RP

Jamie and Selena just finished having centre time, where children have free choices to play with puzzles, to play in a sand box, to play with dolls, to read books, to build blocks, etc. Jamie sat down first and turned the orange iPad on and then as soon as Selena sat, she took over using the iPad. Selena entered the avatar room, casually browsing the options (PROC), decided on giraffe and then a cape and said, "Look!" (3.45). The iPad was still on Selena's side, and Jamie reached over her arms and pressed the 'done' button (PROC) (3.47). Selena looked at the super giraffe with the cape and said, "Oh," while looking at Jamie (3.48). The narrator said, "Tada! That looks great! Let's start today's adventure!" Jamie mimicked that with, "Tada!" first (3.50), and then Selena repeated, "Tada," after Jamie turned the iPad towards me (3.51). They did not navigate with any discernible purpose; hence, I coded all actions as PROC.

After I reminded them how to exit to the main screen by pressing the 'home' button, Selena exited the avatar room and entered the letter sound game room (4.20). I reminded them to share, as Selena had dominated the iPad since the beginning (4.33). Selena said to me, "I have a trouble…" and accidently dropped the iPad onto the table (4.43) (PROC). I presumed she was stating that she was having trouble because the noise level of the classroom was so high that they could not hear the narrator repeating the answer: "That's right. [squirrel s s s]. Wonderful!" When I reached for them, the iPad's screen moved onto the guitar screen, so I asked them to find the correct answer for the "[guh], guitar" (5.01). Then, they realised that the iPad was working fine, and Selena tapped G, A, and T in sequence and exited the game, as the page did not move to the next screen promptly (5.08) (PROC). I reminded them both that they could exit by pressing the home button (5.16).

Selena entered the avatar room again, and this time, she selected a lion and a moustache (5.21) (PROC). Similar to the previous instance when they were in the avatar room, Jamie tapped 'done' and repeated "Tada" after the narrator (5.25) (PROC). Selena held the tablet and turned it towards me: "Look, look!" (5.28) (PROC). Jamie shouted "Tada!" (5.29), and Selena said, "Wow, look! Tada! Tada!" (5.29). They continued to stay in the avatar room and navigated the different options available to change or to dress the animal friends until the end. I coded everything

PROC, because they were freely playing with the app and did not offer any reflective analysis of the contents. During encounters with the app, Selena maintained the lead and did not share with her partner on many occasions; however, Jamie did not complain and tried to work together. As a result, they finished without any confrontation. This excerpt does not display any instances of LA or IN; rather, they were solely enjoying and familiarising themselves with the app.

In general, the children's interactions with the app and with each other did not particularly show any literacy practices transferred from or related to Aniland and offline space in the first few weeks. The children enjoyed getting stickers after spending 10-15 minutes playing Aniland. As shown in Figure 7.3, the two children who were playing the app in Table 7.3 showed me the Aniland reward stickers and posed so I could take photos of them right after I finished distributing the stickers to everyone in the classroom. Also, they showed me around the rug area and explained what they were learning in the classroom during the morning meeting and the story time. The children exhibited joy when they got the stickers after playing with the app. Every week, children stayed in the chair and wait for the others to finish playing Aniland to attain the stickers. Even on the days without iPad activities, they talked about the Aniland characters. During one of my visits during the early phase, I noticed that some students placed the stickers on their bodies, usually their hands or foreheads, mirroring what happened in Classroom 1 in the first example.

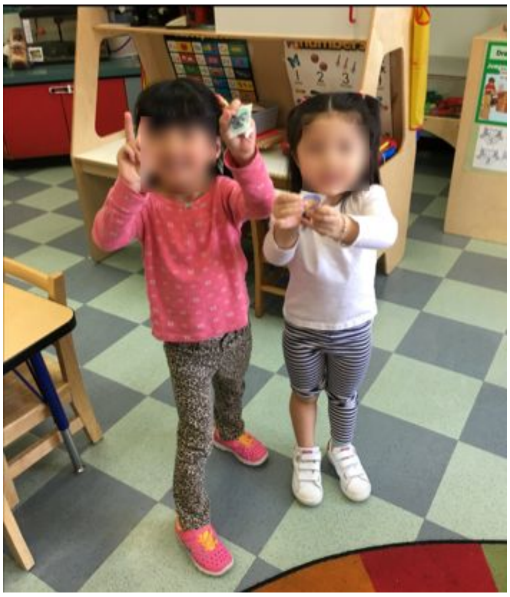


Figure 7.3. Two children show their reward stickers

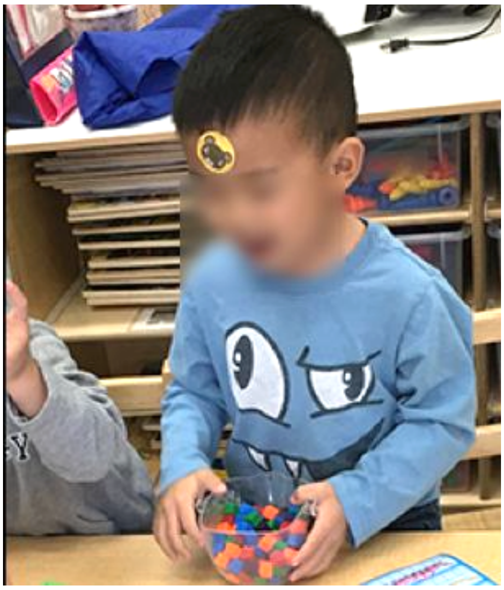


Figure 7.4. A child with a bear sticker on his forehead

When I visited them a day after the iPad day for classroom observation, one student (Figure 7.4) had the bear sticker on his forehead, and he did not expect me to be present that time. Furthermore, the teacher informed me that the children asked when the next ‘iPad day’ would be again multiple times throughout the week. Although I did not find any direct evidence of transfers of learning to other activities in the first few weeks, I was pleased that the children were enjoying the app and saw the potential in connecting the online and offline spaces.

7.1.3 Example 3

I arrived early in Classroom 2 in Week 3 when the children were having reading time. I listened to the story and the children’s interactions with the teacher as I prepared the equipment. Because it was an introduction to animal and nature week, the teacher had read *This is the Farmer* by Nancy Tafuri. She had asked the children many insightful questions, such as “What do you think of the cover?”, “What is this person doing in the picture?”, and “What sound does a pig make?” Many children raised their arms every time questions were asked. These dialogues interactions seemed to hold the children’s attention well. Although this was coincident that the theme of the week matched with that of Aniland ie animals. During the reading time, the children showed particular interest in mimicking the sound of animals (e.g., “oink, oink!” when a pig appeared and “Baa, bba” when a sheep appeared in the book). The

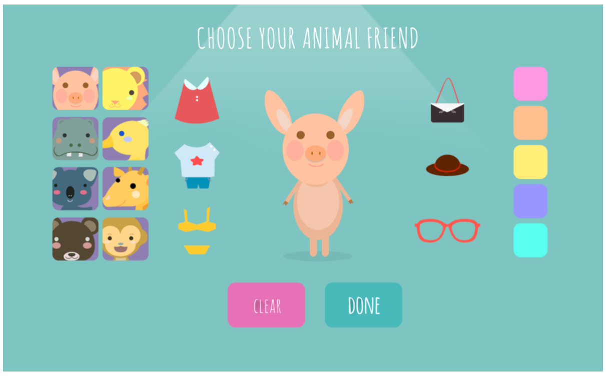
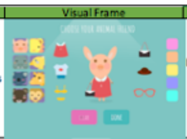
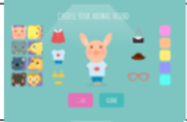
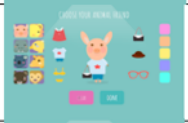
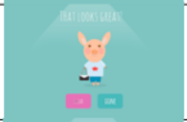
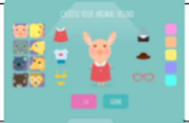
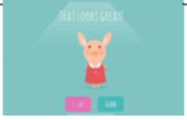


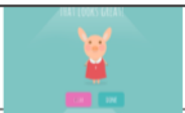
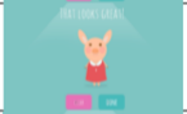
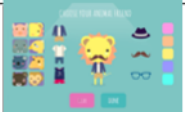
Figure 7.5. A case of imitating a pig's sound

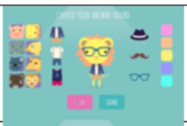
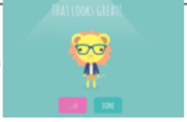
children enjoyed the farm yard book, the teacher's talk around it, the animals on Aniland etc. During the literacy hours, the children sang Old MacDonald Had a Farm and imitated animal sounds followed by the teachers. I could see a possible connection between the reading materials offline and Aniland's pig online in this example (Figure 7.5).

To start the iPad time, the teacher called out each pair's names that she already had written down on a sheet of paper so that the children got to play with different partners than they played with the previous week. The pairs of children held each other's hands and went to find their seats. The transcription excerpt in Table 7.4 below illustrates Elena and Jerry's interactions when playing Aniland.

Table 7.4. *Transcription from Week 3*

Time	ID	Spoken Words	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
3.09	Elena	(..)	Taps on pig, red dress and jeans		Let's choose your animal friend for today's adventure! clicking sound, BGM		PROC	INDI	
3.12	Jerry	This one!	Blocks Elena's hand and chooses a purse.		clicking sound, BGM		PROC	DOMI	AF
3.18	Elena	(..)	Attempts to tap the hat		clicking sound, BGM		PROC	INDI	
3.19	Jerry	Tada	Blocks Elena's hand and taps the done button		clicking sound, BGM		PROC	DOMI	AF
3.22	Elena	((laughter))	Taps clear. Pig > red dress > purse		clicking sound, BGM		PROC	COLL	AF
3.29	Jerry	Tada!	Taps done button and looks at Elena		Tada! That looks great. Let's start today's adventure.BGM		PROC	COLL	AF

3.33	Elena	((laughter))	Looks at the screen		BGM		PROC	COLL	AF
3.35	Jerry	(..)	Looks at the researcher and smiles		BGM		PROC	INDI	
3.36	Researcher	Tada, that looks great!	Researcher repeats after the nnaration		clicking sound, BGM				
3.38	Elena	(..)	Taps back button >pig > red dress > purse		clicking sound, BGM		PROC	INDI	
3.40	Jerry	Tada!	Stands up. Taps done sits down		Tada! That looks great. Let's start today's adventure.BGM		PROC	INDI	AF
3.46	Elena	(..)	Taps clear button and taps the red dress.		clicking sound, BGM	Interestingly she uses left index finger for the left items and right index finger for the right items on the screen	PROC	INDI	
3.47	Jerry	Tada! ((giggles))	Pushes Elena's hand away and taps on done button.		BGM		PROC	DOMI	AF
3.53	Elena	Look!	Smiles and turns around and looks at the researcher		Tada! That looks great. Let's start today's adventure.BGM		PROC	COLL	I
3.57	Researcher	Wow! That is so cool! Cool piggy! Very cute!			clicking sound, BGM				
3.59	Elena	(..)	Taps clear button, picks pig and red dress again		clicking sound, BGM		PROC	INDI	
4.05	Jerry	(..)	Taps done		Tada! That looF16ks great. Let's start today's adventure.BGM		PROC	INDI	
4.07	Elena/Jerry	Tada! ((giggles))	Look at the researcher together.		clicking SFX, BGM		PROC	COLL	AF
4.10	Elena	(..)	Taps clear and lion		clicking SFX, BGM		PROC	DOMI	
4.14	Jerry	(..)	Taps jacket/khaki shorts > masthache		clicking SFX, BGM	Take turns without pushing Emma's hands	PROC	COLL	

4.16	Elena	(..)	Taps glasses		clicking sound, BGM		PROC	COLL	
4.18	Jerry	(..) Tada!	Taps mastache > glasses > hat > glasses > done Looks at Emma's face, smiling		Tada! That looks great. Let's start today's adventure.BGM		PROC	COLL	AF
4.24	Elena	(..)	Looks at Jerry's face and smiles		BGM	They repeat the similar routine three more times until the time ends	PROC	COLL	

Elena took the lead and chose *pig*, *red dress*, and *jeans* (3.09), but no clear evidence of reflective analysis or problem solving was visible yet; therefore, I coded this moment PROC. Jerry blocked Elena's hand from tapping further and chose *purse* for *pig* (3.12) (PROC). Although Elena attempted to tap *hat* on the screen again (3.18) (PROC), Jerry blocked her hand, tapped *done*, and shouted "Tada!" after the narration (3.19) (PROC). With laughter, Elena tapped *clear* to go back to the avatar room and tapped *pig*, *red dress*, and *purse* (3.22) (PROC). Jerry tapped *done* and screamed "Tada!" while glancing at Elena (3.29) (PROC). Elena, while gazing at the screen, laughed aloud after Jerry imitated the "tada" sound (3.33) (PROC).

When I next came to them, Jerry looked at me and smiled, being proud of what they had created (3.35) (PROC). I repeated what the narration said, "Tada; that looks great!" (3.36). Elena tapped the *back* button, *pig*, *red*, *dress*, and *purse*, respectively, which was similar to what she had created immediately before (3.38) (PROC). Then, Jerry stood up, tapped *done*, and shouted "Tada!" while sitting back down on his chair (3.40) (PROC). Such repeated actions occurred between Elena and Jerry's interactions in the next moment: Elena tapped *clear* to go back to the avatar room and tapped the *red dress* for *pig* (3.46) (PROC), and then Jerry tapped *done* while giggling (3.53) (PROC). Elena turned around and looked at me with a smile (3.53) (PROC). I praised them by saying, "Wow! That is so cool! Cool piggy! Very cute!" (3.57). Again, Elena tapped *clear*, *pig*, and *red dress* (3.59) (PROC), after which Jerry tapped *done* (4.05)

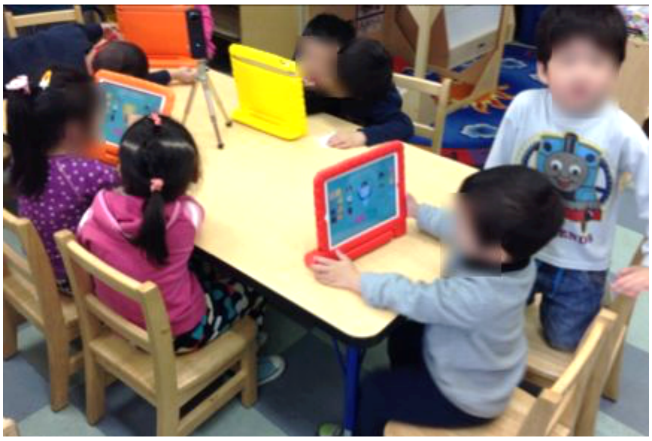


Figure 7.6. Children enjoy creating animal avatars in Week 3

(PROC). They both looked at me giggling and shouting "Tada!" (4.07) (PROC). Onwards, they showed a pattern of Elena creating an avatar and Jerry tapping on *done* three times more. I did not observe any thoughtful input; however, they expressed positive playtime. Overall transcripts show that neither of them tried to dominate the iPad over time too long. In this early stage, the children were in a process of getting familiarised with the app, and everyone around the table (Figure 7.6) showed the most interest in creating avatars.

In this week's example, I searched the data for LA or IN but did not find any. Although Elena and Jerry's interactions showed a pattern of going back and forth between the avatar room and the complete character page, I coded their interactions as PROC since no analysis or problem solving within the app was apparent. In this phase, the children were getting familiarised with the app and its interface. The pair spent the whole duration of the iPad day on creating avatars. Often, the children exhibited joy through laughter and giggles.

While I visited them on an observation day during the centre time, I noticed a child from the previous week who had a bear sticker on his forehead (Figure 7.7) had this time placed a duck sticker on his forehead again and was playing a picture-matching game. The children were curious about my presence in the classroom and about Aniland. The children

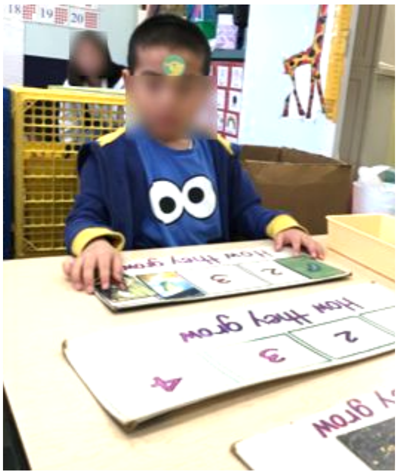


Figure 7.7. A child with an Aniland sticker on his forehead

expressed their interest in playing Aniland. They asked, “Do we play animal land today?” first and some also questioned about getting the reward, “Can I get stickers?” A child stated that she had an iPad at home and played it: “I play iPad at home, too.” It was pleasant to observe the Aniland content had somewhat become a part of their real lives and the children’s connection-making; they were aware the iPad day had been one of their favourite routines, and they also use iPads at home.

7.2 Middle phase

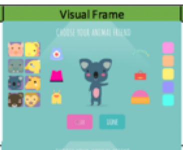
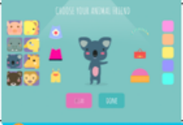
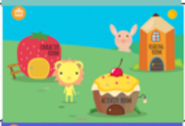
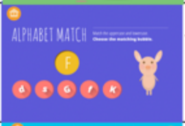
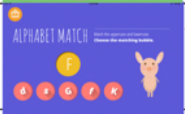
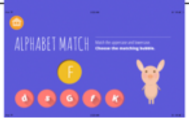
7.2.0 Preview

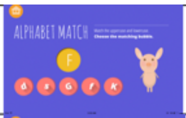
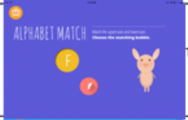
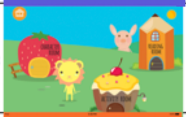
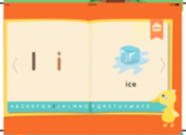
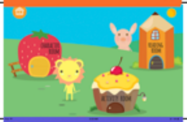
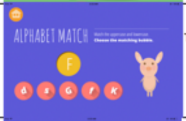
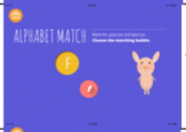
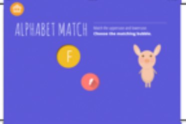
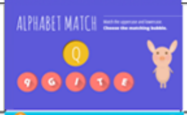
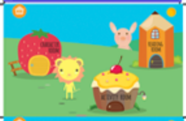
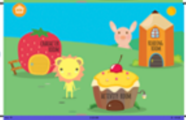
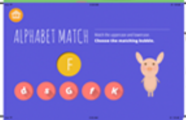
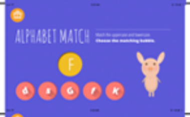
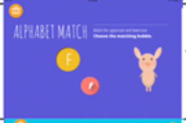
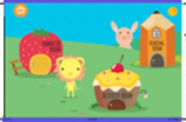
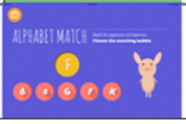
The frequency of guessing the correct answers increased in the middle phase compared to in the beginning phase; however, the children tended to change modes between PROC to EXPO. In relation to classroom pedagogy, children’s learning about the life cycles of living organisms and reading of farm-related books were relevant to animals in Aniland in terms of discussing living creatures on earth in the classroom. Meaningful comments were observed in this phase right before children began playing Aniland, including “Keep the animal safe!” and “I will play with lots of animals!” Having introductory sessions to discuss what children wanted to do in the app or giving the children slight missions to find a particular page in the reading room encouraged them to have goals to achieve for the day. When literacy time was taking place, for example, and a teacher was reviewing the alphabet and letter sounds, it would indirectly prepare children to practise literacy immediately following iPad activity time.

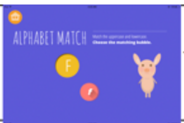
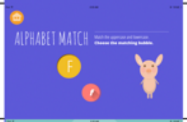
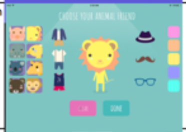
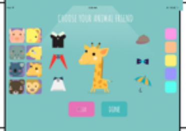
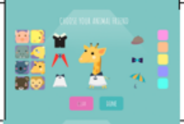
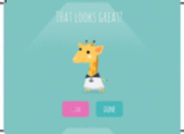
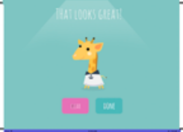
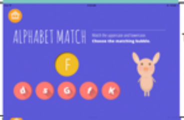
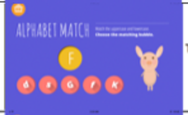
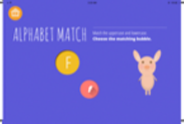
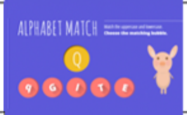
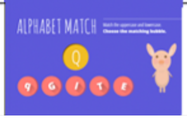
7.2.1 Example 1

In Week 5 in Classroom 2, the children were having atrium time when they play in the indoor playground right outside the classroom. I was preparing the equipment for the iPad time. One child came in early and asked me with excitement, “What are we doing today?” and I said, “We are going to play on an iPad today.” She replied, “I have iPad at home!” and as a teacher told her to sit on the carpet, she ran off. All others came back to the classroom, drank water from the water fountain in the classroom, and gathered around on a carpet. What was special about pairing was that when one child was called, he or she could pick a partner. Half of the students sat down at a big table in pairs, and the other half enjoyed the centre time. As they were settling down in front of the iPads, I said as an introduction, “So, you are going to play Aniland again today. You can pick your favourite animals, read books, and play games.” Table 7.5 below illustrates an interaction involving two children, Jared and Selena.

Table 7.5. *Transcription from Week 5*

Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
11.10	Jared	Ms. Iva!	Toward Researcher who's helping the team on the left		Clicking sound, BGM		PROC	INDI	AF
11.11	Selena	I want play an alphabet	Toward Researcher who's helping the team on the left		Clicking sound, BGM		PROC	INDI	AF
11.14	Researcher	What do we do? Press the blue button to go out.	Walks to the group and taps the alphabet acitivity room on the main page		Clicking sound, BGM				
11.28	Jared	(...)	Taps s, k, and f		This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase bubbles.		PROC	INDI	
11.33	Selena	(...)	Exits the alpbhabe activity page before the answer page pops up		Clicking sound, BGM		PROC	DOMI	
11.35	Jared	(...)	Taps back to the activity room		BGM		PROC	DOMI	
11.36	other group member	Ms. Iva she's not sharing.			This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase bubbles.BGM				
11.39	Researcher	You need to share	Walks toward the group		BGM				

11.42	Selena	(...)	Gazes at Researcher who's working with other kids		BGM	maybe she wants to say something to Researcher	PROC	INDI	
11.43	Jared	(...)	Taps the correct answer, f		That's right, uppercase F, and lowercase F		LA	INDI	
11.52	Selena	(...)	Exits the activity room and goes into the alphabet reading room		BGM		PROC	DOMI	
12.01	Selena	umm...	Tilts ipad toward her and turns the pages until the last page and then exits.		Clicking SFX, BGM		PROC	DOMI	AF
12.34	Jared	this	Taps the activity room		Clicking SFX, BGM		EXPO	INDI	AF
12.37	Selena	(...)	Taps the bubbles and finally chooses the correct answer		This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase bubbles. BGM		EXPO	INDI	
12.40	Jared	yay!	Raises both thumbs up. claps and looks at Iva on his left		That's right, uppercase F, and lowercase F		EXPO	COLL	AF
12.42	Selena	Ms. Iva!	Lifts the ipad and shows the correct answer to Researcher		BGM		PROC	INDI	AF
12.45	Researcher	Oh, great!	Places the ipad in the middle of the two		clicking SFX, BGM				
12.47	Jared	(...)	Leans toward the back of the chair as Selena leads		clicking SFX, BGM		PROC	COLL	
12.48	Selena	(...)	Checks another group's screen and comes back		clicking SFX, BGM		PROC	COLL	
12.49	Jared	(...)	Takes the iPad when Selena went to check another group's screen, enters the activity room		This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase bubbles. BGM		EXPO	INDI	
13.01	Researcher	Ok we are back there, the activity room!			BGM				
13.13	Jared	yay!	Plays the activity room and gets the first answer correct. Raises his right thumb up.		That's right, uppercase F, and lowercase F		EXPO	INDI	AF
13.29	Selena	Yay!	Exits the room and goes back into the activity room		This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase bubbles. BGM		PROC	INDI	AF
13.38	Jared	(...)	Makes big bubbles in the air with his right index finger		BGM		IN	INDI	

13.42	Selena	Yay!	Taps on f, two fists up, looks at Jared.		That's right, uppercase F, and lowercase F		LA	COLL	AF
13.43	Jared	yay!	Two fists up, looks at Selena		BGM		EXPO	COLL	AF
13.46	Selena	No. No.	Glances at the two students on the right side, exits the activity room on the ipad, and come back into the activity room. she does not let Jared to tap by blocking his right hand. exits the activity room again and enters the avatar room		BGM		PROC	DOMI	AF
14.03	Jared	(...)	Tries to tap and decorate the giraffe		clicking SFX, BGM		PROC	INDI	
14.06	Selena	(...)	Blocks Jared and picks the white dress for giraffe, done tap		clicking SFX, BGM		PROC	DOMI	
14.14	Selena	Look!	Brings ipad to Researcher to show her		That looks great!		PROC	INDI	AF
14.18	Researcher	Great job!	Puts back the iPad to the middle		clicking SFX, BGM				
14.22	Jared	(...)	Taps back to the activity room		This is an alphabet uppercase and lowercase matching game. Match the uppercase and lowercase bubbles. BGM		EXPO	COLL	AF
14.30	Selena	(...)	Taps the answer quckly		That's right, uppercase F, and lowercase F		LA	COLL	I
15.05	Teacher	You two come with me!	Leads them to the center time area		Clicking SFX, BGM				
15.13	Researcher	OK. you guys can switch!							
15.15	Jared/Selena	(...)	Both leave the taple				PROC	OFF	

Jared and Selena started playing in the avatar room, led most of the time by Selena, and stayed there for the first four minutes and then looked for me, seeking help on how to navigate to the alphabet room (11.10) (PROC). I assisted them in exiting the avatar room by tapping on the *done* button and entering the activity room (11.14). Jared tapped *s*, *k*, and *f* bubbles in order and waited for a response, and I coded this moment PROC (11.28) since his purpose of tapping was not exhibiting any reflective analysis. While the narrator read out the answer, “That’s right, uppercase F and lowercase f,” Selena exited the activity room without asking Jared’s opinion (PROC) (11.33). Selena held the iPad to herself, but Jared reached his arm and tapped back (PROC) (11.35) into the activity room. Three other groups were working together at the table, and one of them reported his partner’s dominant behaviour over the iPad (11.36). I walked over to the other group.

Selena’s gaze followed where I moved and did not focus on engagement with the app (PROC). Jared took this chance to own the iPad and tapped the correct answer, that is the lowercase f (11.42), and I coded this as LA this time because he had learnt uppercase F and lowercase f matching, whereas he was hesitant about the answer a previous time (11.28). Then, Selena turned to the iPad and immediately took over. She exited the activity room and entered the reading room and turned the page from A to I and exited the room (PROC) (12.01). While she wandered her index finger over the main menu and entered the activity room, Jared chose the activity room (PROC) (12.34). Then, Selena chose the correct answer, lowercase f (EXPO) (12.37). When the narrator said, “That’s right, uppercase F, lowercase f!” Jared shouted, “Yay!” as he clapped and raised his thumbs up (EXPO) (12.40). Selena lifted the iPad and showed it to me (PROC) (12.42).

At this point, Jared’s mode of cognitive processing went back to PROC when Selena took control of the iPad and tapped the home button without asking his opinion (PROC) (12.47). While Selena went to check another group’s screen (PROC) (12.48), Jared took the iPad toward himself to enter the activity room (EXPO) (12.49). I said, “Ok, we are back there, the activity room!” (13.01), hoping to encourage them to go further with the alphabet matching game in the activity room. Jared expressed his happiness about getting the question correct by raising his right thumb up and simultaneously shouting, “Yay!” (EXPO) (13.13). Selena repeated after Jared, “Yay!” but she left the activity room when the next question screen showed. Then, she entered the room again (13.29); therefore, for the first questions exhibited, I coded this moment PROC since Selena did not show consistency in navigation without reflective analysis.

Meanwhile, Jared imitated and drew the shapes of the big bubbles in the air with his right index finger (13.38), and his action could be interpreted as innovation (IN) because he took the content of the app to further play in reality. When Selena heard the narration about getting the correct answer, she said, “Yay!” with her two fists up, and I coded this as LA since she understood that the uppercase F and the lowercase f matched (13.42). Following Selena, Jared raised his two fists up, and they looked at each other (13.43) (EXPO). However, Selena did not allow Jared to move on to the next question by blocking his hand, exiting the activity room, and entering the avatar room (PROC) (13.46). When Selena picked *giraffe*, Jared attempted to tap the screen (PROC) (14.03), but Selena immediately blocked Jared’s hand and picked *white dress* for the giraffe and pressed the *done* button (PROC) (14.06). She walked to me with the iPad to show what she had created in the avatar room (PROC) (14.14). I praised her by saying, “Great job!” and at the same time put back the iPad in the middle of the two (14.18). Jared tapped the activity room (EXPO) (14.22), and Selena tapped the answer without any hesitation (LA) (14.30). A teacher called them to switch with another team, and they went off to enjoy the centre time with the other half of the classroom.

The idea of sharing, particularly taking turns, was the most difficult part. Overall, Jared and Selena repeated EXPO and PROC and played in silence. What would be fruitful to discuss further would be Selena’s behaviour to imitate what others were doing. She constantly looked over which screen other groups were on and sought appraisal from adults as if she were competing against other groups. Forming an adequate peer learning environment in which the peers stimulate each other or that includes good-natured competition would be something to consider in the future.

I spotted three times (11.42, 13.42, and 14.30) when Jared and Selena exhibited LA. In the beginning, they were not able to match the uppercase F and lowercase f, but later, they quickly found the correct answers. Although the children did not move on to the next question in the alphabet matching game because Selena repeatedly exited the activity room after answering the first question, they began to recognise the relationship between uppercase F and lowercase f in this session.

After the iPad time, I packed up the equipment and looked around at what the children were doing in the centre time, I noticed one student had finished an alphabet puzzle and left it on the table (Figure 7.8). A connection may be seen here; reviewing alphabets with a puzzle after reading the alphabet books or playing alphabet letter games on an iPad might have had a positive impact for learning, as repetition is known to be effective. In this kinds of moments, adults' guiding children to make connections between online and offline activities before or after playing a literacy app could heighten the frequency of literacy learning for children. In addition, a part of this excerpt showed a possibility of connecting offline and online activities when Jared was drawing the bubbles in the air (13.38). For instance, if teachers could let children draw those bubbles and alphabet letters on a sheet of paper, in this way, children might be able to familiarise further with the alphabet while using the iPad.

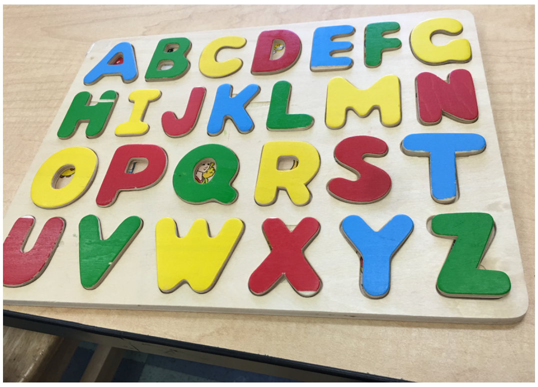


Figure 7.8. A student completes an alphabet puzzle after the iPad time

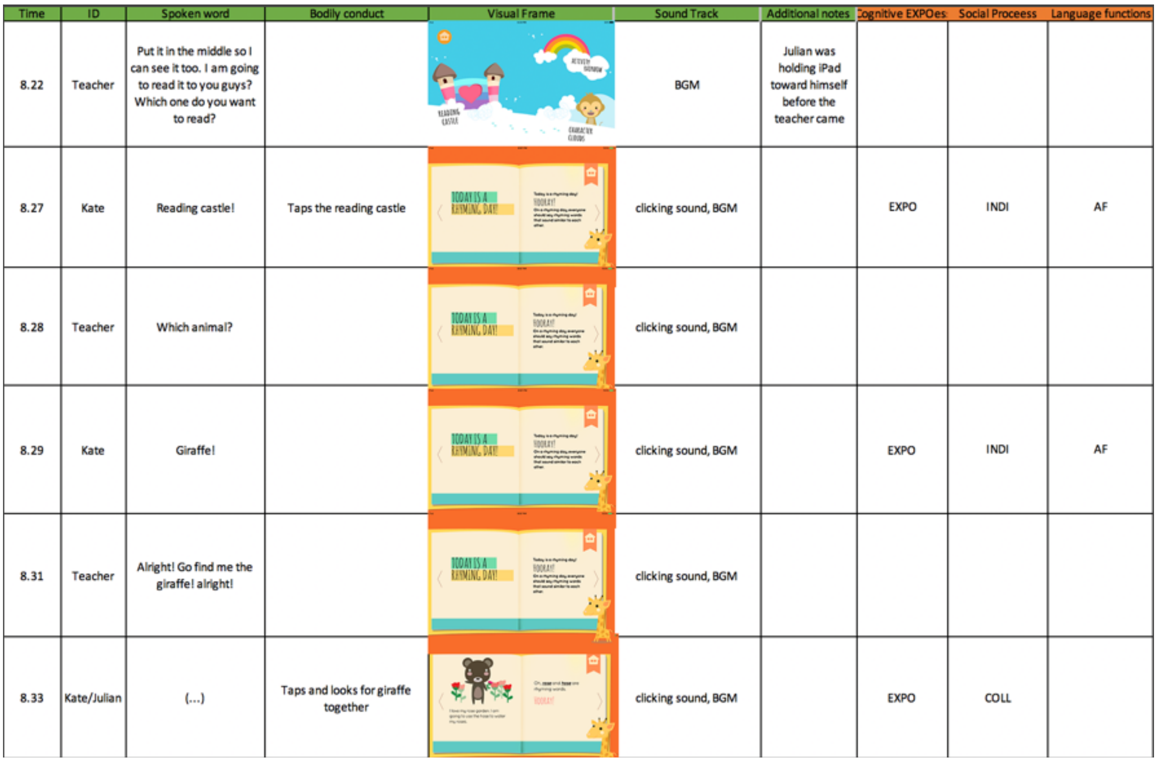
7.2.2 Example 2

In Week 6, Classroom 1, I planned to start off slightly differently by having an introduction. Before children engaged in Aniland, they gathered around on the rug and I encouraged them to find the rhyming book by reading the lion page on the iPad.

> My mom, my dad and I will visit my grandma today. She lives in a village far away. My dad will drive the car there. Oh, far and car are rhyming words! Hooray!

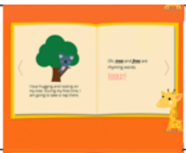
Then, a teacher asked the children, “Do you have any questions for Iva about the iPad?” One asked me, “Do we play iPad today?” I responded, “Yes, I brought iPads for you to play with today”. Suddenly, Jayden said, “Keep the animal safe!” and another child said, “I am going to play with lots of animals”. After this 5 min introductory session, the teachers assigned children seats. Table 7.6 below illustrates an interaction between two children, and Kate is the one who mentioned “I will play with lots of animals!” in the introductory session.

Table 7.6. *Transcription from Week 6*



Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additional notes	ognitive EXPOes	Social Proceess	Language functions
8.22	Teacher	Put it in the middle so I can see it too. I am going to read it to you guys? Which one do you want to read?			BGM	Julian was holding iPad toward himself before the teacher came			
8.27	Kate	Reading castle!	Taps the reading castle		clicking sound, BGM		EXPO	INDI	AF
8.28	Teacher	Which animal?			clicking sound, BGM				
8.29	Kate	Giraffe!			clicking sound, BGM		EXPO	INDI	AF
8.31	Teacher	Alright! Go find me the giraffe! alright!			clicking sound, BGM				
8.33	Kate/Julian	(…)	Taps and looks for giraffe together		clicking sound, BGM		EXPO	COLL	

8.35	Teacher	A bit too loud! alright! Reading castle! Let Khloe go first. Khloe, show me the giraffe!	To another group of kids who are screaming		clicking sound, BGM				
8.41	Kate	(...)	Taps		clicking sound, BGM	she tapped too much and passed the giraffe page	EXPO	INDI	
8.48	Teacher	Go back.	Taps the back button		clicking sound, BGM				
8.50	Kate	(...)	Taps the back button to find the giraffe		clicking sound, BGM		EXPO	INDI	
8.53	Teacher	I am super excited because I am going to bake a cake today.Oh, bake and cake are rhyming words. Hooray! .	Reads giraffe page		clicking sound, BGM				
9.04	Julian	Lion!			BGM		EXPO	INDI	AF
9.05	Teacher	Ok Julian go to the lion	Talks to Julian		BGM				
9.08	Julian	(...)	Taps to find the lion page		clicking sound, BGM		EXPO	INDI	
9.11	Teacher	Alright. My mom, my dad and I will visit my grandma today. She lives in a village far away. My dad will drive the car there. Oh, far and car are rhyming words! Hooray!	Reads the lion page		clicking sound, BGM				
9.28	Kate	I want to read Koala			BGM		EXPO	INDI	AF
9.30	Teacher	Alright. Show me Koala			clicking SFX, BGM				
9.31	Kate	tap to find Koala			clicking SFX, BGM		EXPO	INDI	
9.37	Teacher	You can fast foward			clicking SFX, BGM				
9.39	Kate	(...)	Taps faster		clicking SFX, BGM		EXPO	INDI	

9.47	Teacher	Alright I love hugging and resting on my tree. During my free time, I am going to take a nap there. Oh, tree and free are rhyming words! Hooray! Oh tree and free, do they rhyme? Do they sound same?	Reads the Koala page		clicking SFX, BGM				
10.05	Kate	Yeah.			clicking SFX, BGM		EXPO	INDI	AF
10.07	Julian	Another one	Grabs the iPad		clicking SFX, BGM		EXPO	INDI	AF

At the beginning of their interaction, Julian exhibited dominance by placing the iPad toward himself. A teacher noticed, sat by them, and said, “Put it in the middle so I can see it, too. I am going to read it to you guys. Which one do you want to read?” (8.22). Kate, with excitement, said, “Reading castle” as she tapped the area (8.27), and I coded this moment as EXPO since she had a clear purpose for engaging with the rhyming book. The teacher asked, “Which animal?” (8.28), and Kate responded, “giraffe!” (8.29) (EXPO). The teacher told her to find the giraffe (8.31), and Kate and Julian looked for the giraffe page (8.33) (EXPO). While they were searching for the giraffe, the teacher told the other group to quiet down and said to Julian and Kate, “Let Kate go first. Kate show me the giraffe!” (8.35). Kate turned the pages but had already passed the giraffe page (8.41) (EXPO). The teacher said, “go back,” and showed her how to go back by tapping the back button (8.48). Kate did as suggested and found the page (8.50) (EXPO). The teacher read the page with a sweet voice, acting like an adorable animal. “I am super excited because I am going to bake a cake today. Oh, bake and cake are rhyming words. Hooray!” she said (8.53). As soon as the teacher finished, Julian shouted “lion!” (9.04) (EXPO). The teacher told him to find the page (9.05), and Julian promptly moved to the page (9.08) (EXPO). Then, the teacher read the page: “My mom, my dad and I will visit my grandma today. She lives in a village far away. My dad will drive the car there. Oh, far and car are rhyming words! Hooray!" (9.11). The children were focussed on her voice and hand gestures.

All of the children's cognitive processes were coded as exploratory since they were manipulating the app with purpose and solving problems (i.e., showing the corresponding pages to the teacher). After the teacher finished reading the lion page, Kate said, "I want to read koala" (9.28) (EXPO). The teacher allowed her to find it (9.30), and Kate started to tap it (9.31); however, she had passed the page. I still coded this as EXPO because Kate's purpose was apparent regardless of the delay in finding the page. The teacher suggested she fast forward by tapping (9.37), and Kate found it immediately (9.39) (EXPO). The teacher read the koala page: "I love hugging and resting on my tree. During my free time, I am going to take a nap there. Oh, tree and free are rhyming words! Hooray!" After the narration, the teacher rephrased the sentence with rhyming words and asked, "Oh, tree and free, do they rhyme? Do they sound the same?" (9.47). Kate replied, "Yeah" (10.05) (EXPO). Then, Julian requested "another one" by grabbing the iPad (10.07). The teacher read one more for them before the time ended, but it was not included in Table 7.6 above to reduce redundancy.

Even though I did not spot any moment that directly corresponds literacy acquisition (LA) or innovation (IN), this example illustrating the teacher's role as a reader was tremendous in heightening interest in reading rhyming books for children. The two children discussed above concentrated far better than usual. The children complained that they couldn't hear the sound of the iPad particularly due to the children from the five other groups were extremely loud and acted excitedly. The teacher guided a connection between online and offline spaces by allowing children to navigate on the app while discussing the contents offline and reading the storybooks offline. Furthermore, other children at other tables spent more time reading on this day. The real-life introductory section was ostensibly useful to promote their interest in reading rooms.

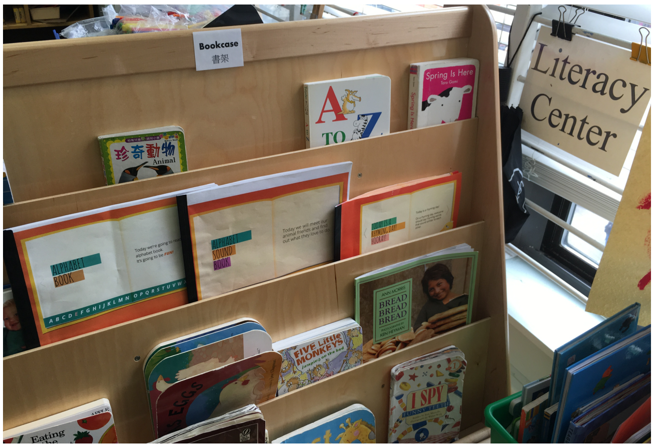
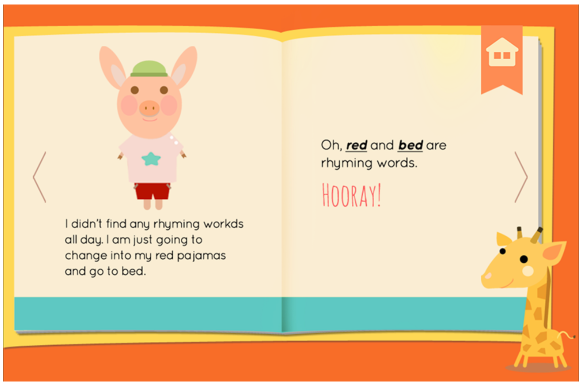


Figure 7.9. Printed version of Aniland books

Generously permitted by the teachers, I was allowed to leave three paper versions of Aniland books on the bookshelf, as shown in Figure 7.9, and children could read them from Week 6. I noticed a connection between printed and digital material leading to a pleasant experience for children. For example, when I visited to observe literacy classes later in the Week 6, Britany brought me a print version from the bookshelf without being asked to do so, turned to the pig page (shown in Figure 7.10), and asked, "How do you turn the page on iPad?" I was holding an iPad and showed her by tapping the right arrow key on the right page of the book on the iPad. Then she asked me "What is arrow key?" I pointed at the right arrow key and explained "it points the way, and when you tap it you can move in the direction you want to go. One arrow moves to the next page and the other goes back a page." This example demonstrated a child's initiation of a comparison between the affordances of digital and print books.



I didn't find any rhyming workds all day. I am just going to change into my red pajamas and go to bed.

Oh, ***red*** and ***bed*** are rhyming words.

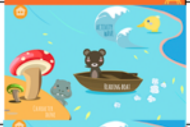
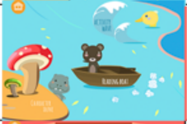
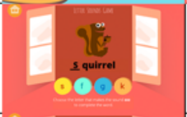
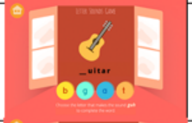
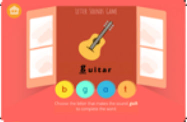
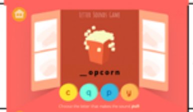
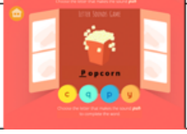
Figure 7.10. The pig page in the rhyming book on an iPad

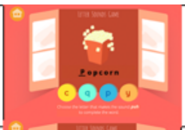
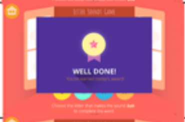
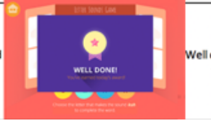
By showing a comparison and contrast between the digital and print versions, I had observed a possibility of combining or connecting print and digital spheres for young children so that knowledge of online contents could be transferred to an offline space or vice versa. Moreover, a teacher informed me Britany and she had read the pig page on the print book version shown in Figure 7.10 together the day before Britany showed and asked me such meaningful questions about the same page on iPad.

7.2.3 Example 3

The transcription below in Table 7.7 presents the children's interaction in Classroom 1 during the sixth week. As on other days, the children had reading time prior to iPad time. After I set up the equipment, the teachers called out the children's names and instructed them to sit down.

Table 7.7. *Transcription from Week 6*

Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additiona notes	Cognitive process	Social process	Language functions
12.14	Arron/ Kira	(..)	Kira tries to tap. Arron pushses Kira with left arm	ALPHABET SOUND BOOK	Alphabet sound book. Today we will meet our animal friends and find out what they love to do.	disagreement between two	PROC	ARGU	
12.17	Kira	(..)	Presses home button to go out and suceeds	ALPHABET SOUND BOOK	clicking		PROC	INDI	
12.19	Arron	(..)	Holds the iPad and taps boat, home button, and activity room		BGM, clicking sound		PROC	INDI	
12.31	Kira	(..)	Kira looks back. Her eyes are not on the screen.		BGM ,letter sound game! Choose the letter that makes the sound sss to complete the word. [s s s]	A is dominant. And it might be why E's not taking control	PROC	OFF	
12.36	Arron	yay!!!	Dance as he raises his hands up and dances again when he gets the 'S' right		That's right 'sss, sss, sss, squirrel' excellent!		EXPO	DOMI	AF
12.38	Kira	(..)	Tries to see other group's ipad screen and turns back to their screen		BGM, Choose the letter that makes the sound guh to complete the word. [g g g].	less focused	PROC	FUSI	
12.49	Arron/ Kira	Yaaas!	Clap together. Arron taps 'g' and looks at the screen		BGM, That's right. [g g g uitar, GUITAR]. Wonderful!	One is persistently dominant	EXPO	COLL	AF
12.59	Arron	Hey! Hey! I know ABC... Look at me! Hey know ABC	Talks toward the researacher and taps P		BGM, Choose the letter that makes the sound p to complete the word. [p p p].		LA	DOMI	RP
13.05	Researcher	Wow you know ABCs!	Walks around the room and come to see them		BGM	Arron taps P			

13.07	Arron	Loot at it Look at it! Yay!	Dances		BGM, That's right. [p p p opcorn, POPCORN]. Bravo!		EXPO	INDI	AF
13.12	Arron/ Kira	(..)	Kira wants to play and Arron puts her finger on the taplet. Arron pushes Kira away		BGM, Choose the letter that makes the sound muh to complete the word. [m m m].	disagreement between two	EXPO	ARGU	
13.14	Arron	Kira, no!!! it's no! Hey, Kira! No Kira!	Arron pushes Kira's arm away		BGM	disagreement between two	EXPO	FLCI	DA
13.22	Arron/ Kira	(..)	Arron lets Kira touch the screen. taps on the alpabet 's' and 'f'		BGM		EXPO	COLL	
13.25	Arron	This one!	Points at' m' for Kira to see		BGM, That's right. [m m m ilk, MILK]. Bravo!		LA	TUTO	I
13.27	Kira	OK.	Touches 'm'		clicking SFX, BGM		EXPO	COLL	A
13.35	Arron	It's my turn	A pushes Kira away with his left arm		BGM, Choose the letter that makes the sound kuh to complete the word. [k k k].		EXPO	INDI	DA
13.44	Kira	(..)	Keeps pressing 'x'		BGM		EXPO	INDI	
13.51	Arron	Aha, my turn!	Raises his right arm		BGM		EXPO	COLL	AF
13.52	Kira	OK.	Puts finger off the screen		BGM		EXPO	COLL	AN
13.53	Arron	OK.	Presses 'K'		BGM, That's right. [k k k ite, KITE]. Marvelous!		EXPO	COLL	RP
14.01	Arron/ Kira	Yay!	Looks at each other, smiles, claps together and raise arms to tell the researcher				EXPO	COLL	AF
14.21	Researcher	Wow you got a medal!	Stands behind them. Arron and Kira look at the researcher		Well done! You've earned today's award!				

At the beginning of play, Arron behaved in a dominant manner. He pushed Kira's hands away when she attempted to touch the icons on the screen (12.14). This moment can be categorised as PROC because Arron navigated in the app without any reflective analysis. Kira tapped *home* button to exit (12.17) (PROC). Arron constantly held the iPad and tapped *boat*, *home*, and *activity wave* (12.19) (PROC). Kira looked back and appeared unfocussed on the screen (12.31) (PROC). Arron then shouted, "Yay!" while raising a hand and dancing (12.36) (PROC). Although he tapped the correct answer, I coded this as EXPO, not LA because whether he got the correct response using a random tap or knowledge was unclear. Kira seemed so confused and distracted that she attempted to look at the other group's iPad screen on the other side of the table (12.38) (PROC). However, Kira refocussed her attention when Arron tapped the correct answer, *g*, for guitar; the narration said, "G, g, g, guitar." Arron clapped while shouting, "Yaaaas!" and Kira clapped along with him (12.49) (EXPO).

When the page turned to the popcorn screen, Arron tried to show how well he was doing with the activity and tapped the correct answer, *p* – "Hey! I know ABC… Look at me! Hey! (I) know ABC!" (12.59) He continued to get my attention – "Look at it! Look at it! Yay!" – by dancing lightly and clapping while standing up (13.07). I coded this moment as LA because Arron clearly knew the correct answer and was confident in his knowledge of the alphabet". When milk appeared on the screen, Arron put his finger on the tablet (13.13) (EXPO), but he pushed Kira's arm away and did not allow her to touch the screen: "Kira, no! It's no! Hey, Kira! No Kira!" However, Arron immediately changed his mind and let Kira touch the screen, so she tapped *s* and *f* (13.21) (EXPO). Arron directed Kira to the correct answer by saying, "This one!" while pointing at *m* (13.25) (LA). Kira tapped *m* as Arron instructed (13.27) (EXPO). However, Arron pushed Kira away with his left arm and expressed his disagreement with continuing to let Kira play. He said, "It's my turn" (13.35) (EXPO). This time, Kira did not yield and kept tapping *x* on the screen without her partner (13.44) (EXPO). When Arron asked Kira nicely while raising his arm, he said, "Aha, my turn!" (13.51) (EXPO). Kira answered, "Okay," and she let Arron take over

(13.52) (EXPO). Arron repeated Kira's response and tapped *k* (13.53) (LA). Arron and Kira shouted "Yay!" together, looked at each other, smiled, clapped and raised their arms to share with me when I walked closer to their table (14.01) (EXPO). I praised them by saying, "Wow, you got a medal!" The two children moved to the avatar room and continued to play fairly and collaborate until the time ended. They remained in exploratory mode, knowing where to navigate and tap.

In the beginning, Kira and Arron demonstrated procedural cognitive processing; however, they later demonstrated exploratory processing because they were more proficient at navigating the app with purpose and solving problems (i.e., Arron pointed out where Kira should tap on the screen). Moreover, Arron showed some signs of language acquisition when getting the correct answers for popcorn, guitar, and kite. I coded EXPO instead of LA when Arron guessed the first challenge, squirrel, correctly because I considered it too early to judge what he had learned. Afterwards, when Arron continued to get the correct answers with his first choice, I coded those moments (12.59; 13.25; 13.53) as LA.

After iPad time, I stayed during atrium time to observe the children and play basketball with them. One teacher mentioned the children with older siblings tend to operate the iPads more proficiently because they play together with their older siblings, who have more complicated apps than younger children would. After atrium time, some parents arrived to pick up their children early. I was able to interview Arron's father, who claimed that Arron played with the iPad on the way to school and home on the subway, which suggested why he operated the iPad smoothly from the first day. Arron's father only allows him to play during those times, and most of his apps are educational titles, such as *Elmo Loves ABC*. Arron is also a middle child with an older brother and a younger sister. Arron's father explained that he emphasises reading many traditional books at home. Not all the children were familiar with the alphabet, but Arron already had advanced knowledge for a preschooler. Arron's father added that using the iPad could supplement the literacy practices the children gain during their literacy hours. His sharing of a positive view on practising literacy skills on iPads was helpful to understand some perspectives of parents' education preferences at home.

The overall classroom dynamic during iPad time was lively this day. The teacher's question prior seating the children with their partners could have had a positive impact. The teacher asked, "Do you have any questions to Iva about the iPad? How do you play?" One answered, "Keep the animal safe!" Another answered, "Play with lots of animals!" The teacher continued, "Okay, let's get started!" During weeks 5, 6 and 7's literacy hours, the children read books about animals and insects, such as *This is the Farmer by* Nancy Tafuri, *The Very Hungry Caterpillar* by Eric Carle, *The Caterpillar and the Polliwog* by Jack Kent, and *Caring for Nature* by Charlotte Guillain. In Week 5, the teachers brought cocoons in a box to raise with the children as a part of the school's curriculum, which was already planned in the beginning of the year, but the teachers intentionally picked more animal oriented books and read the Aniland books during the reading time to enhance connections between the app and the environment. The children in the classroom created a chart (Figure 7.11) and observed these cocoons as they transformed to butterflies over the course of three weeks. Because of this environment, the children seemed more interested in living organisms and nature beginning this week. During independent reading time, they picked the

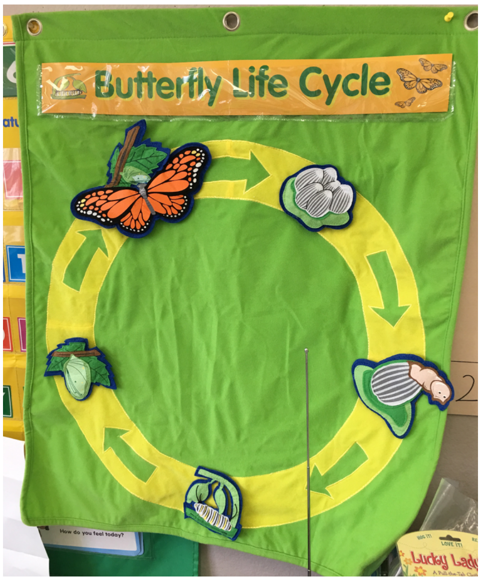


Figure 7.11. A chart of a butterfly's life cycle

books mentioned above. These books were not directly related to Aniland, but I learnt that the children liked and cared for animals; this led to a positive learning experience.

7.3 End phase

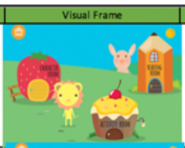
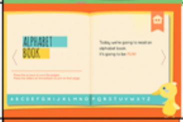
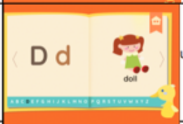
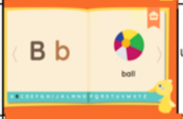
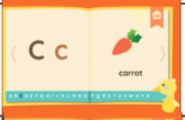
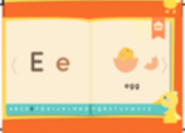
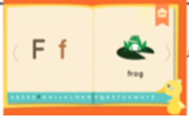
7.3.0 Preview

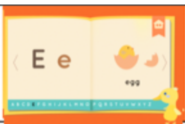
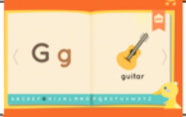
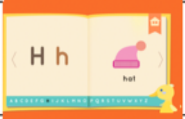
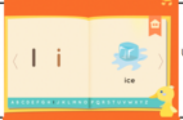
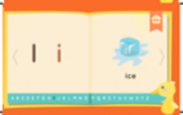
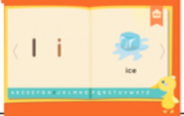
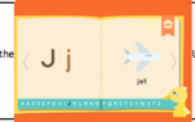
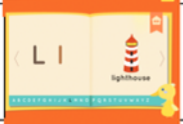
In the following examples from the final phase, children maintained an exploratory (EXPO) mode fairly well compared to in previous phases. I noticed a tremendous difference in children's meaning-making and length of engagement with the reading room on the iPad after the paper version of the alphabet book was introduced in Week 7 during the literacy hour. Children exhibited several instances of literacy acquisition (LA) of letters, to the extent that they were able to come up with different words starting with the letters they saw in the reading room (e.g., ice cream for I and dinosaur for D). Also, collaborative pretend play—for instance, imitating a dinosaur's roar—showed the possibility of connecting online and offline behaviours for learning and entertainment. Children chose correct responses in the activity room more frequently than in previous phases, which could signal a possible connection to increase literacy acquisition.

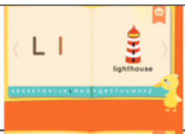
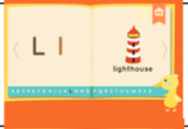
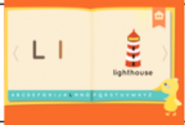
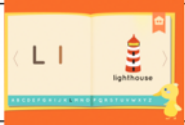
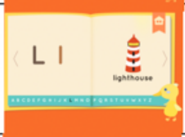
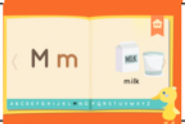
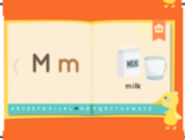
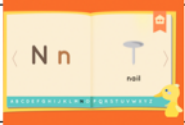
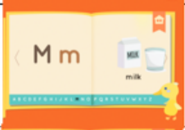
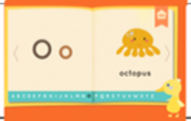
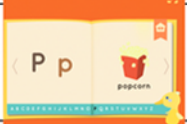
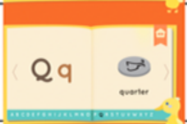
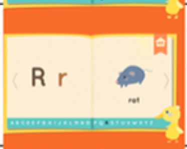
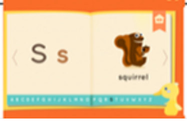
7.3.1 Example 1

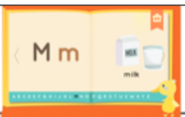
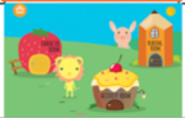
In Week 8 in Classroom 2, the children participated in a dancing activity when I arrived. After I finished setting up the equipment, I went to the centre area and sat down with the children. I showed and reminded them how I to navigate to the rhyming room. I encouraged them to find the rhyming book and read it. The teacher called out the children's names and had them sit down. The transcription below in Table 7.8 portrays Eddie and Leo's interaction.

Table 7.8. *Transcription from Week 8*

Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
8.43	Leo	(...)	Taps on the reading room		Clicking SFX, BGM		PROC	INDI	
8.49	Researcher	Right that's the alphabet reading room!			Clicking SFX, BGM				
8.50	Leo	Oh I can!	Turns the page and keeps tapping to the next page		Today we 're going to read an alphabet book. It's going to be fun! Press the arrows to turn the pages. Press the letters at the bottom to jump to that page.		EXPO	INDI	AF
8.54	Eddie	Stop! Dinosaur!	Taps next and stops at D		Uppercase D, Lowercase d – doll, D is for doll.		LA	INDI	AF
9.01	Leo	Rawr! Dinosaur!			BGM	Relates D to something they like about	IN	COLL	I
9.04	Eddie	Dinosaur! Rawr!			Clicking SFX, BGM	Relates D to something they like about	IN	COLL	I
9.08	Leo	(...)	Taps back button (to b)		Uppercase B, Lowercase b – ball, B is for ball.		EXPO	DOMI	
9.16	Eddie	B!			BGM		EXPO	COLL	I
9.18	Leo	ball	Taps the next button, C		Uppercase B, Lowercase b – ball, B is for ball.		EXPO	COLL	I
9.21	Eddie	cat!			Uppercase C, Lowercase c – carrot, C is for carrot.	Applies cat	LA	COLL	I
9.23	Leo	D	Taps		Uppercase D, Lowercase d – doll, D is for doll.		EXPO	COLL	I
9.25	Eddie	E			Uppercase E, Lowercase e – egg, E is for egg.		EXPO	DOMI	I
9.26	Researcher	E	Comes next to Leo and repeats after Eddie		clicking SFX, BGM		EXPO	INDI	I
9.28	Leo	F	Taps the next button		Uppercase F, Lowercase f – frog, F is for frog		EXPO	INDI	I

9.29	Eddie	(...)	Turns to the next page		clicking SFX, BGM		EXPO	DOMI	
9.31	Leo	G	Turns to the next page		Uppercase G, Lowercase g – guitar, G is for guitar.		EXPO	COLL	I
9.35	Eddie	H			Uppercase H, Lowercase h – hat, H is for hat.		EXPO	COLL	I
9.36	Researcher	very good guys!			BGM				
9.38	Leo	hat	Turns to the next page		Clicking SFX, BGM		EXPO	COLL	I
9.40	Eddie	I, Ice			Uppercase I, Lowercase i – ice, I is for ice.		EXPO	COLL	I
9.45	Leo	Ice			BGM		EXPO	COLL	I
9.46	Researcher	very good. Is ice blue?			BGM				
9.49	Leo	Yes, it's blue			BGM		EXPO	COLL	AN
9.56	Eddie	Ice cream!			BGM		LA	COLL	I
9.58	Leo	Ice cream!	Turns to the next page		clicking SFX, BGM		LA	cOLL	I
10.01	Leo/Eddie	[J!]	Shouts together and Leo taps the next button		Uppercase J, Lowercase j – jet, J is for jet.		EXPO	COLL	I
10.04	Leo	cake! happy birthday!	Shows the lighthouse to Eddie	 L l lighthouse	Uppercase L, Lowercase l – lighthouse, L is for lighthouse.		EXPO	COLL	I
10.05	Eddie	(...)	Looks at other group	L l lighthouse	BGM		PROC	OFF	
10.06	Leo	Look! happy birthday!		L l lighthouse	BGM		EXPO	COLL	I
10.09	Eddie	Lighthouse, lighthouse!		L l lighthouse	BGM		EXPO	TUTO	I

10.11	Leo	House? What?		 L l lighthouse	BGM		EXPO	COLL	Q
10.13	Eddie	Light-house!		 L l lighthouse	BGM		EXPO	TUTO	AN
10.15	Leo	Lighthouse?		 L l lighthouse	BGM		EXPO	COLL	Q
10.19	Leo	L	Points at the L on the screen	 L l lighthouse	BGM		EXPO	COLL	AF
10.20	Eddie	L!		 L l lighthouse	BGM		EXPO	COLL	AF
10.21	Leo	M			Uppercase M, Lowercase m –milk, M is for milk.		EXPO	COLL	I
10.26	Eddie	Milk!			BGM		EXPO	COLL	I
10.33	Leo	Quack, quack, quack (xxx)	Shakes his shoulders		Uppercase N, Lowercase n – nail, N is for nail.	Sound is not clear. he wants to express something extended to the page	IN	COLL	AF
10.37	Eddie	(...)	Taps the next button		clicking SFX, BGM		EXPO	COLL	
10.38	Leo	(...)	Pushes Eddie's hand away and keeps turning the page		Uppercase O, Lowercase o – octopus, O is for octopus.		EXPO	DOMI	
10.43	Leo	p			Uppercase P, Lowercase p – popcorn, P is for popcorn.		EXPO	COLL	I
10.44	Eddie	Q			Uppercase Q, Lowercase q - quarter, Q is for quarter.		EXPO	COLL	I
10.47	Leo/Eddie	[R]			Uppercase R, Lowercase r – rat, R is for rat.		EXPO	COLL	I
10.53	Eddie	Z!		 S s squirrel	Uppercase S, Lowercase s – skate, S is for skate.	S	EXPO	COLL	I

10.54	Leo	Squirrel!	Taps to the next page		clicking SFX, BGM		EXPO	COLL	I
10.55	Eddie	T			Uppercase T, Lowercase t – tree, T is for tree.		EXPO	COLL	I
10.59	Leo	U	Taps to the next page	U u umbrella	Uppercase U, Lowercase u – umbrella, U is for umbrella.		EXPO	COLL	I
11.00	Researcher	U	As passing by the group		clicking SFX, BGM				
11.03	Eddie	V			Uppercase V, Lowercase v – van, V is for van.		EXPO	COLL	I
11.04	Leo	V!	Taps to the next page		clicking SFX, BGM		EXPO	COLL	I
11.05	Eddie	W		Ww watermelon	Uppercase W, Lowercase w – watermelon, W is for watermelon.		EXPO	COLL	I
11.06	Leo	W		Ww watermelon	BGM		EXPO	COLL	I
11.07	Eddie	watermelon			clicking SFX, BGM		LA	COLL	I
11.09	Leo	X		X x xylophone	Uppercase X, Lowercase x – xylophone, X is for xylophone.		EXPO	COLL	I
11.11	Eddie	Y			Uppercase Y, Lowercase y – yarn, Y is for yarn.		EXPO	COLL	I
11.13	Leo	Y, Z	Taps to the last page		Uppercase Z, Lowercase z - zigzag, Z is for zigzag.		EXPO	COLL	I
11.16	Eddie	Yay! the end			Woohoo, that was a lot of letters. You are a great reader! The End!		EXPO	COLL	I
11.17	Leo	The end!			BGM	screen returns to the main page	EXPO	COLL	I

Since Week 5, the teachers had called on some children first and allowed them to pick their partners. The children got along with all the others, and there was a rare opportunity to observe the partners' repetition. Table 7.8 above illustrates Leo and

Eddie’s interaction engaging in the Aniland app in Week 8. From the beginning, the two cooperated and showed equal participation. Leo tapped the alphabet reading room (8.43), and I coded it PROC, as the intention of entering the reading room was not clear then. But I coded the immediate EXPO when Leo focussed on the book and showed confidence with the statement, “Oh, I can!” after the narration on the introductory page (8.50). Leo turned the page to “D,” and Eddie shouted, “Stop! Dinosaur!” (8.54), which could be interpreted as literacy acquisition (LA), since he recognised the letter “D” and applied it to another word starting with it. Then Leo added, “Rawr! Dinosaur!” and extended it to a pretend play (9.01) (IN). As a response to Leo’s playful action, Eddie repeated and roared, “Dinosaur! Rawr!” (9.04) (IN).

Continuing with the alphabet book, Leo tapped the back button and stopped on the “B” page (9.08) (EXPO). Eddie looked at the page and said, “B!” (9.16) (EXPO). When tapping to the next page, Leo responded with, “Ball” (9.18) (EXPO). On the letter “C” page, Eddie expressed, “Cat!” although carrot was on the page. In the same interpretation as applying dinosaur for “D,” I coded this as LA. Leo tapped to the next page and said, “D” (9.23) (EXPO). Then, on the next page, Eddie read the letter “E” (9.25) (EXPO). I came to check on their progress and repeated, after Eddie, “E” (9.26). On the next page, Leo read “F” and tapped the next button (9.28) (EXPO). No one read the letter “E,” and Eddie moved on to the next page (9.29) (EXPO). Leo said, “G,” while tapping the next page button (9.31) (EXPO). I watched them play from behind and praised their progress: “Very good guys!” (9.36). Then Leo added, “Hat,” as shown on the screen (9.38) (EXPO). Children have fluidly taken turns in reading each page thus far.

On the letter “I” page, Eddie said, “I, Ice!” (9.40) (EXPO), and Leo repeated, after him, “Ice” (9.45) (EXPO). I attempted to interact with the two by saying, “Very good. Is ice blue?” (9.46), and Leo answered, “Yes, it’s blue” (9.49) (EXPO). Then

Eddie shouted, “Ice cream!” (9.56) and I coded this moment as LA, as he applied a new word in relation to the letter. Leo repeated after Eddie, “Ice cream!” (9.58) (LA). On the “J” page, they shouted together, “J!” (EXPO) (10.01). When Leo saw the lighthouse image on the “L” page and tilted the iPad towards Eddie, he expressed “Cake! Happy birthday!” (10.04) (EXPO). However, Eddie was not looking at the screen at the moment (10.05) (PROC). Leo again turned the iPad closer to Eddie and said, “Look! Happy birthday!” (10.06) (EXPO). Eddie corrected Leo, who interpreted the lighthouse as a cake: “Lighthouse, lighthouse!” (10.09) (EXPO). Leo was astonished and said, “House, what?” (10.11) (EXPO). Eddie answered with a clear tone for Leo: “Lighthouse!” (10.13) (EXPO); and Leo thought for a moment and again questioned, “Lighthouse?” (10.19) (EXPO). This time, Leo pointed at “L” (10.19) (EXPO), and Eddie repeated, after him, “L” (10.20) (EXPO). Leo moved onto the next page and said, “M” (10.21) (EXPO). Eddie added, “Milk!” (10.26) (EXPO). They kept alternating without any trouble from this point and read each alphabet letter of all the way to the Z. The reading room’s book did not flip by itself; therefore, the children had full control over the pace.

Some interactions between two children indicated literacy acquisition (LA) and innovation (IN). I only coded LA for the instances when children applied new words for the letters, but not when they described the objects on the screen. I believed literacy acquisition might be considered as evidenced when children had internally absorbed the alphabet letters, letter sounds and the relation to the words that contained those letters. For example, when the children recognised the letter D (8.54), they related the D to what they were interested in—dinosaur—despite a doll being on the screen already. Then, to another level, the children made roaring sounds to play with each other, coded as innovation where children created an extended or pretend play on their own.

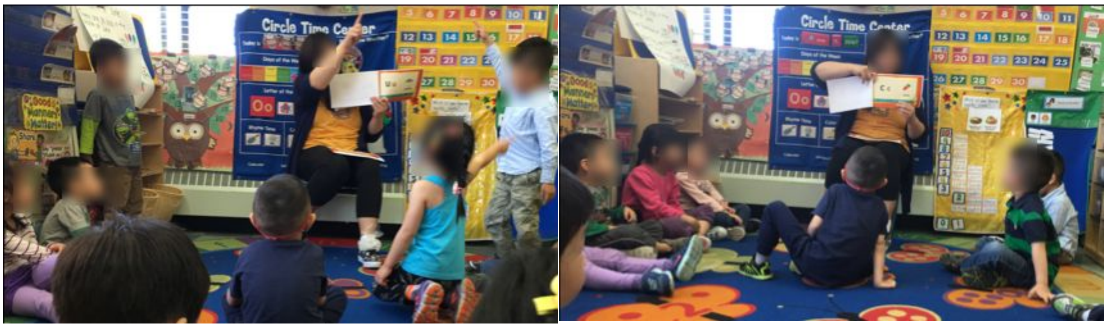


Figure 7.12. A teacher reads the printed version Aniland in Week 7

Prior to this week's iPad day, held on Tuesday as usual, I visited Classroom 2 and attended the literacy hour on Friday of Week 7. The entire class started off by singing and dancing to "Head, Shoulders, Knees and Toes" at various speeds. The children enjoyed the fastest speed. When the children sat down on the carpet using "criss-cross applesauce," referring to crossing their legs, they instantly behaved better, listened to the teacher, remained quiet as needed, and raised their hands to speak.

The teacher read the book of the day called *Caring Nature Caring for Nature* by Charlotte Guillain. and emphasised that the environment is everything around us and why we should not throw garbage on the floor. Then, the teacher read the printed version of Aniland alphabet book (See Appendix 1) that exactly matches the app version (Figure 7.12). She went through each letter with examples that start with those letters in the book. She asked the children to repeat after her, saying each letter. Also, she sometimes asked the children to write in the air while repeating after her or asked questions like "whose name starts with the letter D?" After reading the book, everyone sang the ABC song together. Presumably, reading the Aniland alphabet book during this literacy hour motivated the children to spend more time on the alphabet reading room the following week, like the example illustrated in Table 7.8

above. As a result, the concentration level for reading the alphabet books was high in the following week, Week 8 for Classroom 2.

7.3.2 Example 2

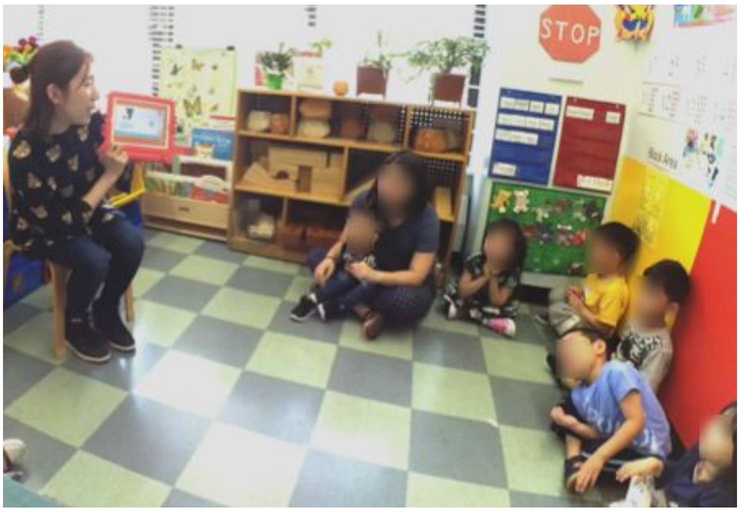
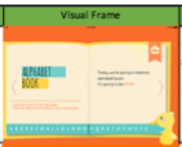
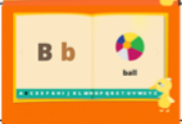
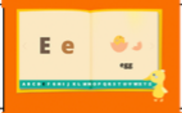
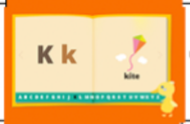
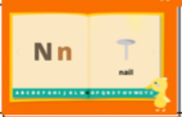
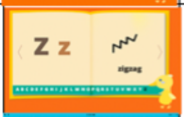
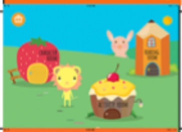
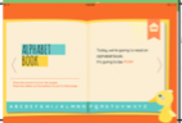
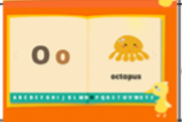
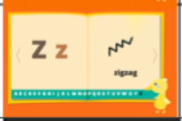
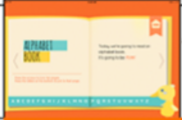
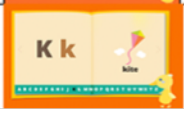


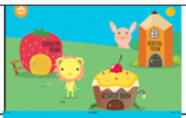
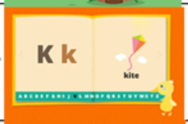
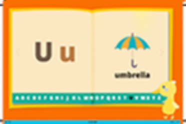
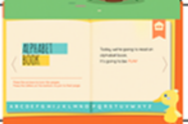
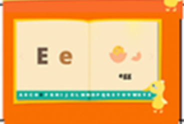
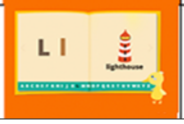
Figure 7.13. Reading the letter sound book on an iPad

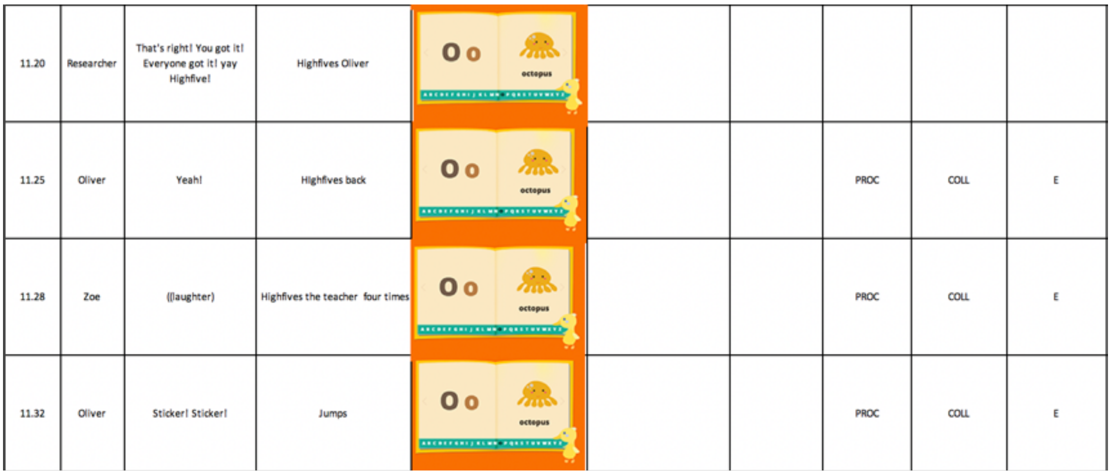
In the beginning of Week 9's iPad time, I pointed out my bear T-shirt and introduced the bear character (Figure 7.13). First, I started by reading, "My name is Baxter. I am a bear. I love to play with my ball. Oh, wait! Baxter, Bear, and Ball all start with the letter B. B!" "Baxter starts with the letter B, [Buh, Buh, Buh]". Then, the children were asked to find the first initials of their names and show them to me on the screen. For example, I asked, "Whose name starts with B?" Some children shouted "Betty!" and "Bella!" I asked them if they can find the letters at the beginning of their names and show them to me or the teachers. In this way, I explored whether children could engage and navigate with a purpose that could enhance meaning-making experiences more than open-ended play.

This time, three children—Zoe, Kylee, and Oliver— were grouped instead of a pair because three children were absent that day, resulting in an odd number in total. The interaction among the three is as shown below in Table 7.9.

Table 7.9. *Transcription from Week 9*

Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	å	Cognitive process	Social process	Language functions
8.47	Zoe/Kaylee	(...)	Tap together		Today we 're going to read an alphabet book. It's going to be fun! Press the arrows to turn the pages. Press the letters at the bottom to jump to that page, BGM		PROC	COLL	AE
9.05	Zoe	(...)	Taps		Uppercase B, Lowercase b – ball, B is for ball, BGM		PROC	INDI	E
9.22	Teacher	Let Kaylee go first.			Uppercase E, Lowercase e – egg, E is for egg, BGM				
9.24	Oliver	It's right there	Points at K		Uppercase K, Lowercase k – kite, K is for kite, BGM		EXPO	TUTO	I
9.25	Teacher	Let Kaylee do it.			Uppercase N, Lowercase n – nail, N is for nail, BGM				
9.26	Zoe	(...)	Points at Z		Uppercase Z, Lowercase z - zigzag, Z is for zigzag, BGM		EXPO	PROB	E
9.27	Oliver	(...)	Turn all the pages and exit the room		Clicking SFX, BGM		EXPO	INDI	'
9.29	Zoe	(...)	Enters the reading room again and turns the page		Today we 're going to read an alphabet book. It's going to be fun! Press the arrows to turn the pages. Press the letters at the bottom to jump to that page, BGM		EXPO	INDI	AE
9.39	Oliver	O, o, o, I find my letter!	Kaylee turns the page		Uppercase O, Lowercase o – octopus, O is for octopus, BGM		EXPO	PROB	I
9.41	Kalyee	(...)	Stops at Z		Uppercase Z, Lowercase z - zigzag, Z is for zigzag, BGM		EXPO	PROB	AE
9.44	Oliver	(...)	Turns off the screen by accident				PROC	OFF	AE
9.46	Researcher	Umm...	Finds the alphabet book for them		Today we 're going to read an alphabet book. It's going to be fun! Press the arrows to turn the pages. Press the letters at the bottom to jump to that page, BGM				
9.49	Kalyee	My name!	Points at K		Uppercase K, Lowercase k – kite, K is for kite, BGM		EXPO	PROB	I

9.54	Teacher	Alright! Now zoe goes first. Find z and then Owen you can find Oliver and show it to researcher and then Kaylee she can find her letter.			Clicking SFX, BGM				
10.08	Oliver	I can't see it. I want to show her.			BGM		EXPO	FUSI	I
10.19	Teacher	Ok Kaylee! Please find yours.	Points at Kaylee		BGM				
10.25	Kaylee	(...)	Looks through calmly and find 'K'		Uppercase K, Lowercase k – kite, K is for kite, BGM		EXPO	PROB	AE
10.40	Zoe	(...)	looks elsewhere		BGM		EXPO	OFF	AE
10.43	Kalyee	(...)	shows K to researcher		BGM		EXPO	PROB	I
10.47	Researcher	Oh yes great job! Did they all find them? Oliver, it's your turn!	Talks to Kaylee Talks to both		BGM				
10.50	Oliver	(...)	Nods and gets the iPad and look through letters		BGM		EXPO	INDI	AE
10.51	Zoe	(...)	Leaves the taple		done showing her alphabet		PROC	OFF	AE
10.54	Oliver	(...)	Leaves the alphabet room and press it many times to get back in		Clicking SFX, BGM		EXPO	INDI	AE
11.04	Researcher	You have to press it firmly	Helps tapping the room						
11.08	Oliver	(...)	Looks for O				EXPO	INDI	AE
11.15	Oliver	(...)	Finds O and taps his head and stands up				EXPO	PROB	I



11.20	Researcher	That's right! You got it! Everyone got it! yay Highfive!	Highfives Oliver	Oo octopus					
11.25	Oliver	Yeah!	Highfives back	Oo octopus			PROC	COLL	E
11.28	Zoe	((laughter)	Highfives the teacher four times	Oo octopus			PROC	COLL	E
11.32	Oliver	Sticker! Sticker!	Jumps	Oo octopus			PROC	COLL	E

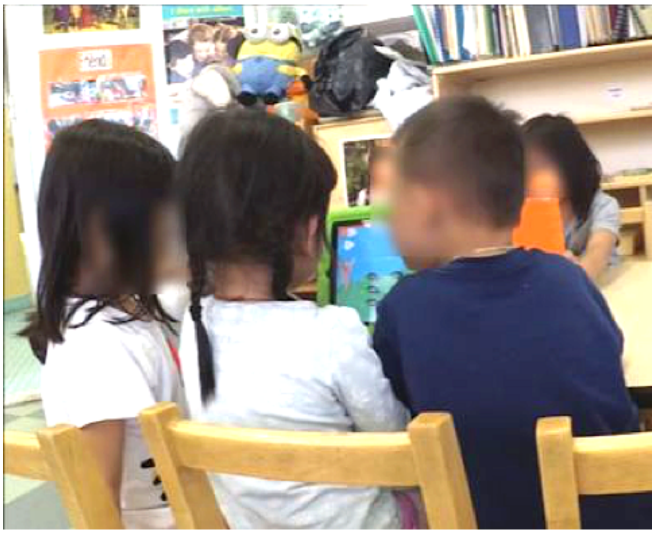


Figure 7.14. Three children share an iPad in Week 9

Three children sat down on the chair when called by a teacher: Oliver (right), Zoe (middle) and Kaylee (left) from the camera's point of view, as shown in Figure 7.14. Zoe and Kaylee tapped together in the alphabet book to turn the page (8.47), and yet they seemed to navigate without any reflective analysis (PROC). Zoe tapped more intensely (09.05) and kept turning the pages (PROC). Although the teacher asked the group to let Kaylee go first (9.22), Zoe did not stop. When the page stopped at K, Oliver said, "It's right there!" (9.25) toward Kaylee and then the teacher. I coded this as EXPO because Oliver seemed to be aware of today's mission and tried to help Kaylee. The teacher again encouraged Kaylee to get involved and have a turn (9.25). Still, Zoe was tapping the screen, and found and pointed at 'Z' (9.26) (EXPO); unfortunately, neither the teacher nor I perceived this in the moment. Then Oliver turned to the final page (9.27) and exited the reading room (PROC). Zoe quickly tapped the reading room again and restarted the alphabet book (9.29) (EXPO). Oliver took his turn (9.39) and searched for ‘O’; once he found it, he shouted with joy, “O, O, O, I find my letter!” (EXPO). Kaylee turned the pages and stopped at page ‘Z’ (9.41). Although I was not sure whether the intention was to help Zoe or not, I coded this moment EXPO as Kaylee was observing the contents of the book.

Oliver unintentionally turned off the screen (9.44) by pressing the sleep/wake button on the iPad. I turned it back on and restarted the alphabet book (9.46). At that point, Kaylee actively looked for her name initial (9.49) and shouted, “My name!” while pointing at ‘K’ (EXPO). Unfortunately, neither I nor a teacher was present at the table to see Kaylee showing K. A teacher went to the table and told Zoe, Oliver and Kaylee to finish the mission in order (9.54). Oliver took the iPad and started again from the main page. He seemed to be a bit frustrated that he could not quickly show the ‘O’ page to the teacher (10.08) but was still coded as EXPO because he was analysing the app correctly and knew how to get to the desired page. The teacher asked Kaylee to find hers this time (10.19). She immediately looked through (15.25) and found ‘K’ without any hesitation (EXPO). Zoe had been patiently waiting for her turn, seemed a bit lost (10.40) and looked elsewhere (PROC). Kaylee shared ‘K’ with me (EXPO) as I walked to the table (10.43). I praised Kaylee for finding it with “Great job!” and asked the teacher if they all found the letters. Then I said, “Oliver, it’s your turn!” Oliver nodded (10.50) and got the iPad to find the letter with his first name’s initial (EXPO). Meanwhile, Zoe left the table (10.51) (PROC).

With continuous tapping, Oliver had a hard time getting back into the reading room (10.54), and I coded this EXPO because he was working toward the mission correctly. I told him to press it firmly (11.04) and he was able to able to enter the reading room to look for ‘O’ (11.08) (EXPO). He found ‘O’ (11.15) and shared it with me (EXPO). I gave him a high five. Zoe came back to the table (11.28) and high-fived me four times just imitating Oliver in the physical world (EXPO). Oliver jumped around and asked for “Sticker! Sticker!” (11.32) as a reward for the day (EXPO). I coded their appraisal and celebration of finishing the mission as EXPO, since I considered it a part of their problem-solving skills and extended feedback on the app.

In fact, this day’s iPad activity was a continuation of alphabet learning, particularly letter sounds from an offline activity. I arrived early to set up iPads and camera equipment; hence, I had time to join the literacy time. Children were learning letter sounds with a teacher. Then, they read a book called *No, David* by David Shannon, with a cover showing a child who is about to drop into a fish tank. The teacher read the title and emphasized “David starts with D, like David; D, D, D”. Everyone repeated after her, “David, D, D, D!” The teacher started by looking at the picture on the cover; she asked the children, “What is going to happen?” One child responded, “Fish will fall!” On the page where David was reaching up high to get cookies from a jar, the kids said, “I can’t look,” which means they imagined the jar falling from a static picture.

On a page where toys were messily spread about on the floor, the teacher asked, “You can clean by yourself, right?” Everyone said, “Yes!” Then, the teacher let me sit down on her chair to give an introductory session about how to find the letter sound book, as previously illustrated on page 15. None of interactions indicated LA; however, the classroom story time and the introduction of the day implied an association of literacy practices on alphabet letters and phonics between offline and online spaces.

Figure 7.15. Playground time in the neighbourhood

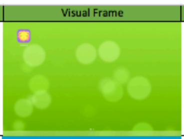
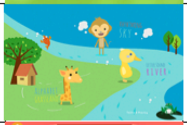
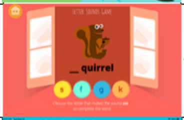
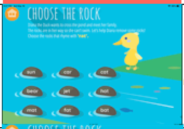
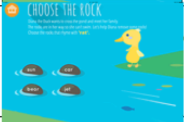
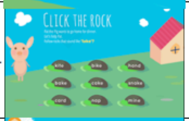
In addition, I noticed the children's likeness in the animal characters in the app and talked about it outside of the classroom. I interviewed one mother of a girl from Classroom 1 in Week 8. Britany told her parents she played with a monkey and a lion on an iPad for the past weeks and she likes the monkey the best. Her mother reported Britany's positive view of Aniland, stating that the contents of the app were a part of the daily conversations between her and her child at home especially on Tuesdays when she had an iPad hour in school. Britany reported she played with animals and learnt alphabet words. This was a meaningful parent–child communication at home, and if this develops, then students can remember more rhyming words from Aniland in school and practise at home.

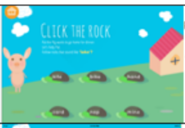
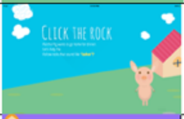
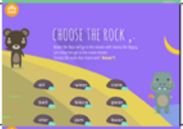
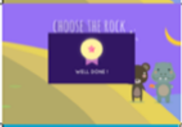
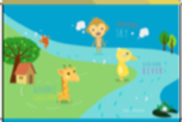
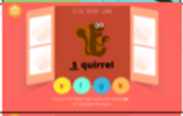
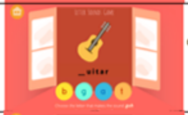
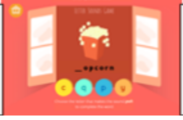
In Week 9, the teachers let me join to the outdoor playground in the neighbourhood on a beautiful day. When we arrived at the playground, the teacher talked about the safety rules and the children had a free play (Figure 7.15). Then, a boy was hanging on a monkey bar by my side, and he imitated the monkey sound, "Woo, woo, ah, ah!" possibly, his action implied the monkey character he saw on the app and expressed to me his remembrance of what he played on the app. I found an opportunity of making connection between the app and their real lives through the animal characters.

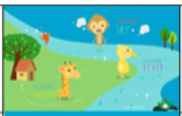
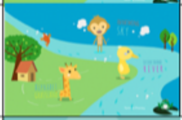
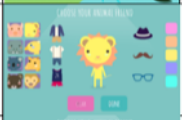
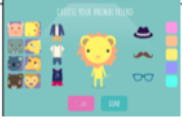
7.3.3 Example 3

In the beginning of Week 10's iPad time in Classroom 2, like any other weeks, the first half of the class sat on the table as pairs. I gave the children a brief introduction and a mission, "Today is the last day you will be playing Aniland. Please go to the activity wave, play it and show me the medal. I have something special for you today!" The children in pairs tapped on the screen and engage in the app. The following Table 7.10 portraits the interaction between Selena and Leo.

Table 7.10. *Transcription from Week 10*

Time	ID	Spoken word	Bodily conduct	Visual Frame	Sound Track	Additional notes	Cognitive process	Social process	Language functions
4.19	Researcher	Please go find the activity wave and then show me the medal. I have something special for you today.	Tells all the children						
4.39	Selena	(..)	Pulls the iPad to herself and taps the app, alphabet activity room		clicking SFX, BGM		PROC	DOMI	
4.44	Leo	I can't see	Stands up and move his upper body toward the iPad		Choose the letter that makes the sound [s] to complete the word.		PROC	COLL	AF
4.47	Selena	Look at it! Yeah!	Puts back to the middle of the table and taps the activity wave, exits, goes to the rhyming day's activity rainbow. Taps cat (O), hat (O) and fat (O) without any hesitation. Then taps car (X), jet (X), Mat (O), fat (O) and then, looks at Leo's face		Choose the rocks that rhyme with 'rat.' Remember, rhyming words sound similar		EXPO	INDI	AF
5.13	Leo	My turn!	Looks at Selena		Cat, hat, bat, fat, mat. Great job! You helped Diana the Duck cross the pond safely and meet her family.		EXPO	FLCI	AF
5.17	Selena	Two? (xxx) Ok?	Pulls iPad and puts in front of her.		BGM		EXPO	PROB	AF
5.23	Leo	My turn! My turn!	Stands up to see the screen better	CLICK THE ROCK	BGM		EXPO	FLCI	AF
5.28	Selena	Yay!	Taps snake (O), cake (O), bake (O)	CLICK THE ROCK	BGM		LA	DOMI	AF

5.34	Leo	My turn!	Graps the iPad	 CLICK THE ROCK	Pat the Pig wants to go home for dinner. Let's help Pat choose the rocks that rhyme with 'lake'. Remember, rhyming words sound similar!		EXPO	FLCI	AF
5.39	Selena	No!		 CLICK THE ROCK	Wonderful! You helped Pat home safe for dinner.		EXPO	FLCI	AF
5.41	Leo	Why?		 CHOOSE THE ROCK	BGM		EXPO	FLCI	Q
5.43	Researcher	Oh Selena! You need to share.		CHOOSE THE ROCK	Lawrence the Lion will go to the movies with Baxter the Bear.				
5.47	Leo	She does not give me, she does not give me		CHOOSE THE ROCK	Let's help him get to the movie theater. Choose the rocks that rhymes with 'bear'!		EXPO	FLCI	AF
5.57	Selena	Ok. You too!		CHOOSE THE ROCK	BGM		EXPO	PROB	AF
5.59	Leo	Taps care (O), bear(O), pear(O), wear(O), air (O)		CHOOSE THE ROCK	BGM, care, bear, pear, wear, air	Selena is watching	EXPO	COLL	AF
6.08	Selena	Ms. Iva not working!		CHOOSE THE ROCK	BGM		EXPO	FUSI	Q
6.11	Researcher	It is. You have to listen. It's telling you the answers. That's right! You are gonna get a medal!		CHOOSE THE ROCK	Air, wear, care, pear, bear. Bravo! Now Lawrence can go to the movies with Baxter.				
6.17	Selena/ Leo	Yay!	Shouts together!	 CHOOSE THE ROCK WELL DONE!	You've earned today's award! Well done!		EXPO	COLL	AF
6.19	Researcher	Did you guys go into the letter sound game too? Now let's go find another game. Can you guys find it? - inturpted video out of memory			clicking SFX, BGM				
6.45	Selena	(..)	Takes off her socks and puts back her shoes		clicking SFX, BGM		EXPO	OFF	
6.50	Leo	Yay! I got a squirrel! Yay!	Enters the letter sound game and gets the question right quickly with one tap on s (O)	 s quirrel s f g k	Choose the letter that makes the sound [s] to complete the word. That's right. [s s s] squirrel. Excellent!		LA	INDI	AF
6.57	Selena	(..)	Leaves the table with her socks		Choose the letter that makes the sound [g] to complete the word.		PROC	OFF	
7.01	Leo	(..)	Taps on g (O)	g uitar b g o t	[g g g]. That's right. [g g g] guitar]. Wonderful!		LA	INDI	
7.07	Selena	(..) Ducky!	Come back to the table, graps the iPad and taps c(X) 7 times, 1(X) 3 times and then p(O). Before moving on to the next page, she taps the home button. Tries to tap on the duck.	 _opcorn c q p y	Choose the letter that makes the sound [p] to complete the word. That's right. [p p p] popcorn. Bravo!		EXPO	INDI	AF

8.28	Leo	Ducky! Ducky! Ducky!	Blocks Selena's hand and taps duck.		clicking SFX, BGM		EXPO	DOMI	AF
8.34	Selena	(..)	Rests her chins on her hand and watches		clicking SFX, BGM		EXPO	COLL	
8.41	Leo	(..)	Taps the character dune.		Let's choose your animal friend for today's adventure!		PROC	INDI	
8.54	Researcher	Ok Leo and Selena. Great job! I have something for you. Let's go to the rug area.			clicking SFX, BGM				

Selena immediately dominated the iPad, placing it closer to herself, and tapped the alphabet activity room without input from Leo (4.39); I coded this moment PROC because there was no clear purpose for entering the alphabet sound activity. Leo complained, “I can’t see it” and stood up to see the screen, which was blocked by Selena’s body (4.44) (PROC). Selena put the iPad back in the middle of the table, exited the letter sound activity, and moved to the rhyming activity; she tapped *cat* (correct), *hat* (correct), and *fat* (correct) without any hesitation; then tapped *car* (incorrect), *jet* (incorrect), *mat* (correct), and *fat* (correct); when she was finished, she looked at Leo’s face, telling him “Look at it! Yeah” (4.47) (EXPO). Leo longed for a chance to play, so he told Selena, “My turn!” (5.13) and listened to the narration: “Cat, hat, bat, fat, mat. Great job! You helped Diana the Duck cross the pond safely and meet her family.” (EXPO).

Selena tried to negotiate “Two? (xxx) OK?” implying that she wanted to solve two challenges; she had finished one already, so there was one more to complete (5.17) (EXPO). However, Leo did not understand her suggestion, probably due to the lack of clarity in her speech, and persisted in wanting to play, saying, “My turn! My turn!” (5.23) (EXPO) while standing up to see the screen better. Selena kept playing regardless of Leo’s protest and tapped all correct answers: *snake*, *cake*, and *bake*

(5.28). Despite Selena's dominant behaviour during playtime, she improved far more than she had during iPad time in previous weeks; she guessed all the rhyming responses correctly in a row on the pig's page, so I coded this moment LA.

Eventually, Leo became upset and grasped the iPad to take over (5.34) (PROC). Selena would not yield and responded, "No!" (5.39) (PROC). Then, Leo looked confused and asked Selena, "Why?" (5.41) (PROC). From the other side of the classroom, I had watched them arguing and came over to their table, saying, "Oh, Selena! You need to share." (5.43). Leo explained to me, "She does not give me, she does not give me" (5.47) (PROC). Selena agreed to let him play. "OK. You too!" (5.57) (PROC) thus solving their sharing problem. I was surprised to see Leo's improvement; he chose all the correct responses with no incorrect input at all. Leo tapped *care*, *bear*, *pear*, *wear*, and *air* (5.59) (LA). Then, Selena said to me, "Ms Iva, not working!" while looking at the screen (6.08) (PROC). I came to her and explained that she needed to wait until the narrator repeated the correct answers (6.11). Both shouted "Yay!" when the page turned to the medal and they heard "Well done!" (6.17) (EXPO). The screen returned to the main screen.

With a beeping sound, the camera filming the children shut down due to being out of memory. I found another one to replace it, and meanwhile children were waiting for me, though I did not instruct them to do so (6.21). Selena took off her shoes and socks and put her shoes back on (6.45). When the camera was ready, Leo entered the letter sound game and tapped the correct response, *S,* to complete squirrel (6.50); I coded this as LA because he was confident about the answer. Suddenly, Selena stood up and left the table with her socks (6.57) (PROC). Leo kept playing by himself, tapping on the correct response, G, for guitar (7.01) (LA). At that point, Selena came back to their table, pulled the iPad toward herself and tapped C (incorrect) 7 times, L (incorrect) 3 times, then P (correct), exited the page and tried to tap on the duck, shouting "Ducky!" Quickly, Leo pushed Selena's hand and tapped the duck: "Ducky! Ducky! Ducky!" (8.28) (EXPO). Leo tapped the character dune and was about to start creating something (8.41) (EXPO). Since it was the last day, I had to end the session 9 minutes early, as we had a review and award time; trophies were ready with each child's favourite animal character sticker (Figure 7.16). I had asked all the children what their favourite animals were during Week 8. Therefore, Leo and Selena played up to that point and then enjoyed the centre time until the second half of the class finished their turn.

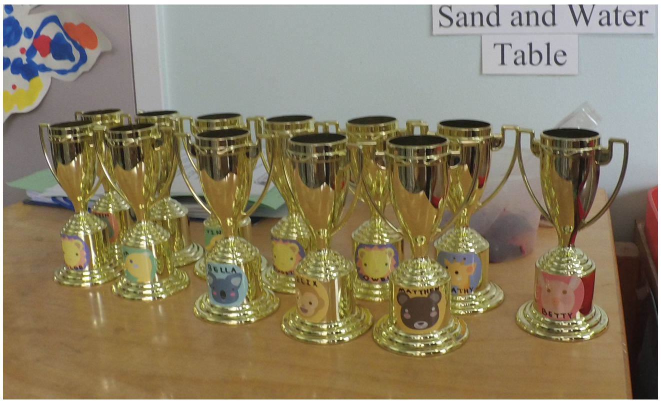


Figure 7.16. Trophies given to children on the last day

After the second group finished, the teachers helped me sit everyone down on the round carpet. As soon as the children sat down, I initiated a conversation to review some of the literacy contents from Aniland and to hand out the trophies. The conversations between me and the children of Classroom 2 were as follows:

1 Me: we played Aniland for 10 weeks.
2 Children: ((scream))
3 Me: so, I want to ask you some questions. What did you like the most about playing Aniland?
4 Arron 1: pig
5 Jared: animal
6 Joanne: the lion, lion!
7 Jacob: crocodile
8 Me: did you learn anything?
9 Jacob: popcorn
10 Elena: cat
11 Leo: ducky
12 Me: ducky, yes, so many things. Now, I have a paper version of Aniland and I want to ask you some questions. This is same as the iPad. What is the same alphabet letter as this one?
13 Teacher: Mike!
14 Mike: ((stands up and pointed at the lowercase c))

15 Me: that’s right. Lowercase c and uppercase C ((points at the letters)). Very good. ((points at a printed sheet of the alphabet order activity)). What letter goes here? b, c, d, e...
16 Jared: f!
17 Me: that's right, Jared! Very good. You guys remember all. Ok, now, what letter does the guitar starts with?
18 Marion: g!
19 Jacob: g!
20 Karen: ((stands up and points at g))
Me: how does g sound like?
21 Child 1: guitar
22 Child 2: /g/
23 Child 3: /g/guitar
24 Me: /g/, /g/, that's right. guitar! there's another one! ((turns to the milk page))
25 Children: milk!
26 Me: what does m sound like?
27 Child 1:/m/, /m/!
28 Karen: ((comes to the front and points at m))
29 Me: that's right! who's name starts with the letter m?
30 Children: Mila!
31 Me: Mila!
32 Leo: Marion!
33 Me: Yes, Marion!
34 Jamie: Mike
35 Me: Mike, too! You guys remember so many things!
36 Child 1: where is my letter A?
37 Child 2: where is my letter J?
38 Me: oh, Jacob, yes your name start with j. Is there anything you didn't like about the iPad?
39 Children: ...
40 Me: do you have any animal you want to see here?
41 Mike: no
42 Elena: nothing
43 Me: nothing?
44 Jared: dog!
45 Me: dog. and someone mentioned a crocodile.
46 Kira: watermelon?
47 Me: watermelon? Is it an animal?
48 Children: no!
49 Me: we saw watermelon here, right? what letter does watermelon start with?
50 Joanne: d
51 Kira: z
52 Me: almost. it's very close to z.
53 Leo: w!
54 Me: w! that’s right! very good, everyone. you guys did such a great job. thank you so much for playing this. so, I am going to call everyone’s name and you will have special gifts.
55 Children: yay!
56 Teacher: shhhhhh…
57 Me: Karen, come and get this. Great job, Karen. Everyone, clap!
58 Children: ((clap))
59 Me: Jared! you did a great job!
60 Children: ((clap))
61 Teacher: yay!
62 Me: Selena, great job, Selena!

63 Children: yay! ((clap))
64 Me: ((hands all the trophies to everyone)) did you guys have fun?
65 Children: yeah!
66 Me: you guys did such a great job! thank you!
67 Teacher: thank you, Ms Iva!
68 Children: thank you, Ms Iva! ((stand up, dance and come to hug me))

Note on transcription
This transcription is different from other parts of the format I used. All names appear are pseudonyms. This follows standard linguistic conventions of transcribing talk, focussing on dialogues and avoiding capitalisation at the beginning of turns
Exceptions are sound:
/ / for sound of letters
(( )) for talk or behavior

For this transcription that depicted the final group review and conversation, I evaluated the children's interest in animals and the connection with the real world. Also, I analysed in terms of emergent literacy skills: orthographic knowledge and phonemic awareness.

The first meaningful conversation was about what animals the children recognised from this final review and shared what they liked and knew about those animals. The children mentioned that they liked the pig, animal, lion, and even crocodile, which did not exist in the app. They said they learned about popcorn, cat, and ducky, also implying that this was the most memorable part of the app.

Moreover, the children and I had interesting conversations that we had not addressed prior to Week 10 to discuss what they liked and disliked about the iPad activities and Aniland. I asked them, "Is there anything you didn't like about the iPad?" so I could learn more about the children's honest feedback. However, everybody remained silent. I moved on to the next question, "Do you have any animal you want to see here?" A child answered "dog", which was one of the animals I thought about including when creating the app. Someone had also mentioned "crocodile" earlier, and the children remembered that those two were missing in the avatar room nor do they appear in the activities and readings.

Then, I observed the children's capability to associate what children had seen in the app with the real world. For this day, I prepared the paper version of Aniland to make connections between the iPad and the paper version of Aniland's content as a review for what they had seen over the past ten weeks. Many children answered and showed alphabet knowledge by matching the lowercase and the uppercase correctly, and Mike stood up and came to the front to tap the lowercase c on the paper as he would on the app (Figure 7.17). More specifically, I noticed an evidence of orthographic awareness when a couple of the children shouted that "F" came next in the alphabet after "B, C, D, E". Then, Jared came to the front and pointed at F on the paper, showing that the children were making connections between online and offline learning by reviewing these print-outs.

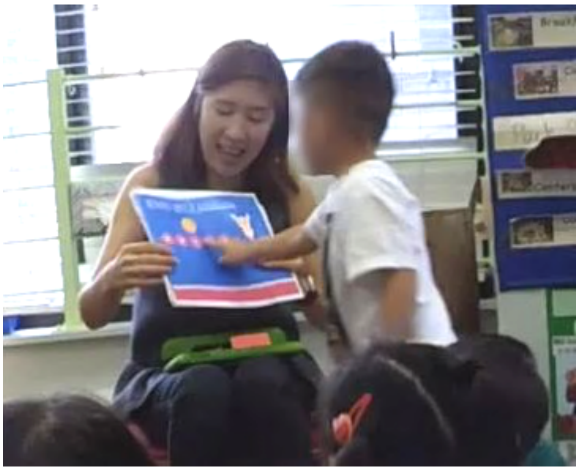


Figure 7.17. A child points at the matching letter on a paper version of Aniland

An interesting example followed when I asked if they wanted to see any other animals, one child answered "watermelon" as one of the characters. Although a watermelon is not an animal, it appeared in the alphabet reading room; they might have remembered it from the alphabet reading room in Aniland. I continued the discussion related to orthographic awareness and asked the children, "What letter does watermelon start with?" The children were silent for a moment and then Joan, Kira, and Leo shouted "D", "Z", then "W" respectively. I acknowledged "W" was the right answer.

Relating further to the emergent literacy skills, I observed moments of their exhibition of phonemic awareness, being able to associate the alphabet letter and its sound. I showed a print-out of a guitar with an underscore in the place of G. I asked them, “What does G sound like?” A couple of children answered “/g/” with confidence, and one child said “/g/, guitar” just like the narration presented in Aniland. As soon as I presented them with a picture of milk with an underscore in the place of M, one yelled “milk.” I asked the children, “What does M sound like?” and made connections with their names: “Whose name starts with the letter M?” The children screamed those names with M, Mila, Marion, and Mike. Other children whose names started with A and J wanted to see those letters, implying that they understood the letter sounds and they were again capable of associating them with real life.

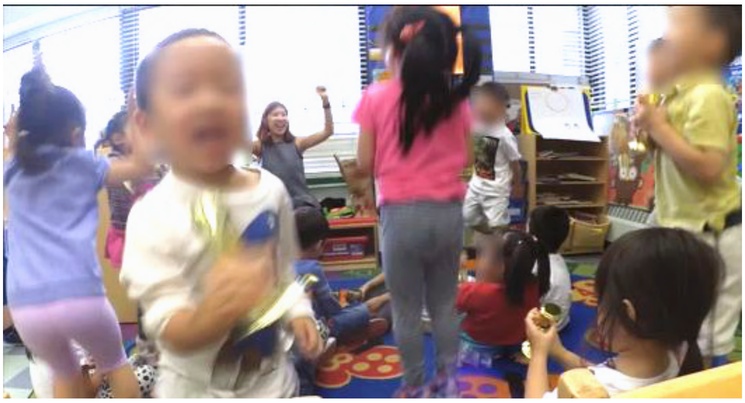


Figure 7.18. Children dance after receiving the trophies on the last day

I praised their good work over the course of 10 weeks and distributed the trophies with their favourite animals. Every time a child received a trophy, the other children clapped, and they all danced and jumped around after everyone had attained their trophies (Figure 7.18). Then, each of the children came to hug me and said “Thank you” before I started to clean up the equipment. At the end, they all hugged me, leaving me a feeling that Aniland and I had been a part of their culture more than solely a language-learning app. In Classroom 1, I received a surprise gift which contained names and art work of each children from the class (See appendix 6). Not only did children accept me and the iPad activity every week, they allowed me to take part in their classroom culture. I hoped Aniland on iPads, Aniland on paper and books, the animal stickers, the animal tattoos, the paper dolls, the trophies all worked together into reinforce a positive literacy learning environment for 10 weeks.

7.4 Analysis Summary of RQ3

In this chapter, I not only focussed on analysing the cognitive modes of the children's interaction but also investigated whether there was any meaningful connection between the app and the classroom.

In the beginning phase, the children were familiarising themselves with the app, my presence around them, and a change in schedule and were adapting to using tablets, which they had not used in school and did not all possess at home. At the start, children had some trouble collaborating because one child in pairs would sometimes dominantly take over the iPad. Children showed repeated actions of going in and out of the alphabet matching game.

Although neither LA nor IN were observed in the first example, I saw a positive potential for a further connection between offline and online when a child used the reward animal sticker on the top of a water bottle or other two students stuck those stickers on his or her forehead during other classroom activities. Extrinsic motivations driven by external rewards—in this case stickers—might have caused the children to have a positive energy and feeling of achievement (Reeve, 2006) for playing Aniland. In other words, this may imply that the children felt proud to attain the stickers as rewards after successfully completing the iPad time, and talk about Aniland's contents later on.

In the middle phase, in Week 6, Arron and Kira in Classroom 1 initially had some trouble collaborating because Arron wanted to keep the iPad to himself.

Regardless of Arron’s dominant behaviour, he showed LA by choosing the correct responses, exhibiting improvements from the previous weeks. Arron later allowed Kira play, and the mode changed from PROC to EXPO. Arron led Kira to tap the correct answers and showed LA in that he was certain about which letter completed “milk,” and they collaboratively finished the challenge. They maintained EXPO until the end of their engagement with the app.

Coincidently in both classrooms, the children had been reading animal and nature-related books with the teachers. In Classroom 1, reading books such as *This is the Farmer* by Nancy Tafuri was somewhat related to Aniland in that they had some animals in common; this activity made for a good transition from playing the app to reading offline or vice versa. I noticed the children liked to imitate the animal sounds, such as “Oink” and “Baa”. This could be an effective stimulus for children’s literacy learning to make connections between classroom activities and the app. This mimicking of sound after seeing an image can be interpreted as ‘transduction’, the movement of semiotic material from one mode to another (Bezemer & Kress, 2008). Here, ‘mode’ means a collection of resources for creating significance, such as expression, gesture, or picture, which are socially and culturally formed by another (Bezemer & Mavers, 2011). Transduction of image (e.g., “pig”) to sound (e.g., “oink”), image to text, and text to sound were seen in this example. In Classroom 2, when the teacher asked them how to play Aniland, the two children answered, “Keep the animal safe!” and “Play with lots of animals!” They also raised cocoons to observe life cycles in the classroom starting in Week 4. These new lessons on living creatures made a positive impact on the children’s work with animals in the app. Also,

It was evident during the middle phase that teachers being around them and reading the books for them was extremely helpful for heightening their interest in and concentration on reading books, because they tended to turn the pages too quickly when the teachers were not present. During the individual reading time, child's engagement with the printed version of rhyming book and comparing the functions of turning pages in both circumstances demonstrated a connection between offline and online spaces. This explicit comparison being especially interesting as revealing something about the children's capacities to make connections, although this might often remain subconscious and/or implicit.

In Week 9, I briefly showed the children the alphabet book and asked them to find the letters starting their first names, which fostered engagement toward the alphabet book on the iPad. Briefly, if teachers or parents plan for children to practise similar literacy content offline and online within a closed period of time, then children may absorb and enhance literacy skills by frequent exposure to similar content.

In the final week, I noticed that Selena and Leo started in PROC and switched to EXPO soon after they entered the rhyming activity room. When I encouraged them to take turns, Selena shared the iPad with Leo; both exhibited LA as they performed perfectly, choosing the correct responses in the rhyming activity room. They continued to maintain mostly EXPO and some LA moments by navigating and selecting correct answers without hesitation. Some children even interacted with the printed version of the activity room as they would the iPads.

After I distributed the trophies with each one's favourite stickers, everyone portrayed happiness by dancing and jumping. The most fruitful time of the week was the review session and award presentation after the children finished interacting with the app. By asking the children to review questions on uppercase and lowercase matching, letter sounds, and alphabet order using the printed version of Aniland, I realised how confident and fluent they had become in phonemic awareness, knowledge of graphemes, and orthography over the course of 10 weeks.

CHAPTER 8: DISCUSSION

8.0 Introduction

This chapter explains the findings of this research. I divided the chapter into four major sections. The first section reflects on the methodology and research design of the study. The second section addresses the research questions and discusses the findings for each; the third section addresses the key contributions of this research based on the findings of the study. The last section summarises the overall findings of the study.

8.1 Reflection on Methodology

With a grounding in linguistic ethnography, I closely analysed how "situated language use can provide both fundamental and distinctive insights into the mechanisms and dynamics of social and cultural production in everyday activity" (Rampton et al., 2004, p. 2). I observed preschool-aged children's naturalistic behaviours and interactions in the classrooms. I did not attempt to measure the quantitative outcome, for example, the number of questions they got correct in the activity rooms; rather, I took a qualitative approach towards their overall improvements in performance.

It should be mentioned that I actively participated as a part of the community rather than as an outsider just there for my own research. I committed myself to interacting with the children, teachers, parents, and administrators. I brought in my app Aniland to engage children to play it for 10 weeks. I worked with the teachers' curricula instead of imposing my own guidelines. For instance, I aligned the animal topics in the app to the teachers' activity choices. I also blended into the community and became so involved that I participated in their literacy hours, centre time, playground time, art, and snack time, among other classroom activities. I believe in and followed the ethnographic method, where the researcher tries to understand the culture as it is while recognizing that his or her presence has an impact. The children considered me almost as a new teacher because I spent my time at the centre at least 3 times a week. The children greeted my name whenever they saw me. I believed the nature of my study was to observe the children up close and to create a comfortable environment for the teachers and students.

I interviewed parents in a semi-structured way, meaning I demonstrated some flexibility in the dialogue. I learned about the parents' views from those who agreed to have an interview to express their opinions or concerns about their children's literacy learning and use of digital media in general. Although I did not always did not always direct the conversation and answers, we had comfortable conversations. Neither parents nor teachers had distasteful opinions against using digital technology in the classroom or using it as learning tool.

When interviewing a lead teacher from Classroom 1, I learned that a computer had been used in the Classroom 1 during free play, but collaboration or turn-taking was difficult among the children; therefore, they did not provide it anymore. Thus, she mentioned that if iPads could be guided properly to promote collaboration and be used as cooperative tools, they would be adequate for early childhood education. With the increasing presence of digital video technology in social research, how to represent multimodal interaction has become a growing task (Flewitt, 2006; Kissmann, 2009). For data collection, I used three different recordings (action camera, 360° spherical video camera, and screen recording) to insure that I gathered enough sources for transcriptions in case one or two of the methods did not function.

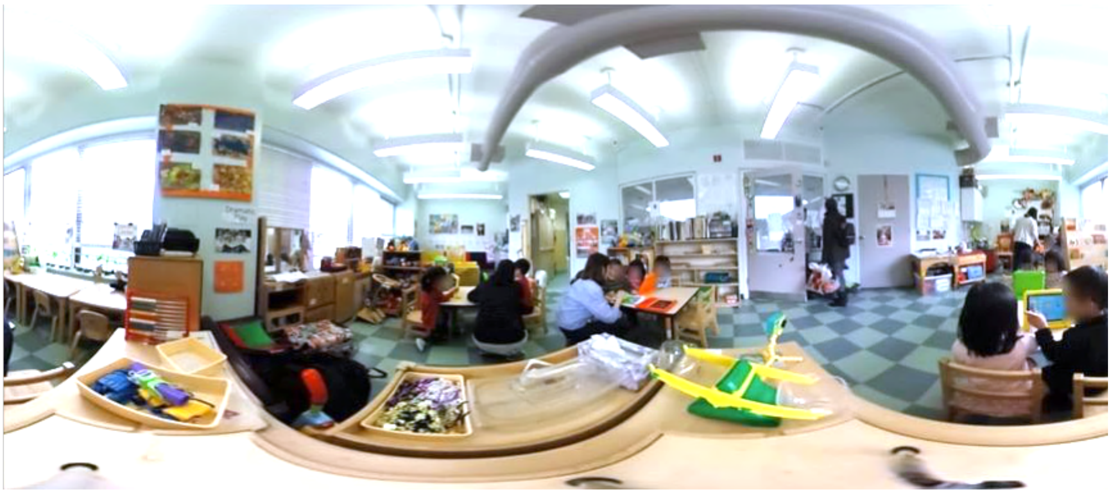


Figure 8.1. Theta 360° spherical camera recordings in Classroom 1

With these three different types of recordings, the best angle and sound were not easy to select. The action cameras did not have viewfinders, so I estimated and adjusted the angles to the best of my ability; I learned to find better positions over the course of time. The 360° spherical video camera was useful to oversee the classroom's overall movement and activity (Figure 8.1). The iPad recording relied on the third party app, Shou, and Wi-Fi—this was before the official screen recording option was offered by iTunes—so when the connections were disrupted in the middle of recording, some of them shut off automatically. I analysed the videos of the children's interactions among peers using a literacy app.

The length and the style of each transcription file for analysis varied due to the selection of the segment that represented the richest display of interpretation; however, I attempted to maintain a consistent level of detail. It was challenging to choose 3–5 minutes out of 10–15 minutes of playtime, but I reviewed each transcript repeatedly until I found the best segment that represented the children's interactions.

8.2 Revisiting Research Questions

In the following sections, I will discuss the findings of this research in relation to each research question.

8.2.1 Research question 1

> RQ1. In what ways do preschoolers engage in the meaning-making processes and practice emergent literacy skills when using iPads in the classroom?

To answer this question, I focussed on analysing the cognitive processing to observe how the interactions of children transformed between exploratory (EXPO), referring to navigating with reflective analysis and problem solving, and procedural (PROC), referring to random navigation without reflective analysis, and if any influences have affected literacy acquisition (LA) or Innovation (IN) throughout the study's phases.

From the early weeks' examples, I did not gather any evidence of the meaning-making process when children engaged with the app, staying in PROC mode most of the time. Children casually navigated the app. The children enjoyed creating animal characters in the avatar room, reading books for brief moments, and playing rhyming and letter sound games by randomly tapping on the prompts, as they adjusted to the new virtual environment.

In this mid-phase, EXPO more frequently appeared than at the beginning of study. Children navigated the app comfortably, as they mostly understood where to find the avatar room, reading materials, and games. They often navigated and engaged in the reading room and alphabet game longer. The collaboration and meaning-making process began to be developed, as they started critical decision-making by asking each other's opinions, for example: which one do you want, which animal do you like, and is this okay. Moreover, I observed the children did not consistently choose the correct responses for the letter sound and rhyming activities, but they performed better overall than in the earlier weeks.

In the end phase, they started the session in PROC, however, towards the end, they exhibited EXPO more frequently. I observed their levels of comprehension or interpretation became clearer, and they continued tapping on the areas they wanted to explore. Particularly when playing the rhyming game the second time, the children exhibited EXPO more frequently than the first time. They focussed much better and provided the correct responses more quickly and precisely than previous phases; therefore, their literacy skills may have somewhat improved. Some practices of emergent literacy skills were evident, for example, when playing the rhyming game, the children guessed the correct answers more frequently than the first time. They focussed much better and provided the correct responses more quickly and precisely than in the previous phases; therefore, their literacy skills may have somewhat improved.

Significant amounts of meaning-making efforts and practicing of literacy were observed by the frequency of obtaining the right answers in the activity room and reading the books in the reading room. In general, it was more evident that their meaning-making became more frequent in choosing the correct places and buttons to tap and supporting each other with better suggestions or solutions toward the final phase. However, meaning-making moments were not always linearly developed; children sometimes had a tendency to work better and make more meaningful connections with the app when they had closer relationships or horizontal friendships, wherein the partners have an equal relationship and respected each other’s decisions (Rogoff, 2003). I considered the procedural reactions as salient because random navigation and attempting to be familiar with the apps were necessary in the early weeks of their engagement. Consistent with Christ and Wang (2014), as the children were more familiar with working together as a group, I saw more potential for learning and meaning-making in the later stages. The taxonomy of cognitive processing dimensions, the analytical framework of peer group interaction (Kumpulainen & Mutanen, 1999) worked effectively in order to investigate the children's social interactions, communications, and linguistic improvement.

8.2.2 Research question 2

> RQ2. What changes in peer group interaction do children display when they engage in the app with peers across time?

To observe the children's interactions and the way in which the children reacted to each other while engaging with the apps, I focussed on both social processing and communication style.

In the beginning phase, children stayed in the dominant or individualistic mode, they were all eager to have opportunities to play with the iPad. The concept of sharing the iPads in the classroom was new, and various disagreements emerged; I observed various types of conflict and disagreement among the children They tended to remain silent and did not interact with each other when tapping on the screen. The teachers and I sometimes had to interrupt to insist on turn-takings and sharing iPads when one child overly dominated them. However, the conflicts lasted only for a brief time. Eventually, the children engaged in consistent turn-taking and respected each other's choices.

In the mid-phase, particularly in the avatar room where the children spent the most time, they created animals with a fairly good turn-taking manner. They were not verbally expressive but persistently maintained the turn-taking when navigating the activity room and the reading room. I observed children also verbally expressed "my turn" and "your turn" and cheered each other when they received the virtual medals upon the completion of the games. With some ups and downs and dominant behaviour to keep the iPads to themselves, after all, the children returned to collaborative participation toward the end of each session. The children began with relatively few strategies for effective interaction but gradually developed these, especially verbally.

In the final phase, the children's behaviour often changed from dominant and individual social behaviours to collaborative behaviours. There was no pushing or any other show of dominance that lasted longer than the previous times. Turn-taking was equitable and they did not face the consequence of having the app taken away. For example, a child tapped one or two items and then gave his/her partner a chance to play. Furthermore, I observed children had become better accustomed to how to navigate the app and solve the problems when iPads froze or were stuck at the recording page. Overall, the pairs exhibited more calmness and various language uses, such as affectional, repeating, informative, and answering, than at the beginning phase. Furthermore, the children engaged in more frequent conversations than in the beginning and middle phases. Interventions by the teacher or me became less necessary as the quality of collaboration improved.

This study was consistent with some studies that had shown (Flavell, Shipstead & Croft, 1978) children older than 3-years old are capable of thinking from other persons' views. Children in my study demonstrated they were able to collaborate and understand that other children wanted to play. Also, with whom they were paired or how acquainted they were to each other was also important to their performance. Importantly, the teachers' involvement and guidance were crucial, as the teacher supported the children when they were confused and frustrated and encouraged both children to play equally, which, therefore, heightened their social interactions, communication (Rogoff, 2003).

The co-lead teacher from Classroom 1 during the interview in Week 9 provided insightful feedback on the children's interaction, "At first we had a lot of trouble pairing the children together, and they often wanted to end early because they were not getting along with their partners. Although we had to try different pairings to find children whose personalities matched the best, I think they all also learned to share the iPads better as the weeks went on. This is a big accomplishment because these children are used to using iPads as an individualized form of entertainment."

8.2.3 Research question 3

> RQ3. Are there any literacy practices with Aniland that reappear in the classroom context?

To reiterate, I decided to choose examples from one classroom, to generate a richer answer to this research question by focusing on the connection between the iPad and the classroom context. I explored any links between online and offline space — i.e. iPad activity and regular classroom activities, such as reading time, story time, centre time, atrium time, etc.

Particularly in terms of literacy practices, I observed, in Classroom 1 and Classroom 2, instances of children engaging with the emergent literacy contents of Aniland, including reading and activity materials involving phonemic knowledge, which associates the alphabet letter and its sound. In Classroom 1, I wore a bear T-shirt in Week 9 to read a page about Baxter the bear; in fact, I wanted to encourage them to read the letter sound book. After reading, I asked children, "Baxter starts with the letter B, [Buh, Buh, Buh]. Whose name starts with B?" With confidence, children shouted "Betty!" and "Bella!" In Classroom 2, in Week 10, the final day before everyone received a trophy, I prepared the print version of Aniland to share its viability as reviewing material. I showed the students print-outs of pages with images of a guitar and milk and asked them what the first letter of each item sounded like.

They repeated “[guh]” and “[muh]”, just as they had heard in Aniland. Further questions related to students’ names: “Whose name starts with the letter M?” Then they proudly answered, “Mila, Marion, and Mike”. They understood what the letters sounded and were able to associate them with real life. Moreover, I noticed evidence of orthographic awareness, both online and offline. For example, during the last week’s review time, when I asked what would come, on a sheet of paper after “B, C, D, E”, Jared walked to the front, and pointed to “F” on the sheet; this demonstrated that reviewing these print-outs facilitated the child in making associations between online and offline learning.

Over the course of the study, children constantly showed a preference for animals. Even after the relatively brief exposure to Aniland that occurred during the first week, children had already determined their favourite animal characters and they showed their preferences in the avatar room while creating their characters. I noticed, during one of my early visits, that some children used the stickers on their water bottles. The teacher notified me that the children asked, on various occasions throughout the week when the next “iPad day” would be. One day before the children started to play, a teacher asked whether they wanted to ask questions about the iPad. One child shouted “Keep the animal safe!” and another child said, “I am going to play with lots of animals”. The children's cheerful mood during and after working with iPad indicated that they anticipated a favourable experience in during the iPad time ahead.

Further, I saw an opportunity for the children to make connections between the app and their real lives through the animal characters. In general, all children enjoyed creating sounds in the avatar room for the animals, such as “Lion. Rawrrrr!”, although the characters in Aniland never make an animal’s roaring sound in nature rather, but rather talk and act more like humans. When I went to a playground with the children, a boy hung on the monkey bars and imitated a monkey sound, “Woo, woo, ah, ah!” as if he were providing the sound effects for Curious George. I wished that I had been afforded more time, as it was difficult to have conversations on the crowded playground; I was interested in engaging in further discussion with the child about why he decided to imitate a monkey at that particular moment.

It is important for the teachers to be involved when the tools are present. The teachers integrated Aniland into their pedagogical plans. When a teacher read a book, such as *This is the Farmer* by Nancy Tafuri, before iPad time started, the activity provided a good transition from offline reading to playing with the app. I noticed that the children liked to imitate the animal sounds, such as “Oink” and “Baa”. This mimicry of sounds, subsequent to seeing an image, can be interpreted as “transduction”, which refers to movement of semiotic material from one mode to another (Bezemer & Kress, 2008). This implied different imageries; animals may be a trigger specifically for literacy learning. Most important, this study demonstrated the potential help to literacy learning represented by the children making connections between classroom activities and the app to make connections between classroom activities and the app. Tablets can be used as a resourceful educational or entertainment tool at both school and home. To enhance children’s learning, it is necessary to “percolate” the influences that exist in the gap between home and school (Gillen & Kucirkova, 2018).

The iPad was used as a tool to make connections with real world concepts. Interestingly, a given child’s initiation of a comparison between the affordances of digital and print books appeared after I shared three printed versions of Aniland with exactly the same texts as that of the iPad’s on the bookshelf in both classrooms. My hope was for children to chances to practise the literacy contents as much as possible. Britany brought me the print version of a letter sound book and showed me the pig page, and then expressed curiosity, “How do you turn the page on the iPad?” When I told her to press the right arrow key, she asked me “What is an arrow key?” I explained that the arrow key caused the images to move in the direction she preferred. It was a remarkable moment that Britany herself initiated, explicitly prompting a discussion of the comparative functions. Reviewing the materials on the print-outs was effective to engage children and emphasise print knowledge. This occurs when print knowledge is used to compare digital and print versions of items that look identical. In view of Labbo’s (1996) notion for a broader definition of literacy, one that integrates multimedia and digital prints into young children’s emerging conceptions of prints, it is important to consider how children may incorporate digital technology into the classroom settings.

One of the most fruitful outcomes was that Aniland content had, to some extent, become so much a part of the children’s real lives and connection-making, that they were aware of iPad day as being one of their favourite routines and they also use iPad at home for other activities. A connection between online and offline lives, regarding the purpose of literacy, is essential at this point (Gillen, 2014; Kress, 2010).

8.2.4 Implications of findings

The findings from RQ1–RQ3 present implications for pedagogic practice with young children.

The first main implication is the integration of tablets into a preschool classroom’s literacy curriculum. Consistent with the literature reviewed earlier, emergent literacy skills can be encouraged through children’s exploration of print (e.g. icons, symbols, letters, words) on the tablet screens as young children play with apps (Marsh, 2016; Neumann & Neumann, 2014). The app particularly supported children on letter knowledge, phonological awareness, and phoneme-to-grapheme conversion

(Whitehurst & Lonigan, 1998), as observed when they repeated after the narration from the reading room and activity room and matched images and sounds.

The study demonstrated children's expanded and heightened imagination while using the iPad—the imagination and creativity of children that Vygotsky (1986) emphasised as the critical didactic outcome in humans. Children imagine themselves as more competent, for example, when taking on powerful roles and having new experiences, and this very act of imagination enables them to grow and learn.

In the study, for example, there were incidents of children pretending to eat popcorn and shouting, "Nom," when they saw popcorn in the letter sound game. Another time, a child imitated dinosaur sounds and an attacking motion to impersonate a tyrannosaurus when his partner tapped on a dinosaur costume for the duck in the avatar room. Devices such as iPads can contain endless images and sounds; using them at the right occasion and moment can help stimulate children's imaginations while they practice literacy skills.

A lead-teacher in Classroom 1 expressed the following: "… if I was going to integrate iPads into a preschool curriculum I would want to make sure there was a lot of fine motor skills being practiced because that is a benefit of iPads and something that my students could always use more of." Understanding each child's motor skills to choose the corresponding apps to motivate children effectively is in learning and teaching through iPads (Nacher et al., 2016).

To support learning through literacy apps on tablets, teachers need to consider young participants' interest and preferences, as well as their setting. Teachers should provide a setting wherein they control comfort, peer pressure, and other factors that may affect literacy learning outcomes to enable the children to perform their tasks. Children's affection and preference towards animals were shown to be an effective pedagogic method for heightening their interest in various topics. For the preschool-aged group, the animal theme engaged the children's interests and bridged the app and other activities in the classroom. The animals can take on many appearances, and children can imitate animal sounds. Gillen and Kucirkova's study (2018) supports the idea that children can form a good basis for developing phonics from animal sounds. Finding appealing topics that children can relate to in their class would be a fruitful way to incorporate literacy learning into the school setting.

The second par is implications for designs of literacy apps for pre-schoolers. Over the course of the study, I realised there were improvements that would make Aniland more suitable for heightening children's engagement from a design perspective. In terms of main usability and user interface, I considered how suitable the menu was for the young children—whether it contained sufficient audio or visual feedback, hotspots, and large enough buttons, and what movements children are capable of at this age (e.g., tapping, swiping, zooming). Young children may enhance their emergent literacy skills and digital literacy skills by using the tablets, making observations, and engaging in trial and error.

From my observations of the study, app developers and designers should use creative and playful designs that catch the target-aged children's attention and make them interested in continuing their playing after their first few attempts. The current Aniland app contains three main areas—alphabet, alliteration and rhyming—but if there were more content available, a longer duration of the study would be possible.

Children seemed to be fond of having surprises; creating their own characters; making, building, and playing games; and being creative. They particularly loved rewards; they received rewards in the form of a medal on the screen (See Appendix 2), stickers, tattoo stickers (See Appendix 4), or a trophy on the last day.

I learned that the design components of an app, such as visual characters, backgrounds, colour schemes, sound, shapes, and typefaces, can all impact the learning outcomes (Jewitt, 2016). The set of colour and design features should be appropriate for the type of app, but one study interestingly found that children are not always attracted to bright colours, and clearly defined images or symbols are more important (Neumann, 2014). Young children can lose interest when there is too much written text or if the text is too small or the images too static; they prefer animated images. I hope to add more interactive features such as bubble pop-ups when the children get the right answers in the bubble alphabet matching or order game (See Appendix 1).

Moreover, children should be appropriately challenged and given enough content to explore so they do not lose interest. To promote creativity and autonomy, I should add activate and deactivate features (e.g., narrator on and off options) and, additionally, a settable limitation on play time (Flewitt et al., 2014; Marsh et al., 2015). To enhance collaborative learning, there must be an agent that can stimulate children to work together on the screen. If an app requires more than two hands to touch or drag at the same time, this feature could enhance collaboration and motivation when the peers need each other to complete a task.

As a designer, it was meaningful for me to use Aniland, which I created, as it allowed me to fully understand the background and the literacy objectives of the app and also to observe the children. They started with minimal knowledge at the beginning, and as the study progressed, they enjoyed making connections to the animals they liked and pursued meaning-making experiences in emergent literacy learning.

Visual and design guidelines for app creators based on educational research are necessary to ensure appropriate and productive use of tablets in both home and school settings. Children must feel comfortable and capable of understanding and operating the app materials to effectively learn through the apps. The content of the apps should be suitable for their abilities and advocate their learning (Guernsey & Levine, 2015). Through the use of well-designed apps promoting collaborative features, young children are able to elevate their emergent literacy skills with having fun while developing social skills as well. With the help of supportive parents, teachers, and researchers, creating and choosing carefully designed iPad apps for the appropriate age group can be beneficial for communication and literacy skills for children with needs.

The third implication is for classroom research. I constantly encouraged the children to play Aniland every week. This was particularly true in the beginning phase to ensure that they would be motivated to continue playing for the full 10 weeks. Children who were given the sticker reward at the end of iPad time indicated that the experience gave them a positive feeling of achievement. Also, one time, I handed out paper dolls and, another time, tattoo stickers. It was critical to reward and praise the children when they finished tasks on the tablet, verbally (i.e., "Excellent job!"), physically (i.e., stickers or high fives), or even virtually (i.e., virtual badges; Kucirkova, 2014; Parish-Morris et al., 2013). The children may experience the triggering of extrinsic motivation and feel driven by external rewards, as, in this case, stickers have a positive energy and provide a feeling of achievement (Reeve, 2006) for playing Aniland.

According to the overview of early-year use of digital technology studies between 2005 and 2015, "Parents would welcome stronger and more collaborative relationships with early years settings, with information-sharing and exchange of good practice regarding the use of technologies in the home to promote and enhance learning and development" (Kumpulainen & Gillen, 2017, p. 24). To that end, adult–

child interaction can be considered a social practice as it is an essential part of everyday life experiences (Merchant, 2015; Levy, 2009), and in consequence, iPads can be employed as a valuable educational home activity if parents and children join together.

By playing Aniland on an iPad, the children were able to practice twenty-first-century skills for the digital age (Trilling and Fadel, 2009): creativity, critical thinking, collaboration, and communication. Bruner (1977) emphasised that one of the advantages of using a machine for learning is that children can receive rapid feedback or “immediate correction” on the choices they make (p. 84). Digital technology can be fun within the boundaries of academics in any subject (e.g., literacy, mathematics, history, science), and by connecting digital technology-oriented activities with classroom discussions, children in the classroom can learn academic content outside of the classroom (Salen & Zimmerman, 2003). This is also in line with the suggestions of running literacy studies with young participants, including consideration for how the digital space can connect to their offline lives in regard to their social and cultural contexts (Gillen, 2014). The concept of bridging the content of digital technology to real-life learning is the root of this study. There is a need for continuously stimulating apps with educational content to ensure a reliable and safe learning environment for children.

On the other hand, home education cannot merely be ignored as children attempt new ways to engage in meaning-making outside of school through digital technologies (Wohlwend, 2010). As parents increasingly own smartphones and touchscreen tablets, these devices become a part of indispensable child-rearing practices because they can be utilised as a bonding activity between parents and children (Kirkorian & Pempek, 2013). Parents whom I interviewed toward the end of the study were enthusiastic about the use of iPad for both learning and entertainment:

- iPad technology is the future of education that can’t be avoided so classroom use is a good idea! I let my son play iPads upto 2 hours per day. 50% for leisure and 50% of the times for education (Classroom 1, dad)

- I allow my son to play his iPad 30 min to 1hr per day. He learned ABC by app since he was 1. He still remembers the contents he has played. The apps he played were like Elmo, Sesame ABC, and other educational apps. He also reads lots of traditional books. (Classroom 2, mom)

To that end, adult–child interactions can be considered a social practice as they are an essential part of everyday life experiences (Merchant, 2015; Levy, 2009), and in consequence, iPads can be used as a valuable educational home activity if parents and children join together. These joint media activities are encouraged by the National Association for the Education of Young Children (NAEYC, 2012), which takes the position that they are to be used not only for enjoyment but also for education, specifically literacy education.

To give children the full benefit of digital technology, responsible choices such as ‘co-viewing’, ‘co-participation’, and ‘joint media engagement’ between parents and their children at home are vital (Stevens & Takeuchi, 2011; Takeuchi, 2011). It is crucial for parents and children to work together and observe the role of family entertainment/educational devices rather than having children operate the apps by themselves.

To show a possible connection between online and offline learning, children enjoyed reading farm books and hearing about the farm, which emphasises the idea that learning animal sounds in a fun and memorable way to engage early literacy learning. Particularly, they liked the farm yard book, the teacher’s talk around it, and the animals on Aniland. I observed that the children spent the most time in the character room and found the animals likable; for example, many children said the giraffe was their favourite among the eight animals.

8.3 Key contributions of this study

My study's main contribution is enabling an understanding of young children and the complexity of literacy learning. The analytical framework of peer group interaction (Kumpulainen & Mutanen, 1999) was overall effective in revealing and uncovering the complexity of children's interaction with iPads. The key finding of this study was that participating children attained emergent literacy skills and social skills while learning to actively participate with their peers.

Children not only interacted with students within their own groups, but also reacted constantly to the other groups around them, a desire to compete, cooperate, dominate, tutor, etc. I learned to be aware that children are unpredictable. Sometimes, they when they were focusing well, they stood up to go change their socks or clothes, and suddenly left and touched the camera, because they were so full of curiosity. Despite the children's unpredictable actions at times

This study supported the value of shaping the learning spaces in which students explore concepts of emergent literacy. Furthermore, literacy practices are related to social, cultural, historical, and material contexts (Barton & Hamilton, 1998; Gee, 1996; Street, 1995), where groups of individuals could be drawn together to satisfy a mutual, strong interest or engage in a shared activity (i.e., iPad engagement). The Aniland app facilitated this phenomenon by bridging the connections between the classroom and the technological skills, cultural understandings, and so forth that children brought from their home-based experiences.

Communicating with and asking children for their opinions is important to engage young students. On the first day of the study, I talked to every child, so that I could receive a smiley or sad face on the consent forms I had designed for them. Therefore, I was able to ask their whether they were happy, sad, or uncomfortable playing Aniland. I think this represented an important action between the children and me, as it established their trust in me, and their sense that it would always be okay for them opt out if they did not feel like continuing their involvement. It must be acknowledged that children have the right to make their voices heard and experiences understood (Dunn, et al, 2018). Having the opportunity to sign their own consent forms gave them a research right that began with feeling of self-esteem and inclusion (Marchant & Kirby, 2004).

From a socio-cultural perspective, learning occurs when a child is socially engaged and able to interact with others (Vygotsky, 1986). This study relied on an understanding that entails a constructive view of children's socio-cultural development, literacy and learning. As children's use of the touch screen tablets continues to advance, it is important to study how these digital technologies impact children's literacy learning.

Moreover, NLS represented a new tradition in considering the nature of literacy and understood it as a social practice (Street, 1985). Researchers have investigated NLS to determine its socio-cultural approaches to literacy and suggested that literary practices are embedded in wider social contexts (Barton, 2007; Barton & Hamilton, 2012; Gee, 1996; Gillen, 2014). Literacy is intrinsically associated with the historical, cultural, and social values that form around children. In my study, children played with iPads in pairs as a part of their classroom culture and interacted with their peers and teachers for 10 weeks. In this sense, NLS articulated the particular social and cultural practices related to iPad use in the classroom.

For the most part, children's interactions with digital devices do not diminish other forms of play. Children can balance interactions with digital devices with their other ongoing forms of play (Plowman & Stevenson, 2012; Vanderwater et al., 2007). It was better to run the research while children were all in the room because they tend to want to stay in the atrium area, which is the indoor playground. Physical fun is still the dominant form of children’s entertainment.

Although there are some negative aspects on health issues associated with using tablets at early ages, children still love physical activity, they are hardly likely to become addicted to iPads, as some worried critics are asserted, provided that they still have access to traditional forms of play. Throughout the course of the study, I have become persuaded that iPads and tablet devices can be useful supplementary tools for practising emergent literacy learning and for facilitating collaboration in early childhood education and school settings of this generation.

CHAPTER 9: CONCLUSION

9.1 Summary of the study

This ethnographic study explored preschool-aged children's emergent literacy skill learning with an iPad literacy app and did not limit what literacy means as a social practice (Street, 1995). This study is based on group activities and opened up the opportunity of improving students' social skills while sharing iPads and communicating with each other. Considering the importance of new literacy in acquiring sufficient literary knowledge and the potential impact of digital technology on a child's understanding of literacy and peer interaction, it is worthwhile to seek the integration of literacy learning skills in school. The intent of this study was for the findings to provide guidance for educators and media designers in the development of age-appropriate tablet content that is enjoyable as well as educational.

The study aimed to demonstrate the usefulness of educational digital media without disregarding the importance of traditional media (i.e., books). Preschool teachers have traditionally supplied children with print-based texts and tools to promote children's literacy in reading and writing. As digital technology becomes more vital, literacy learning may change to include digital technology integration in the classroom. The study showed that some literacy skills children have traditionally learned from books and activities in the classroom compared to the content of the app.

As I have shown, young children can explore with iPads both independently and collaboratively. Despite critical views on young children's use of tablets because such technology might increase isolation or disregard the importance of interacting with others while learning, this study supported children's communication through sharing iPads and encouraging play together.

This study illustrated children's unique ways of employing reading skills and solving literacy questions while working with each other in the classroom. Often one tended to dominate the iPad in the beginning of the phase; however, later on, their willingness to share the iPad increased with the collaboration frequency toward the end of the phase. Children tend to find affinity with groups and find their identity through joining a group in the virtual world (Hannaford, 2012). I believe young children would benefit from continued encouragement for collaboration under the supervision or guidance of adults when using digital media to practice literacy skills.

Not only was the interaction among the children important, but the interaction between the teachers asking the children questions was also important for engaging children in the study. Whether digital devices are involved or not, learning is effective with two-way communication with others; therefore, teachers' roles are critical in promoting interaction for cooperative learning (Gillies, 2006). When young children are encouraged to collaborate under the supervision or guidance of adults when using digital media to practice literacy skills, individual cognition and social interaction in learning could be heightened.

9.2 Limitations

There were several limitations in this study. Although I considered an equal distribution in gender, age, and number of participants for each condition, the characteristics of each classroom were generally different: Classroom 1 being more active and Classroom 2 being calmer, particularly during the iPad time. However, children have sharper focus in the morning than in the afternoon, according to my interviews with the teachers. When I observed Classroom 2, usually the kids had better attention because they engaged with the iPads at 10:30 a.m., whereas the children in Classroom 1 participated in the iPad time at 3:30 p.m. In contradiction, research conducted by the Centre for Evaluation and Monitoring (CEM, 2017) in England discovered that kids learn more in the evening than in the morning.

If children of both classrooms could engage with the app during similar times of the day, it might be efficacious for observing their interactions, as the children would have similar energy and attention levels. However, the classrooms had different schedules to follow, and the teachers and I chose the best time for iPad activities without interrupting the flow of the day. The study started in April 2016, seven months after the beginning of the school year in September 2015. Although some changes were observed in social interaction and emergent literacy skills over 10 weeks, it would be beneficial if the duration of study was longer to track the findings. In addition, as a Classroom 1 teacher suggested during an interview, if I had started the study in the Fall semester, it would have been more fruitful to observe the students' progress in literacy learning for the whole year, because many students have far less emergent literacy knowledge in the fall.

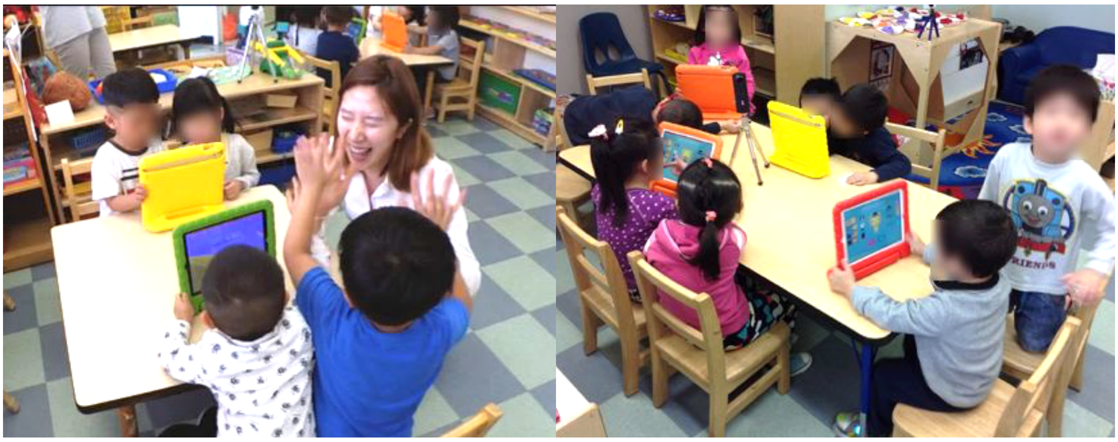


Figure 9.1. Setups of Classroom 1 (left) and Classroom 2 (right)

The noise levels were not taken into consideration initially when a full class played at the same time; Classroom 2 generally created more noise than Classroom 1 when the different groups sat closer to each other.

I sustained each classroom's table setups as they were, to not interrupt the flow of the teacher's instruction plan and classroom layout (Figure 9.1). I only realised the noise level when I started to transcribe files; the sound from the main cameras was inaudible and I often had to rely on the iPad recordings. I learned that placing groups farther apart would not only heighten the children's focus because they could hear less from other groups, but it also would ease the transcription process for the researcher.

On a positive note, another limitation was that variation of having a naturalistic observation: I frequently did not observe what I expected, such as literacy-related outcomes, because the children unexpectedly cried or argued with friends during the reading time, snack time, atrium time, and so on. For the interviews, I originally did not plan to give directions to the teachers or parents, but given the limited time, I changed to using semi-structured interviews to understand the children's media behaviour at home, preferred activities at home and school, opinions on literacy apps like Aniland, and so on. Although I tried not to lead to something far off the topic, I heard something about the parents' lives, their family relationships, and so on. I made sure that information all remained confidential and unrecorded in my field notes.

Most significantly, the sample size and duration of the children's involvement in Aniland was too limited to make a complete interpretation for making a judgement on the iPad and literacy app's effects on children's literacy learning. Because of the time constraints in this study, the Anilab team and I focused on phonics, alliteration, and rhyming. I hope to create the next version of Aniland with a greater variety of themes in literacy development (e.g., sentence comprehension, oral language, and vocabulary) to engage children for a longer duration. In this sense, connections between researchers and developers are critical to create the best designs for learning and to improve the possible outcomes.

9.3 Future directions

Throughout the course of the study, I have come up with some suggestions for further study in the field.

First of all, I noticed children's frequent silence or quiet moments while engaging with the iPad app. I hope to find more meaning in their implicitness because the durations of the silence were different and sometimes children would use hand gestures or posit facial expressions. If I could discover a method to observe children's inner dialogue, their minds could be perceived as unique features (Vygotsky, 1987; Clark, 1998) on social processing, such as for feeling confusion, being off-task, or experiencing conflict, which are better when children are silent. Therefore, I hope to find more specific and accurate ways of interpreting moments with inner voice for further research.

All participants were native English speakers; however, considering the school is located on the lower east side of Manhattan, considered Chinatown, in New York, some participants were bilingual. In rare cases, I noticed children and teachers spoke in Cantonese to communicate while playing Aniland. A teacher explained to me during the interview that some children could speak Cantonese and some could speak Taishanese. Chinese people in New York City speak a variety of dialects but share a common written language. Cantonese, Taishanese and Mandarin are known to be the most dominant dialects spoken in Chinatown in Manhattan. Most of the early residents of Chinatown who came to New York from villages in the Sze Yap area of China spoke Taishanese, and those from the greater Pearl River delta region of Guangdong Province spoke Cantonese (Tench, 2017). Research may expand on how bilinguals attain their first literacy skills and whether one is predominant over the other when using digital media. The expansion can explore the impact of educational media on encouraging bilingual/multilingual young children to learn literacy skills in each language.

Although Prensky (2001) divided the generation gap between digital natives and digital immigrants, I believe those were unnecessarily defined terms and could not represent the whole. No clear evidence supports Presnky's theory that the younger generation's thinking is fundamentally different and they are capable of processing information faster. Being surrounded by or exposed more frequently to digital media may make their learning styles different, but it does not mean that they will learn particularly faster (Margaryan, Littlejohn & Vojt, 2011). Teachers and parents who were interviewed noted that they were keen on the latest technology like tablets and they understand the possible positive outcomes (e.g., enhancing literacy and math skills, relieving stress by playing games, or using time effectively on transportation) and negative outcomes (e.g., eye health or addiction) of its use and plan accordingly with regards to the traits of children in the classroom and home. It should be emphasized that for preschoolers, the balance between traditional and digital learning must be appropriately guided by adults who understand and are prone to keeping up with the tablets, considering the tablets' affordances.

For quality and professional development, educators need consistent support and the opportunity for professional development and training in the hands-on digital technology tools in the classroom (Appel & O'Gara, 2001; Barron et al., 2011). My study contributes to pedagogical studies in my finding that young children's engagement with touchscreen tablets may elevate their abilities and joy in their emergent literacy skills, particularly with a skilled adult's support. Furthermore, it has shown the fruitfulness of being aware of, and encouraging, effective connections between online and offline activities.

References

Agostini, A., Di Biase, E., & Loregian, M. (2010). Stimulating cooperative and participative learning to match digital v' needs: Large multi-touch-screens as cornerstone of pervasive classrooms. In *Pervasive Computing and Communications Workshops (PERCOM Workshops)*, *2010 8th IEEE International Conference* (pp. 274-279). IEEE.

Alvermann, D. E. (2011). Popular culture and literacy practices. In M.L. Kamil, P. D. Pearson, E. B. Moje, & P. P. Afflerbach (Eds.), *Handbook of Reading Research*: Volume IV, pp. 541-560.

American Academy of Pediatrics (1999), Committee on Public Education. Media education. P*ediatrics*, 104, 341–343

American Academy of Paediatrics (2015) Media use by children younger than two years, *Pediatrics*. Retrieved from https://pediatrics.aappublications.org/content/128/5/1040

American Academy of Pediatrics. (2016). American Academy of Pediatrics announces new recommendations for children's media use. *Advocacy & Policy*. Retrieved from http://pediatrics.aappublications.org/content/138/5/e20162591.full

Anderson, D. R., Huston, A. C., Schmitt, K. L., Linebarger, D. L., Wright, J. C., & Larson, R. (2001). Early childhood television viewing and adolescent behavior: The recontact study. *Monographs of the Society for Research in Child Development*, i-154.

Appel, A.E., & C. O'Gara. (2001). Technology and Young Children: A Review of Literature. *TechKnowLogia*, 3(5): 35–36. http://ict.aed.org/ infocenter/pdfs/technologyandyoung.pdf.

Apple Press Releases. (2010). Apple reports quarterly results. Retrieved from http://www.apple.com/pr/library.

Arnott, L. (Ed.). (2017). *Digital technologies and learning in the early years*. Sage.

Avtar, T. (2014). How App Markets are adding a lot of value in Education, Think Tab Blogs. Retrieved from http://www.thinktab.com/how-app-markets-are-adding-a-lot-of-value-in-education/

Baldry, A., & Thibault, P. J. (2006). *Multimodal transcription and text analysis: A multimedia toolkit and coursebook*. Equinox.

Bannister, S. (2010). Integrating the iPod touch in K-12 education: Visions and vices. *Computers in the Schools*, 27(12), 121–131.

Barone, D. (2012). Exploring home and school involvement of young children with Web 2.0 and social media. *Research in the Schools*, 19(1), 1-11.

Barriball, K. L., & While, A. (1994). Collecting data using a semi-structured interview: a discussion paper. *Journal of Advanced Nursing-Institutional Subscription*, *19*(2), 328-335.

Barron, B., Cayton-Hodges, G., Bofferding, L., Copple, C., Darling-Hammond, L., & Levine, M. H. (2011, September). Take a giant step. In *The Joan Ganz Cooney Center at Sesame Workshop*. Retrieved from www. joanganzcooneycenter.org/Reports-31.html.

Barton, D., Hamilton, M., & IvaniÚc, R. (Eds.). (2000). *Situated literacies.* London: Routledge.

Barton, D., & Hamilton, M. (2012). Understanding literacy as social practice. In *Local literacies.* (pp. 21-40). Routledge.

Barton, D., & Hamilton, M. (1998). Everyday literacies. *Local literacies: reading and writing in one community.* London, New York: Routledge.

Barton, D., Hamilton, M., & IvaniÚc, R. (Eds.). (2000). *Situated literacies*. London: Routledge.

Bayne, S., & Ross, J. (2007, December). The ‘digital native’ and ‘digital immigrant’: a dangerous opposition. In *Annual Conference of the Society for Research into Higher Education (SRHE)* (Vol. 20). ac.uk/staff/sian/natives_final.pdf.

Bebell, D., Dorris, S., & Muir, M. (2012). Emerging results from the nation’s first kindergarten implementation of iPads. *Research summary*.

British Educational Research Association. (2011). Ethical guidelines for educational research. Retrieved from https://www.bera.ac.uk/publication/ethical-guidelines-for-educational-research-2011

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

Bezemer, J., & Kress, G. (2008). Writing in multimodal texts: A social semiotic account of designs for learning. *Written communication*, *25*(2), 166-195.

Bezemer, J., & Mavers, D. (2011). Multimodal transcription as academic practice: a social semiotic perspective. *International Journal of Social Research Methodology*, *14*(3), 191-206.

Bird, J. (2017). The Digital Play Framework and the Exploration of Technology Tools. Chicago: Erikson Institute. Retrieved from https://hdl.handle.net/1959.11/27090

Bird, J., & Edwards, S. (2015). Children learning to use technologies through play: A Digital Play Framework. *British Journal of Educational Technology*, *46*(6), 1149-1160.

Blanchard, J., & Moore, T. (2010). *The digital world of young children: Impact on emergent literacy.* Pearson Foundation. Retrieved from http://www.pearsonfoundation

Bowman, M. & Treiman, R. (2004). Stepping stones to reading. *Theory into Practice*, 43, 295–303.

Bronfenbrenner, U. 1977. "Toward an Experimental Ecology of Human Development." *American Psychologist*, 32(7), 513–531.

Brown, A. (2011). Media use by children younger than 2 years. *Pediatrics*.

Brown, A., Shifrin, D. L., & Hill, D. L. (2015). Beyond 'turn it off': How to advise families on media use. *AAP News*, *36*(10), 54-54.

Bruner, J. (1985). Child's talk: Learning to use language. *Child Language Teaching and Therapy*, *1*(1), 111-114.

Bruner, J. S. (1972). Nature and uses of immaturity. *American psychologist*, *27*(8), 687.

Burghardt, G. M. (2005). *The genesis of animal play: Testing the limits*. MIT Press.

Burnett, C., Merchant, G., Simpson, A., & Walsh, M. (Eds.). (2017). *The case of the iPad: Mobile literacies in education*. Springer.

Burnett, C. (2009). "That's more like how they know me as a person": one primary pre-service teacher's stories of her personal and 'professional' digital practices. *Literacy*, *43*(2), 75-82.

Burnett C. and Merchant G. (2012) Learning, Literacies and New Technologies: The Current Context and Future. In J. Larson and J. Marsh (Eds.) *The SAGE Handbook of Early Childhood Literacy* (2nd edtn), London: Sage, 575-586.

Burden, K., Hopkins, P., Male, T., Martin, S., & Trala, C. (2012). iPad Scotland Evaluation. Hull: University of Hull.

Carle, E. (1994). *The Very Hungry Caterpillar.* Philomel Books.

Carr, J. M. (2012). Does math achievement h'APP'en when iPads and game-based learning are incorporated into fifth-grade mathematics instruction?. *Journal of Information Technology Education: Research*, *11*(1), 269-286.

Carrington, V., & Hodgetts, K. (2010). Literacy-lite in BarbieGirls™. *British Journal of Sociology of Education*, *31*(6), 671-682.

Centre for Evaluation and Monitoring (2017). Do Children Learn Better in the Morning or Afternoon. Retrieved from https://www.cem.org/do-children-learn-better-in-the-morning-or-afternoon

Christ, T., Wang, X. C., & Chiu, M. M. (2015). Emergent readers' social interaction styles and their comprehension processes during buddy reading. *Literacy Research and Instruction*, *54*(1), 45-66.

Christ, T., & Wang, X. C. (2015, April). Reading Approaches, Interaction Styles, and Depths of Comprehension Discussed: An Analysis of Kindergartners' Buddy Reading with iPad App Books. Paper presented at the annual meeting of the American Educational Research Association Conference, Chicago, IL.

Clark, C. (2014). Children's and Young People's Reading in 2013. Findings from the 2013 National Literacy Trust's annual survey. *National Literacy Trust.* Retrieved from http://www.literacytrust.org.uk/assets/0002/6896/Children_and_Young_People_s_Reading_in_2014.pdf

Cohen, M., Hadley, M. & Frank, M. (2010). Young children, apps & iPad. New York: Michael Cohen Group. Retrieved from http://mcgrc.com/publications/publications/

Cohen, V. L., & Cowen, J. E. (2011). *Literacy for children in an information age: Teaching reading, writing, and thinking*. Belmont, CA: Wadsworth Cengage Learning.

Copland, F., & Creese, A. (2015). *Linguistic ethnography: Collecting, analysing and presenting data*. Sage.

Common Sense Media (2013). Zero to eight: Children's media use in American 2013. San Francisco: Common Sense Media.

Critcher, C. (2008). Making waves: Historical aspects of public debates about children and mass media. In K. Drotner & S. Livingston (Eds.), *International Handbook of Children, Media and Culture*, 91-104.

Davies, J., & Merchant, G. (2014). 14 Digital literacy and teacher education. *Popular culture, pedagogy and teacher education: International perspectives*, 180-193.

Davies, J., & Merchant, G. (2009). *Web 2.0 for schools: Learning and social participation* (Vol. 33). Peter Lang.

Davis, L. L. (2015) NAPLAN online research and development: Report 1: Device Effect Study – Literature Review. Australian Curriculum, Assessment and Reporting Authority.

Damon, W., & Phelps, E. (1989). Critical distinctions among three approaches to peer education. *International journal of educational research*, *13*(1), 9-19.

DeBell, M. (2005). Rates of Computer and Internet Use by Children in Nursery School and Students in Kindergarten through Twelfth Grade: 2003. Issue Brief. NCES 2005-111. *National Center for Education Statistics*.

Dewald, J. (1993). *Aristocratic Experience and the Origins of Modern Culture: France, 1570-1715* (p. 105). Berkeley, CA: University of California Press.

Drotner, K., and Livingstone, S. (2008) Volume introduction. In Drotner, K., and Livingstone, S. (Eds.). *The International Handbook of Children, Media and Culture*. London: Sage.

Donohue, C., & Schomburg, R. (2017). Technology and interactive media in early childhood programs: What we've learned from five years of research, policy, and practice. *Young Children*, *72*(4), 72-78.

Du Bois, J. W. (1991). Transcription design principles for spoken discourse research. *Pragmatics*, *1*(1), 71-106.

Dunn, J., Gray, C., Moffett, P., & Mitchell, D. (2018). 'It's more funner than doing work': children's perspectives on using tablet computers in the early years of school. *Early Child Development and Care*, *188*(6), 819-831.

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration?. *Educational technology research and development*, *53*(4), 25-39.

Edwards, S., & Bird, J. (2017). Observing and assessing young children's digital play in the early years: Using the Digital Play Framework. *Journal of early Childhood research*, *15*(2), 158-173.

Edwards, D., & Potter, J. (1992). *Discursive psychology*. Newbury Park, CA: Sage.

Engen, B. K., Giæver, T. H., & Mifsud, L. (2017, October). Collaborative Writing through iPad Sharing. In *E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education* (pp. 1691-1705). Association for the Advancement of Computing in Education (AACE).

The Economist. (2010, March 22). Even Apple doesn't know who its iPad is for. Retrieved September 1, 2016, from http://www.economist.com/blogs/babbage/2010/03/apples_ipad

Fagen, R. (2002). Primate juveniles and primate play. *Juvenile primates*, 182-196.

Flavell, J. H., Shipstead, S. G., & Croft, K. (1978). Young children's knowledge about visual perception: Hiding objects from others. *Child Development*, 1208-1211.

Fletcher-Watson, S., Petrou, A., Scott-Barrett, J., Dicks, P., Graham, C., O'Hare, A., & McConachie, H. (2015). A trial of an iPad™ intervention targeting social communication skills in children with autism. *Autism*, 1362361315605624.

Flewitt, R. (2011). Bringing ethnography to a multimodal investigation of early literacy in a digital age. *Qualitative Research*, *11*(3), 293-310.

Flewitt, R. (2005). Conducting research with young children: Some ethical considerations. *Early child development and care*, *175*(6), 553-565.

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

Flores, M., Musgrove, K., Renner, S., Hinton, V., Strozier, S., Franklin, S., & Hil, D. (2012). A comparison of communication using the Apple iPad and a picture-based system. *Augmentative and Alternative Communication*, *28*(2), 74-84.

Flynn, E., Pine, K., & Lewis, C. (2006). The microgenetic method: Time for change. *Psychologist*.

Frost, J. L., Wortham, S. C., & Reifel, R. S. (2008). *Play and child development*. Upper Saddle River, NJ: Pearson/Merrill Prentice Hall.

Gass, S. (2013). How to Choose the Right Apps for Early Learning: Young Children Learn Best from Carefully Vetted Content. *THE Journal (Technological Horizons In Education)*, *40*(9), 20.

Gasparini, A., & Culén, A. (2012). Acceptance factors: an iPad in Classroom Ecology. In *2012 International Conference on e-Learning and e-Technologies in Education (ICEEE)* (pp. 140-145). IEEE.

Gasparini, A., & Culen, A. (2013). The iPad in a classroom: a cool personal item or simply an educational tool?: 204-209.

Gee, J. P. (1996) Social Linguistics and Literacies: Ideology in Discourses. *Critical perspectives on literacy and education. London: Falmer Press*.

Gillen, J. (2015) *Virtual spaces in literacy studies.* In: The Routledge handbook of literacy studies. Routledge Handbooks in Applied Linguistics. Routledge, London.

Gillen, J. (2014). *Digital literacies*. London: Routledge.

Gillen, J. (2009). Literacy practices in Schome Park: A virtual literacy ethnography. *Journal of Research in Reading*, 32, 57–74.

Gillen, J., & Cameron, C. A. (2017). Negotiating citizenship: a young child's collaborative meaning-making constructions of beavers as a symbol of Canada. *Language and Education*, *31*(4), 330-350.

Gillen, J., & Merchant, G. (2012). From virtual histories to virtual literacies. In G. Merchant, J. Gillen, J. Marsh & J. Davies (eds) *Virtual literacies: Interactive Spaces for Children and Young People*. New York: Routledge.

Gillen, J., & Barton, D. (2010). Digital literacies: Research briefing for the TLRP-TEL (Teaching and Learning Research Programme - Technology Enhanced Learning). London: ESRC Teaching and Learning Research Programme.

Gillies, R. M. (2006). Teachers' and students' verbal behaviours during cooperative and small-group learning. *British Journal of Educational Psychology*, *76*(2), 271-287.

Given, L. M. (2008). Semi-structured interview. *The SAGE encyclopedia of qualitative research methods*, *2*, 810-811.

Guernsey, L., & Levine, M. H. (2015). *Tap, Click, Read: Growing Readers in a World of Screens*. John Wiley & Sons.

Guillain, C. (2008). *Caring for Nature.* Heinemann Library.

Günther, J. (2007). *Digital natives & digital immigrants*. Innsbruck: Studienverlag.

Hannaford, J. (2012). Imaginative interaction with Internet games. For children and teachers. *Literacy*, *46*(1), 25-32.

Harwood, D. (2017). *Crayons and iPads: Learning and teaching of young children in the digital world*. London: Sage.

Haugland, S. (2000). *Computers and young children*. Champagne, IL: ERIC Clearinghouse on Elementary and Early Childhood Education. (ERIC Document Reproduction Service No. ED 438 926).

Harrold, R. (2012). The ipad effect: leveraging engagement, collaboration, and perseverance. *International Educator*, *26*(3), 4-18.

Hartup, W. W. (1992). Friendships and their developmental significance. *Childhood social development: Contemporary perspectives*, 175-205.

Hillman, M., & Moore, T. J. (2004). The web and early literacy. *Computers in the Schools*, *21*(3-4), 15-21.

Hughes, M. (1975). Egocentrism in preschool children.

Hutchison, A., Beschorner, B., & Schmidt-Crawford, D. (2012). Exploring the use of the iPad for literacy learning. *The Reading Teacher*, *66*(1), 15-23.

Hutt, C. (1966). *Exploration and Play in Children.* Paper presented at the Symposia of the Zoological Society of London, London, England.

International Reading Association. (2009). IRA position statement on new literacies and 21st century technologies. Newark, DE: Author. Available at www.reading.org/General/AboutIRA/PositionStatements/21stCenturyLiteracies.aspx.

Jewitt, C. (2016). Multimodal analysis. *The Routledge handbook of language and digital communication*, 69-84.

Jewitt, C., Price, S., & Xambo Sedo, A. (2017). Conceptualising and researching the body in digital contexts: towards new methodological conversations across the arts and social sciences. *Qualitative research*, *17*(1), 37-53.

Kent, J. (1985). *The Caterpillar and the Polliwog*. Aladdin.

Kinzer, C. K., & Leu, D. J. (2016). new literacies, New Literacies. *Encyclopedia of educational philosophy and theory*, 1-7.

Kirkland, D.E., & Jackson, A. (2009). “We real cool”: Toward a theory of black masculine literacies. *Reading Research Quarterly*, 44(3), 278–297.

Kirkorian, H. L., & Pempek, T. A. (2013). Toddlers and Touch Screens: Potential for Early Learning? *Zero to Three*, *33*(4), 32-37.

Kissmann, U. T. (2009). Video interaction analysis. *Methods and methodology. Frankfurt/M.: Peter Lang*.

Knobel, M., & Lankshear, C. (Eds.). (2007). *A new literacies sampler* (Vol. 29). Peter Lang.

Kress, G. (2010). *Multimodality: A social semiotic approach to contemporary communication*. New York, NY: Routledge.

Kucirkova, N. (2015). Story-Making with iPad Apps: Baking Stories in the 21st Century. *Exchange*.

Kucirkova, N. (2014). Shiny Appy Children. 16 December, 2014. *The Joan Ganz Cooney Center*. Retrieved from http://www.joanganzcooneycenter.org/2014/12/16/shiny-appy-children/

Kucirkova, N. (2013). Children's interactions with iPad books: research chapters still to be written. *Frontiers in psychology*, *4*, 995.

Kucirkova, N., Littleton, K., & Cremin, T. (2016). Young children’s reading for pleasure with digital books: six key facets of engagement. *Cambridge Journal of Education. 47*(1), 1-18.

Kucirkova, N., Messer, D., Sheehy, K., & Flewitt, R. (2013). Sharing personalised stories on iPads: A close look at one parent–child interaction. *Literacy*, *47*(3), 115-122.

Kuhn, D. (1995). Microgenetic study of change: What has it told us? *Psychological Science*, *6*(3), 133-139.

Kumpulainen, K., & Gillen, J. (2017). Young children’s digital literacy practices in the home: A review of the literature.

Kumpulainen, K., & Mutanen, M. (1999). The situated dynamics of peer group interaction: An introduction to an analytic framework. *Learning and instruction*, *9*(5), 449-473.

Kvavik, R. B. (2005). Convenience, communications, and control: How students use technology. *Educating the net generation*, *1*(2005), 7-1.

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.

Lankshear, C., & Knobel, M. (2011). *New literacies*. McGraw-Hill Education (UK).

Lankshear, C., Bigum, C., Durrant, C., Green, B., Morgan,W., Murray, J., Snyder, I. and Wild, M. (1996) ‘Literacy, technology and education: A project report’, *Australian Journal of Language and Literacy*, *19*(4): 345–59.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge university press.

Leichtenstern, K., André, E., & Vogt, T. (2007). Role assignment via physical mobile interaction techniques in mobile multi-user applications for children. In *Ambient Intelligence* (pp. 38-54). Springer, Berlin, Heidelberg.

Leu, D. J. (2000). Literacy and technology: Deictic consequences for literacy education in an information age. In M.L. Kamil, P.B. Mosenthal, P.D. Pearson, & R. Barr (Eds.), *Handbook of reading research* (Vol. 3, pp. 743–770). Mahwah, NJ: Erlbaum.

Leu, D. J., Kinzer, C. K., Coiro, J. L., & Cammack, D. W. (2004). Toward a theory of new literacies emerging from the Internet and other information and communication technologies. *Theoretical models and processes of reading*, *5*(1), 1570-1613.

Levy, R. (2011). *Young Children Reading: At home and at school*. Sage Publications.

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.

Lim, C. P. (2002). A theoretical framework for the study of ICT in schools: a proposal. *British Journal of Educational Technology*, *33*(4), 411-421.

Livingstone, S., Marsh, J., Plowman, L., Ottovordemgentschenfelde, S., & Fletcher-Watson, B. (2014). Young children (0-8) and digital technology: a qualitative exploratory study-national report-UK.

Luwel, K. (2012). Microgenetic method. In N. Seel (Ed.), *Encyclopedia of the sciences of learning* (pp. 2265-2268). New York: Springer.

Lynch, J. & Redpath, T. (2014). ‘Smart’ technologies in early years education: A meta-narrative of paradigmatic tensions in iPad use in an Australian preparatory classroom. *Journal of Early Childhood Literacy*, *14*(2), 147-174.

Mangen, A., & Kuiken, D. (2014). Lost in an iPad: Narrative engagement on paper and tablet. *Scientific Study of Literature*, *4*(2), 150-177.

Marchant, R., & Kirby, P. (2004). The participation of young children: Communication, consultation and involvement. In B. Neale (Ed.), *Young children’s citizenship: Ideas into practice* (pp. 92-163). York, United Kingdom: Joseph Rowntree Foundation.

Margaryan, A., Littlejohn, A., & Vojt, G. (2011). Are digital natives a myth or reality? University students’ use of digital technologies. *Computers & education*, *56*(2), 429-440.

Marsh, J. (2016). The digital literacy skills and competences of children of pre-school age. *Media Education: Studi, Ricerche, Buone Practice*, *7*(2), 197-214.

Marsh, J. (2012). Purposes for literacy in children's use of the online virtual world Club Penguin. *Journal of Research in Reading*, *00*(0), 1-17.

Marsh, J. (2010). Young children's play in online virtual worlds. *Journal of Early Childhood Research*, *8*(1), 23–39.

Marsh, J., Plowman, L., Yamada-Rice, D., Bishop, J., & Scott, F. (2016). Digital play: A new classification. *Early Years*, *36*(3), 242-253.

Marsh, J., Plowman, L., Yamada-Rice, D., Bishop, J.C., Lahmar, J., Scott, F., Davenport, A., Davis, S., French, K., Piras, M., Thornhill, S., Robinson,P. and Winter, P. (2015). Exploring Play and Creativity in Preschoolers' Use of Apps: Final Project Report. Accessed at: www.techandplay.org.

Martin, C., Williams, C., Ochsner, A., Harris, S. King, E., Anton, G., Elmergreen, J. & Steinkuehler, C. (2012). Playing together separately: Mapping out literacy and social synchronicity. In G. Merchant, J. Gillen, J. Marsh & J. Davies (Eds.), *Virtual literacies: Interactive spaces for children and young people*, 226 - 243. London: Routledge

McCarty, P. (2007). *Hondo and Fabian*. Macmillan.

McManis, L. D., & Gunnewig, S. B. (2012). Finding the education in educational technology with early learners. *Young Children*, *67*(3), 14-24.

Merchant, G. (2015). Keep taking the tablets: iPads, story apps and early literacy. *Australian Journal of Language and Literacy*, 38(1), 3-12.

Merchant, G. (2014). Young children and interactive story-apps. In: C. Burnett, J. Davies, G. Merchant & J. Rowsell (Eds.), *New Literacies around the Globe* (pp.121-139). London: Routledge.

Merchant, G. (2012). Mobile practices in everyday life: Popular digital technologies and schooling revisited. *British Journal of Educational Technology, 43*(5), 770-782.

Merchant, G. (2009). Literacy in virtual worlds. *Journal of Research in Reading*, 32(1), 38–56.

Merchant, G., Gillen, J., Marsh, J., & Davies, J. (2012). *Virtual Literacies: Interactive Spaces for Children and Young People*. London: Informa UK Limited.

Nacher, V., Jaen, J., Navarro, E., Catala, A., & González, P. (2015). Multi-touch gestures for pre-kindergarten children. *International Journal of Human-Computer Studies*, *73*, 37-51.

Naties, V. (1989). United Nations Convention on the Rights of the Child (UNCRC).

National Association for Education of Young Children (NAEYC). (2012). Technology and Interactive Media as Tools in Early Childhood Programs Serving Children from Birth through Age 8. Retrieved from http://www.naeyc.org/files/naeyc/file/positions/PS_technology_WEB2.pdf

National Literacy Trust. (n.d.). How to choose apps. Retrieved from https://literacyapps.literacytrust.org.uk/how-to-choose-apps/

Neumann, M. M. (2016). Young children's use of touch screen tablets for writing and reading at home: Relationships with emergent literacy. *Computers & Education*, *97*, 61-68.

Neumann, M. M. (2014). An examination of touch screen tablets and emergent literacy in Australian pre-school children. *Australian Journal of Education*, *58*(2), 109-122.

Neumann, M. M., & Neumann, D. L. (2017). The use of touch-screen tablets at home and pre-school to foster emergent literacy. *Journal of Early Childhood Literacy*, *17*(2), 203-220.

Newcomb, A. F., & Bagwell, C. L. (1995). Children's friendship relations: A meta-analytic review. *Psychological bulletin*, *117*(2), 306.

Norman, D. (1988). *The psychology of everyday things*. New York: Basic Books.

NPD Group. (2010). Over Half of Children Now Using Smart Devices. Port Washington, NY: The NPD Group. Retrieved from https://www.npd.com/wps/portal/npd/us/news/press-releases/over-half-of-children-now-using-smart-devices/

Nygard, A. O. (2017). Digital Literacy Practices in Education. *An investigation of the Use of Blogs in a Norwegian High School.*

Oliemat, E., Ihmeideh, F., & Alkhawaldeh, M. (2018). The use of touch-screen tablets in early childhood: Children's knowledge, skills, and attitudes towards tablet technology. *Children and Youth Services Review*, *88*, 591-597.

O'Mara, J., & Laidlaw, L. (2011). Living in the iworld: Two literacy researchers reflect on the changing texts and literacy practices of childhood. *English Teaching: Practice and Critique*, 10, 149–159.

Onwuemezi, N. (2016). Survey finds 76% of children prefer print books. *The Bookseller*. Retrieved from https://www.thebookseller.com/news/children-prefer-print-books-e-books-survey-finds-322447

Panzarino, M. (October 2, 2012). "Rare full recording of 1983 Steve Jobs speech reveals Apple had been working on iPad for 27 years". The Next Web. Retrieved from https://thenextweb.com/apple/2012/10/02/rare-full-recording-of-1983-steve-jobs-speech-reveals-apple-had-been-working-on-ipad-for-27-years/

Palaiologou, I. (2016). Children under five and digital technologies: implications for early years pedagogy. *European Early Childhood Education Research Journal*, *24*(1), 5-24.

Parish-Morris, J., N. Mahajan, K. Hirsh-Pasek, R. M. Golinkoff, and M. F. Collins. (2013). "Once Upon a Time: Parent-Child Dialogue and Storybook Reading in the Electronic Era." Mind, Brain, and Education 7 (3): 200–211.

Park, Y. (2011). A pedagogical framework for mobile learning: categorizing educational applications of mobile technologies into four types. *International Review of Research in Open and Distance Learning*, 12(2), 78-102.

Pemble, C. (2018). Digital Technologies and Generational Identity ICT Usage Across the Life Course. *Journal of Enabling Technologies*.

Penuel, W., Pasnik, S., Bates, L., Townsend, E., Gallagher, L., Llorente, C., & Hupert, N. (2009). Preschool teachers can use a media-rich curriculum to prepare low-income children for school success: Results of a randomized controlled trial. New York, Menlo Park, CA: Education Development Center, SRI International.

Pew Research Center (2014). Millennials in adulthood. Washington, DC. Retrieved from https://www.pewsocialtrends.org/wp-content/uploads/sites/3/2014/03/2014-03-07_generations-report-version-for-web.pdf.

Philip, J., Adams, R., & Iwashita, N. (2014). Peer interaction and second language learning. New York, NY: Routledge.

Pirini, J., Norris, S., Geenen, J., & Matelau, T. (2014). Studying social actors: some thoughts on ethics. In S. Norris & C. D. Maier (Eds.), *Interactions, images and texts: a reader in multimodality* (pp. 233–242). Boston, MA/Berlin: De Gruyter.

Plowman, L., Stephen, C., & McPake, J. (2010). *Growing up with technology: Young children learning in a digital world*. Routledge.

Powell, M. A., & Smith, A. B. (2009). Children's participation rights in research. *Childhood*, *16*(1), 124-142.

Prensky, M. (2001). Digital natives, digital immigrants. *On the horizon*, *9*(5).

Purcell, K., Heaps, A., Buchanan, J., & Friedrich, L. (2013). How teachers are using technology at home and in their classrooms. Washington, DC: Pew Research Center's Internet & American Life Project.

Rampton, Ben, Tusting, Karin, Maybin, Janet Barwell, Richard, Creese, Angela and Lytra, Valy 2004. UK Linguistic Ethnography: A Discussion Paper. Paper published at http://uklef.ioe.ac.uk/linguisticethnography.html

Redit, S. (2015, October 12). Pediatricians Rethink Screen Time Policy for Children. *The Wall Street Journal*. Retrieved from: http://www.wsj.com/articles/pediatricians-rethink-screen-time-policy-for-children-1444671636

Reese, E., Cox, A., Harte, D., & McAnally, H. (2003). Diversity in adults' styles of reading books to children. *On reading books to children: Parents and teachers*, 37-57.

Reeve, J. (2006). Extrinsic Rewards and Inner Motivation. In C. M. Evertson & C. S. Weinstein (Eds.), *Handbook of classroom management: Research, practice, and contemporary issues* (pp. 645-664). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Reiser, R. A., Tessmer, M. A., & Phelps, P. C. (1984). Adult-child interaction in children's learning from "Sesame Street". *ECTJ*, *32*(4), 217-223.

Richards, K. (2003). *Qualitative inquiry in TESOL*. Springer.

Richardson, W. (2006). *Blogs, wikis, podcasts, and other powerful Web tools for classrooms.*, Thousand Oaks, CA: Corwin Press.

Rideout, V. (2014). *Learning at home: families' educational media use in America*. New York: The Joan Ganz Cooney Center at Sesame Workshop

Rogoff, B. (2003). *The cultural nature of human development*. Oxford University Press.

Rogoff, B. (1994). Developing understanding of the idea of communities of learners. *Mind, culture, and activity*, *1*(4), 209-229.

Rogoff, B. (1993). Children's guided participation and participatory appropriation in sociocultural activity. *Development in context: Acting and thinking in specific environments*, 121-153.

Rogoff, B. (1991). Social interaction as apprenticeship in thinking: Guided participation in spatial planning.

Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. Oxford university press.

Rose, S., Fitzpatrick, K., Mersereau, C., and Whitty, P. (2017). Playful pedagogic moves: digital devices in the outdoors. In: D. Harwood (ed.), *Crayons and iPads: Learning and teaching of young children in the digital world*. 16-28.

Rowsell, J. (2017). Be the "I" in iPad: iPads and the children who love them. *Crayons and iPads: Learning and teaching of young children in the digital world*, 6-15.

Salen, K., & Zimmerman, E. (2004). Rules of play: Game design fundamentals. *Cambridge: The MITPress*.

Samuelsson, I. P., & Carlsson, M. A. (2008). The playing learning child: Towards a pedagogy of early childhood. *Scandinavian journal of educational research*, *52*(6), 623-641.

Seales, R., & Harding, E. (2013). Four-year-old girl is Britain's youngest iPad ADDICT: Shocking rise in children hooked on using smartphones and tablets, 27 April, 2013. *Daily Mail*. Retrieved from http://www.dailymail.co.uk/news/article-2312429/Four-year-old-girl-Britains-youngest-iPad-ADDICT-Shocking-rise-children-hooked-using-smartphones-tablets.html.

Sefton-Green, J., Kumpulainen, K., Lipponen, L., Sintonen, S., Rajala, A., & Hilppö, J. (2015). Manifesto by the Playful Learning Center: Playing with learning.

Shifrin, D., Brown, A., Hill, D., Jana, L., & Flinn, S. K. (2015). Growing up digital: Media research symposium. *American Academy of Pediatrics*, *1*, 2015.

Siegler, R. S. (2006). Microgenetic analyses of learning. In W. Damon, R. M. Lerner, D. Kuhn, & R. S. Siegler (Eds.), *Handbook of Child Psychology*: Volume 2: Cognition, perception, and language (6th ed., pp. 464-510). Hoboken, NJ: Wiley.

Siegler, R. S., & Crowley, K. (1991). The microgenetic method: A direct means for studying cognitive development. *American Psychologist*, 46, 606-620.

Snow, C. E., Burns, M. S., & Griffin, P. (1998). Preventing reading difficulties in young children National Academy Press. *Washington, DC*.

Stephen, C., & Plowman, L. (2014). *Digital play*. London: Routledge.

Stevens, R., & Penuel, W. R. (2010). Studying and fostering learning through joint media engagement. In *Principal Investigators Meeting of the National Science Foundation's Science of Learning Centers, October, Arlington, VA* (pp. 1-75).

Stevens, R., & Takeuchi, L. (2011). The New Coviewing: Designing for Learning through Joint Media Engagement.

Storch, N. (2005). Collaborative writing: Product, process, and students' reflections. *Journal of second language writing*, *14*(3), 153-173.

Street, B. (1995) *Social Literacies: Critical Approaches to Literacy in Development, Ethnography and Education*. Harlow: Pearson Education.

Street, B. (1993). *Cross-Cultural Approaches to Literacy*. Cambridge: Cambridge University Press.

Street, B. (1984). *Literacy in theory and practice*. Cambridge Cambridgeshire ; New York: Cambridge University Press.

Suwankhong, D., & Liamputtong, P. (2013). Ethnographic performance and its flexibility in researching a traditional healing system in southern Thailand. *Qualitative Research Journal*.

Swinglehurst, D. (2015). How linguistic ethnography may enhance our understanding of electronic patient records in health care settings. In *Linguistic Ethnography* (pp. 90-109). Palgrave Macmillan, London.

Takeuchi, L. M. (2011). Families Matter: Designing media for a digital age. In *New York: The Joan Ganz Cooney Center at Sesame Workshop*.

Tench, R. (2018). America's Changing Neighborhoods: An Exploration of Diversity Through Places.

Thomas, A. (2011). Towards a Transformative Digital Literacies Pedagogy. Nordic Journal of Digital Literacy, 6(1-2), 89-101.

Toomer, P. (2010, July). iPads: "There's no limit to how successful they will be". *New Zealand Interface Magazine*. Retrieved from http://interfaceonline.co.nz/2010/07/09/ipads-theres-no-limit-to-how-successful-they-will-be.

Trilling, B., & Fadel, C. (2009). *21st century skills: Learning for life in our times*. John Wiley & Sons.

Turbill, J. (2001) A Researcher Goes to School: Using Technology in the Kindergarten Literacy Curriculum, *Journal of Early Childhood Literacy*, 1(3): 255– 279.

Tusting, K. (2013). Literacy studies as linguistic ethnography. *Working papers in Urban Language and Literacies*. King's College London.

U.S. Department of Education (2016). National Education Technology Plan. Retrieved from http-//tech.ed.gov/files/2015/12/NETP16.pdf.webloc

Vandewater, E., Rideout, V., Wartella, E., Huang, X., Lee, J., & Shim, M. (2007). Digital childhood: Electronic media and technology use among infants, toddlers and preschoolers. *Pediatrics*, 119(5), 1006-1015.

Vygotsky, L. S. (1987). The development of scientific concepts in childhood. *The collected works of LS Vygotsky*, *1*, 167-241.

Vygotsky, L. S. (1986). *Language and thought*. Cambridge, MA: MIT Press

Vygotsky, L. S. (1978). *Mind in Society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1967). Play and its role in the mental development of the child. *Soviet psychology*, *5*(3), 6-18.

Walker, G. (2011). Tablet product and market history. *Saatavilla osoitteessa: http://www. walkermobile.com/Tablet_History. pdf. Viitattu*, *1*, 2012.

Walsh, M. & Simpson, A. (2014). Exploring embodied literacies through touch pad technologies: the dynamic materiality of modal interactions. *Australian Journal of Language and Literacy*, 37(2), 96–106.

Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Annual progress in child psychiatry and child development*, 37-76.

Wohlwend, K. (2010). A is for avatar: Young children in literacy 2.0 worlds and literacy 1.0 schools. *Language Arts*, 88(2), 144-152.

Woloshyn, Vera & Grierson, Arlene & Lane, Laura. (2017). Using iPads to Empower Young Children as Readers and Writers. In: D. Harwood (ed.), *Crayons and iPads: Learning and teaching of young children in the digital world. 91-102.*

Wray, D., & Kumpulainen, K. (2010). Researching classroom interaction and talk. *Educational research and inquiry: Qualitative and quantitative approaches*, 170-185.

Wright, S. (2007). Young Children's Meaning-Making through Drawing and 'Telling' Analogies to Filmic Textual Features. *Australasian journal of early childhood*, *32*(4), 37-48.

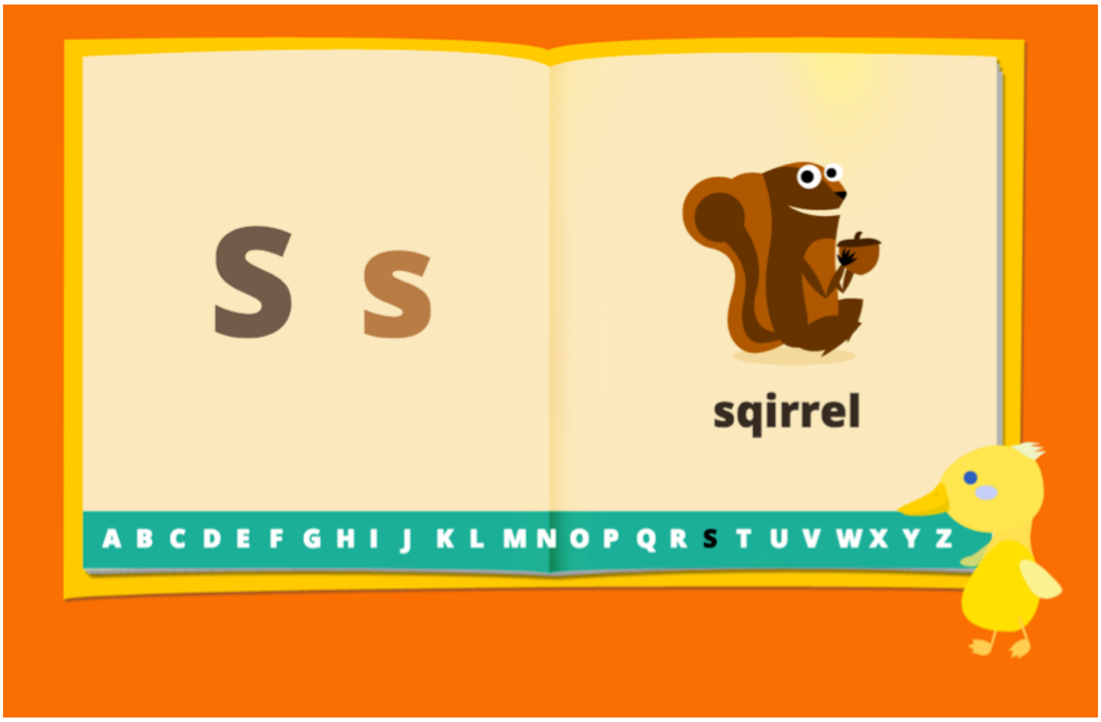
Appendices

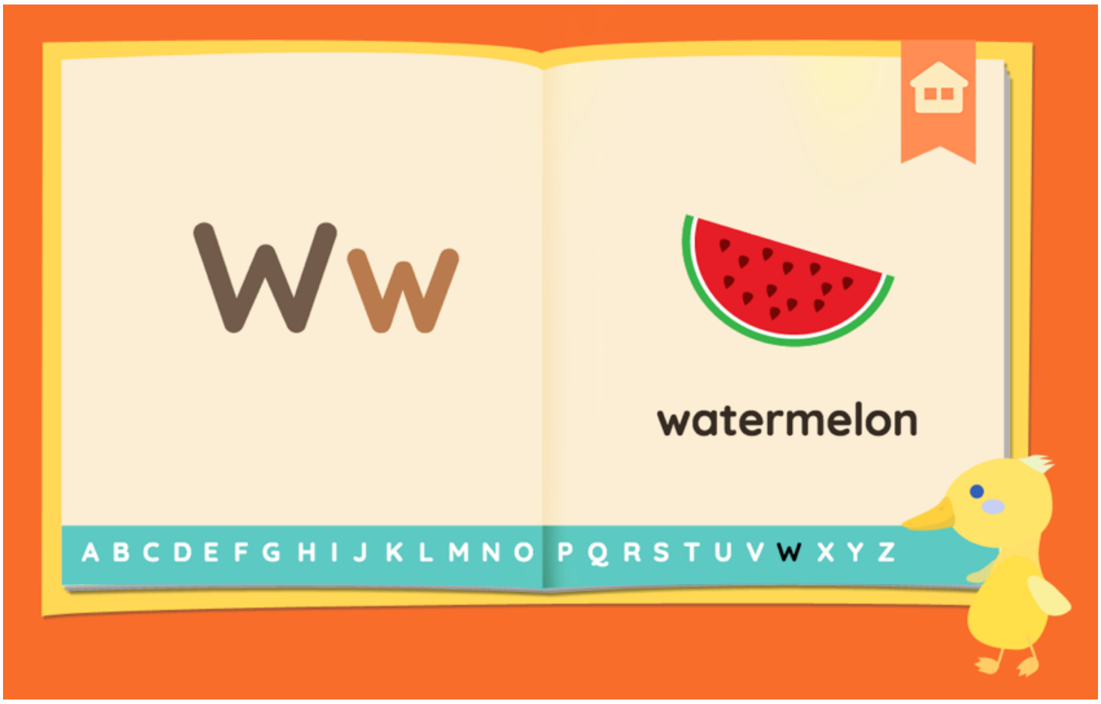
Appendix 1. Samples of Aniland print version

Please note that pages on iPads and prints are identical absence of the home button on prints.

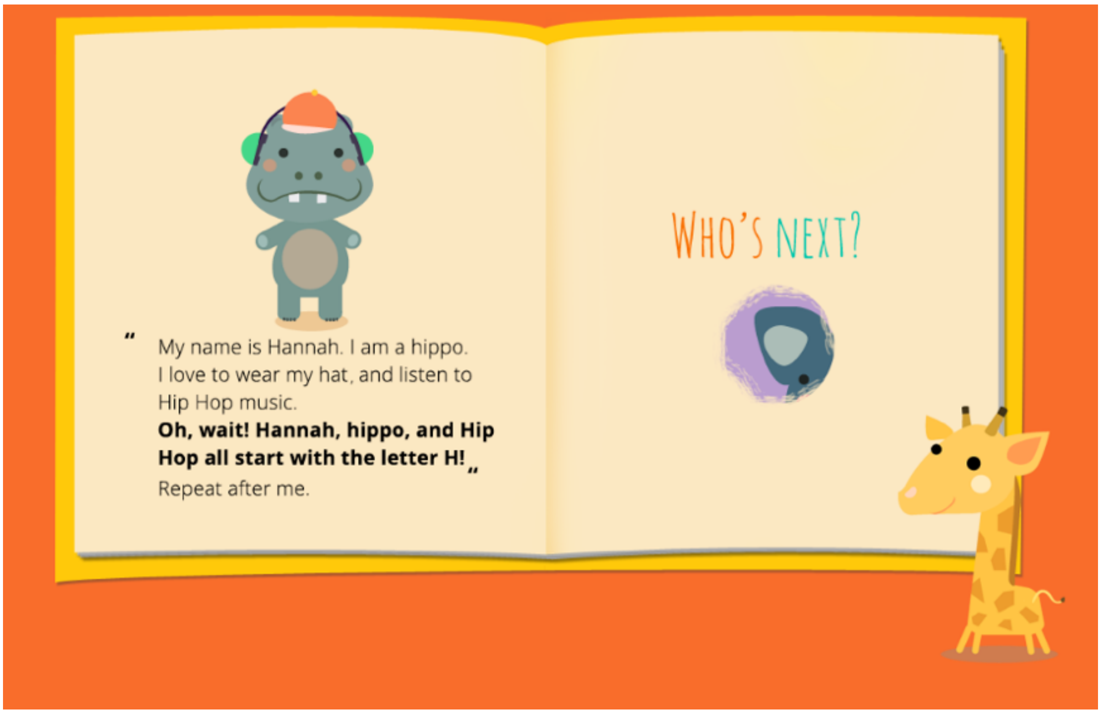
Books

Alphabet letter book

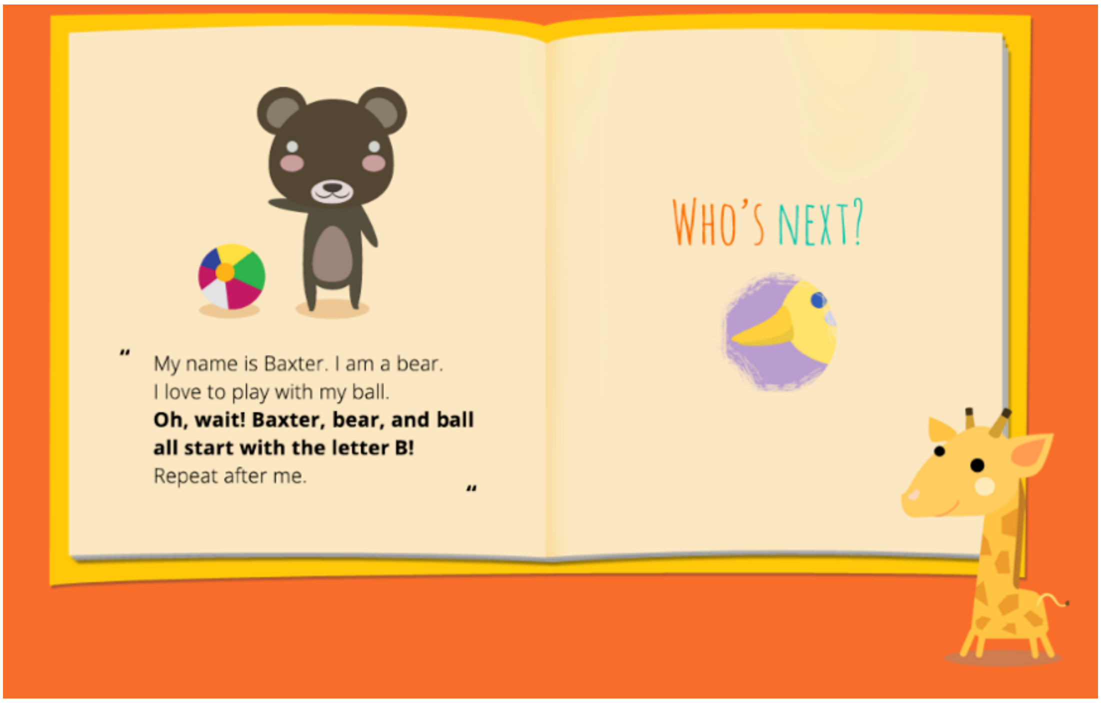

S s
sqirrel
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z


W w
watermelon
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Alphabet sound book

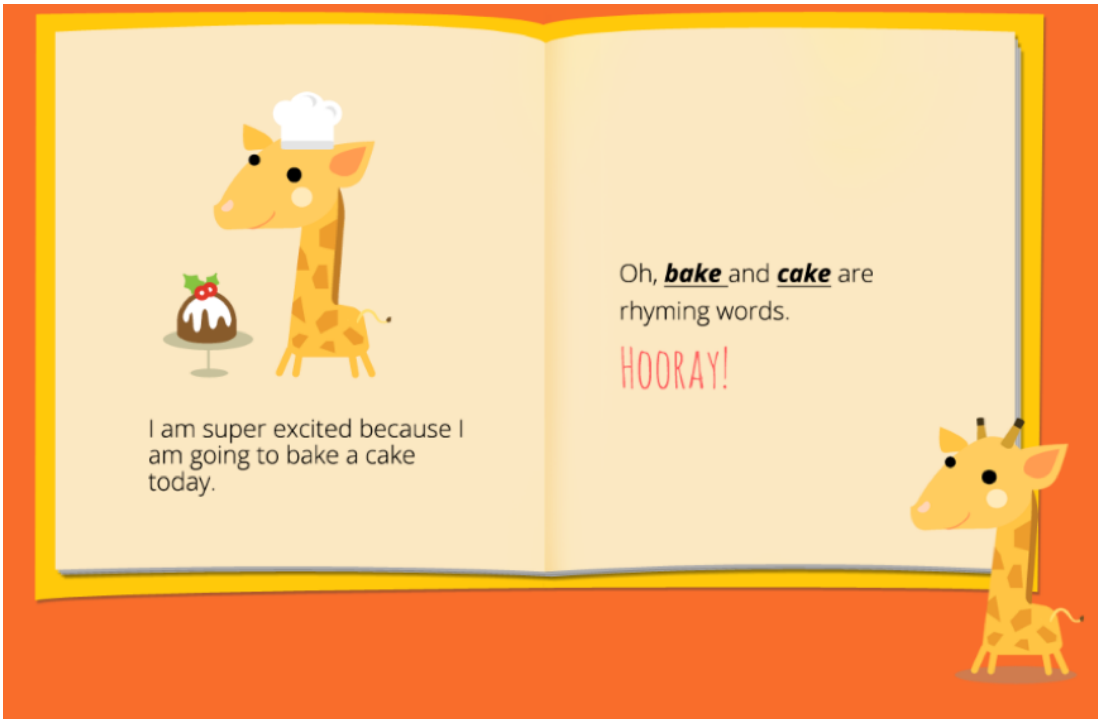


" My name is Hannah. I am a hippo.
I love to wear my hat, and listen to
Hip Hop music.
**Oh, wait! Hannah, hippo, and Hip
Hop all start with the letter H!** "
Repeat after me.



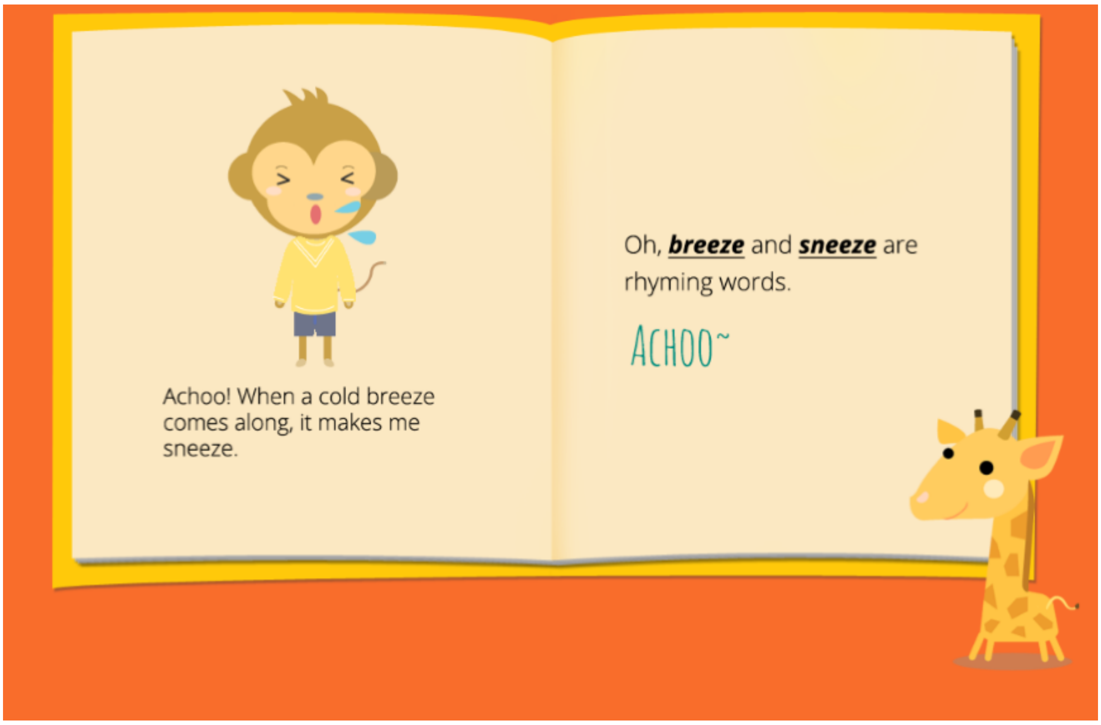
" My name is Baxter. I am a bear.
I love to play with my ball.
**Oh, wait! Baxter, bear, and ball
all start with the letter B!**
Repeat after me. "

Rhyming day book



I am super excited because I am going to bake a cake today.

Oh, ***bake*** and ***cake*** are rhyming words.

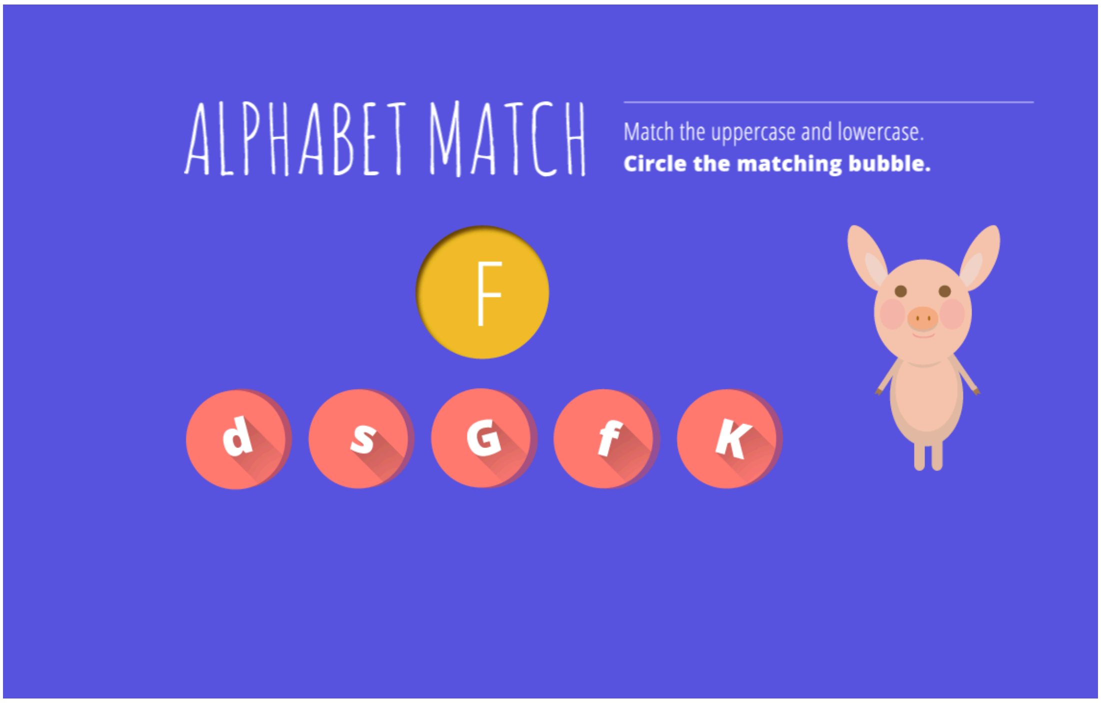


Achoo! When a cold breeze comes along, it makes me sneeze.

Oh, ***breeze*** and ***sneeze*** are rhyming words.

Activities

Alphabet Matching Game

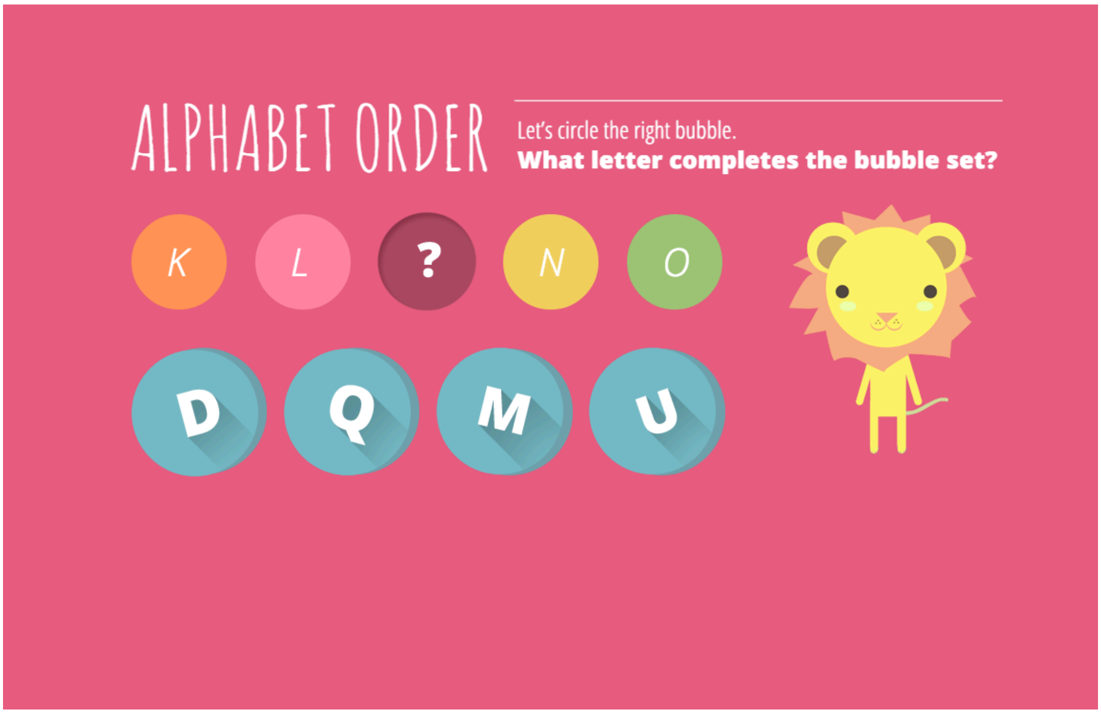


ALPHABET MATCH

Match the uppercase and lowercase.

Circle the matching bubble.

Alphabet order game

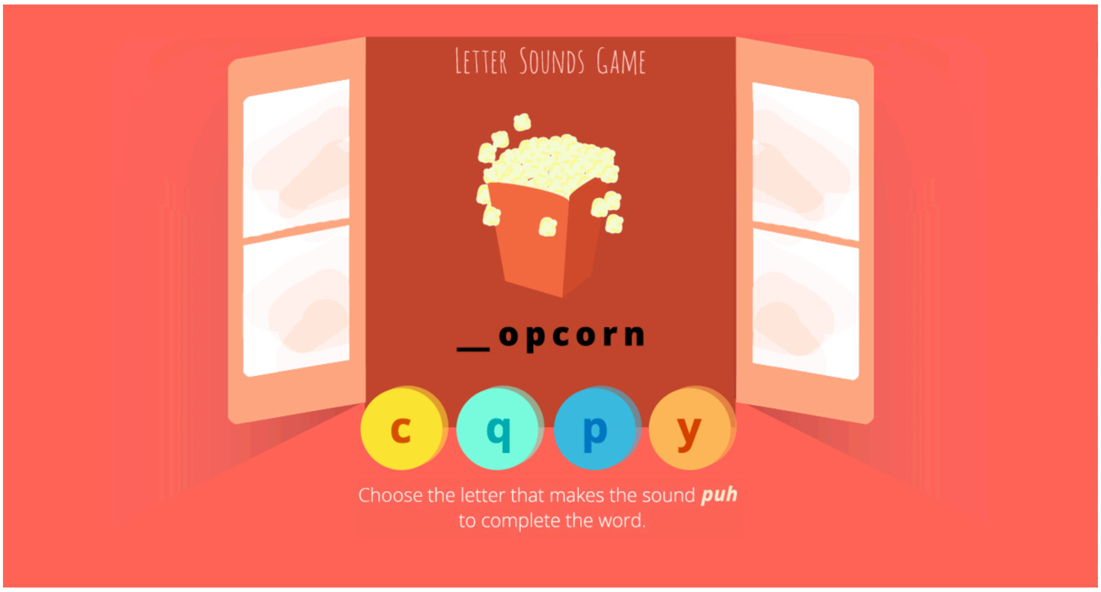


ALPHABET ORDER

Let's circle the right bubble.

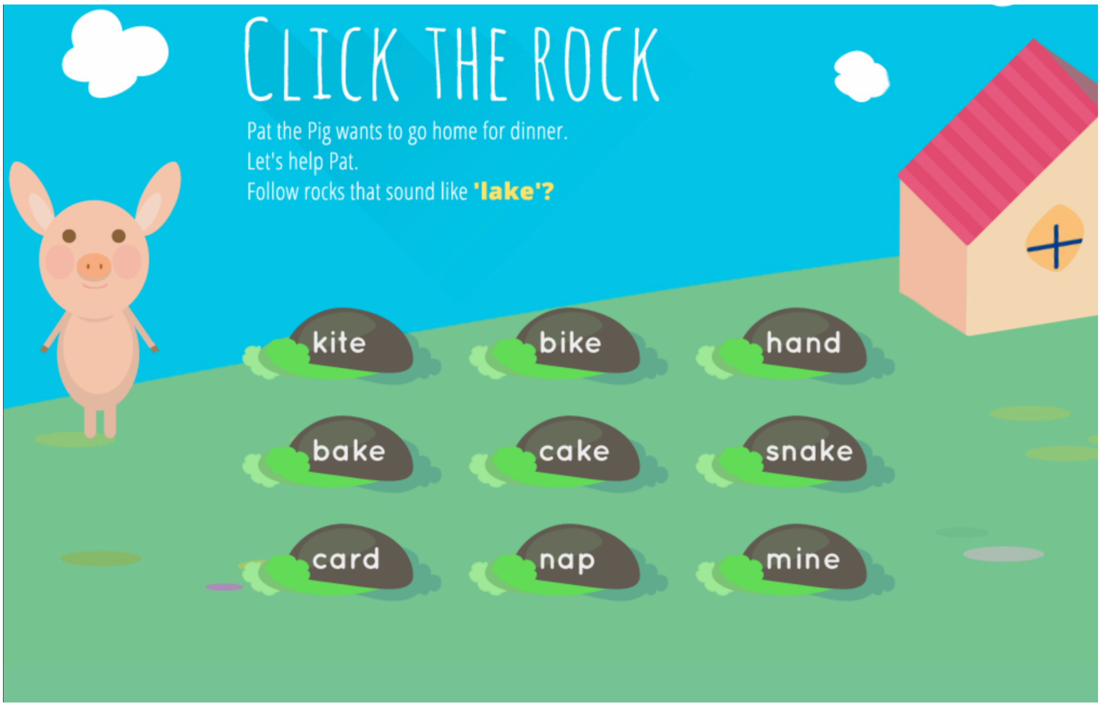
What letter completes the bubble set?

Letter Sounds Game


LETTER SOUNDS GAME
_opcorn
c
q
p
y

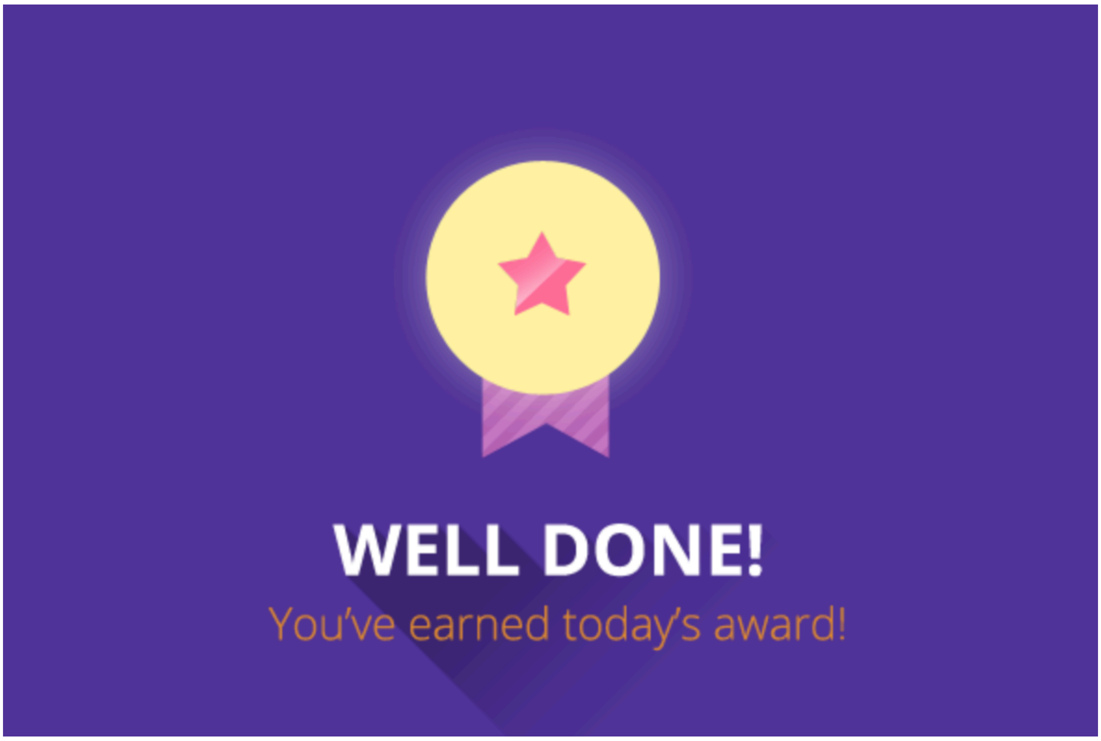
Choose the letter that makes the sound ***puh*** to complete the word.

Rhyming game


CLICK THE ROCK
kite
bike
hand
bake
cake
snake
card
nap
mine

Pat the Pig wants to go home for dinner.
Let's help Pat.
Follow rocks that sound like **'lake'?**

Appendix 2. Virtual medal
Users can obtain the virtual medal after completing any activity


WELL DONE!
You've earned today's award!

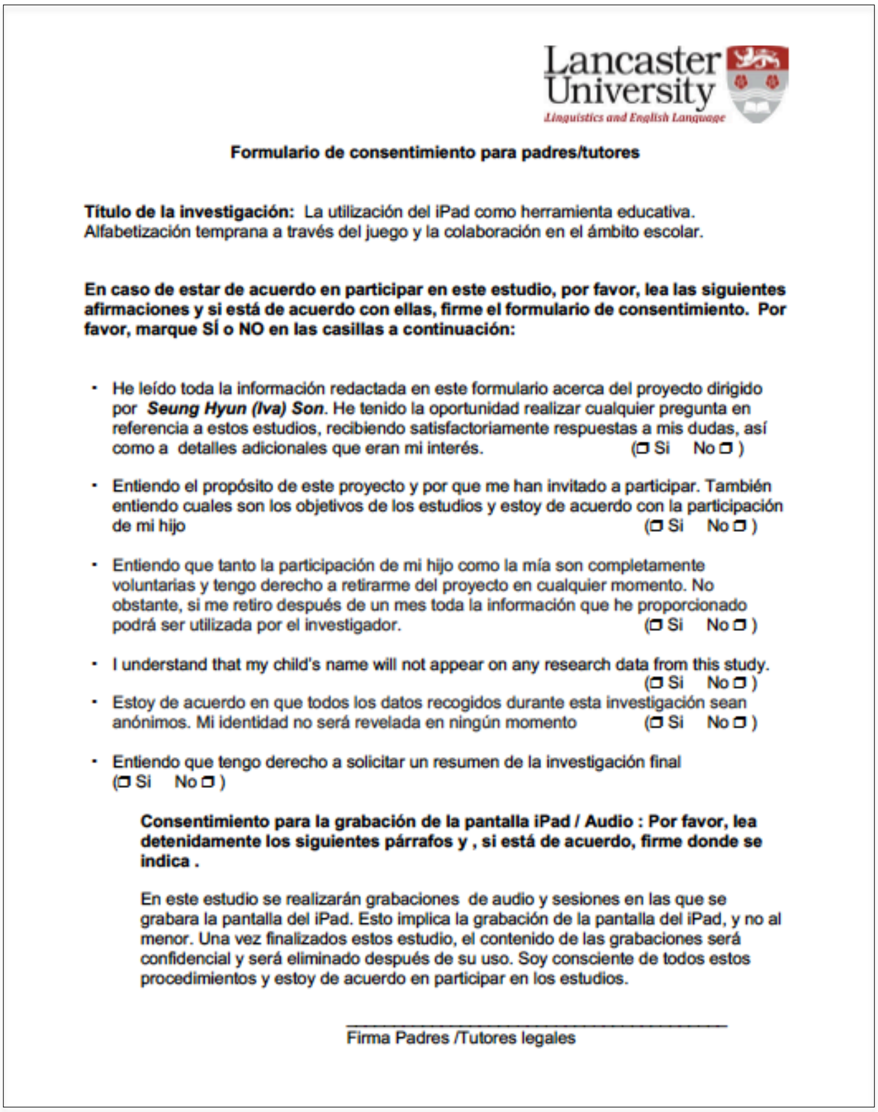
Appendix 3. Paper doll
An alternative reward for the iPad day in Week 6

Appendix 4. Tattoo sticker

An alternative reward for the iPad day in Week 9

Appendix 5. Consent form in Spanish

I prepared an additional consent form in Spanish but ended up not using it. Neither Classroom 1 nor 2 had children from Spanish Speaking families.



Lancaster University
Linguistics and English Language

Formulario de consentimiento para padres/tutores

Título de la investigación: La utilización del iPad como herramienta educativa. Alfabetización temprana a través del juego y la colaboración en el ámbito escolar.

En caso de estar de acuerdo en participar en este estudio, por favor, lea las siguientes afirmaciones y si está de acuerdo con ellas, firme el formulario de consentimiento. Por favor, marque SÍ o NO en las casillas a continuación:

- He leído toda la información redactada en este formulario acerca del proyecto dirigido por ***Seung Hyun (Iva) Son***. He tenido la oportunidad realizar cualquier pregunta en referencia a estos estudios, recibiendo satisfactoriamente respuestas a mis dudas, así como a detalles adicionales que eran mi interés. (☐ Si No ☐)
- Entiendo el propósito de este proyecto y por que me han invitado a participar. También entiendo cuales son los objetivos de los estudios y estoy de acuerdo con la participación de mi hijo (☐ Si No ☐)
- Entiendo que tanto la participación de mi hijo como la mía son completamente voluntarias y tengo derecho a retirarme del proyecto en cualquier momento. No obstante, si me retiro después de un mes toda la información que he proporcionado podrá ser utilizada por el investigador. (☐ Si No ☐)
- I understand that my child's name will not appear on any research data from this study. (☐ Si No ☐)
- Estoy de acuerdo en que todos los datos recogidos durante esta investigación sean anónimos. Mi identidad no será revelada en ningún momento (☐ Si No ☐)
- Entiendo que tengo derecho a solicitar un resumen de la investigación final (☐ Si No ☐)

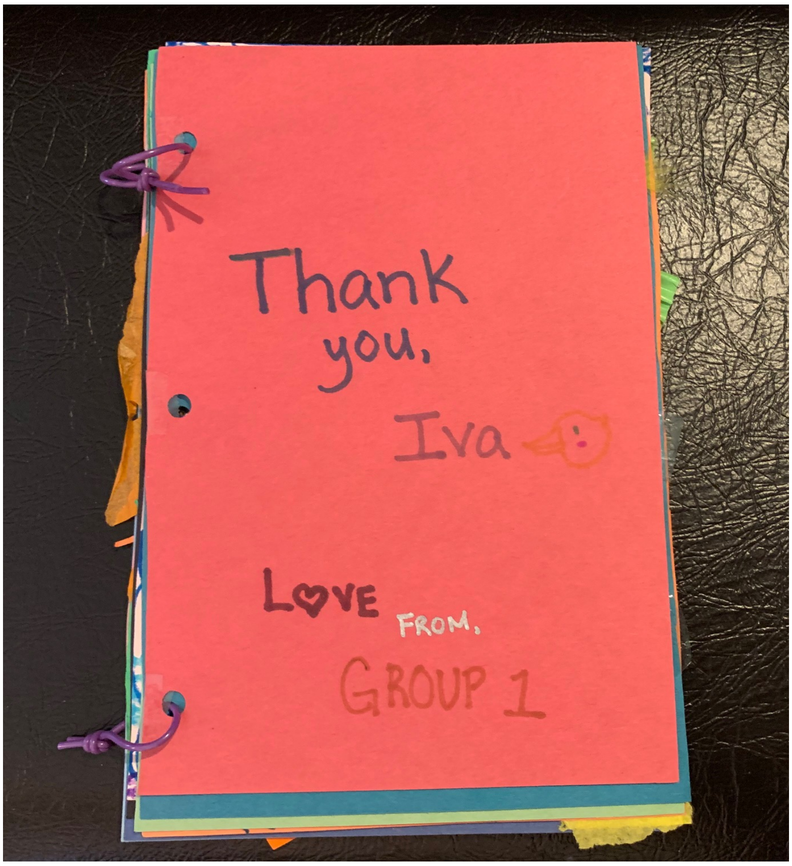
Consentimiento para la grabación de la pantalla iPad / Audio : Por favor, lea detenidamente los siguientes párrafos y , si está de acuerdo, firme donde se indica .

En este estudio se realizarán grabaciones de audio y sesiones en las que se grabara la pantalla del iPad. Esto implica la grabación de la pantalla del iPad, y no al menor. Una vez finalizados estos estudio, el contenido de las grabaciones será confidencial y será eliminado después de su uso. Soy consciente de todos estos procedimientos y estoy de acuerdo en participar en los estudios.

____
Firma Padres /Tutores legales

Appendix 6. Gifts from Classroom 1 children

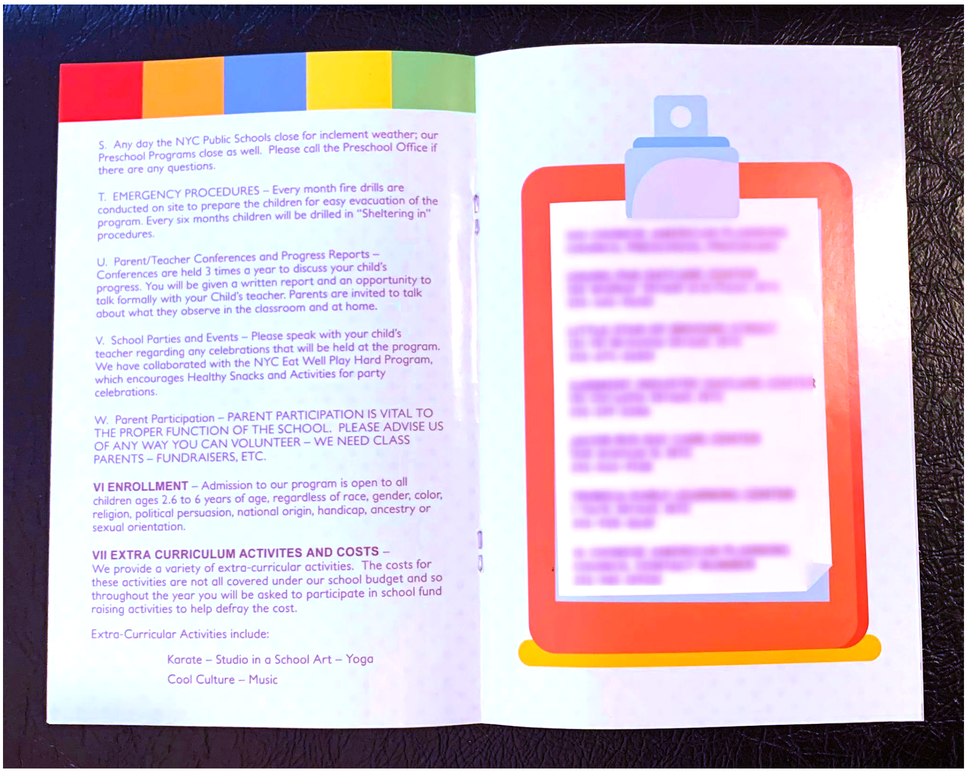
Children in Classroom 1 gave me a gift with their art work and thank you notes on the last day


Thank you,
Iva
LOVE FROM,
GROUP 1

Appendix 7. The new parent handbook

I redesigned the parent handbook for the preschool after the study.

PRESCHOOL
PARENT HANDBOOK
our happy moments of center



S. Any day the NYC Public Schools close for inclement weather; our Preschool Programs close as well. Please call the Preschool Office if there are any questions.

T. EMERGENCY PROCEDURES – Every month fire drills are conducted on site to prepare the children for easy evacuation of the program. Every six months children will be drilled in "Sheltering in" procedures.

U. Parent/Teacher Conferences and Progress Reports – Conferences are held 3 times a year to discuss your child's progress. You will be given a written report and an opportunity to talk formally with your Child's teacher. Parents are invited to talk about what they observe in the classroom and at home.

V. School Parties and Events – Please speak with your child's teacher regarding any celebrations that will be held at the program. We have collaborated with the NYC Eat Well Play Hard Program, which encourages Healthy Snacks and Activities for party celebrations.

W. Parent Participation – PARENT PARTICIPATION IS VITAL TO THE PROPER FUNCTION OF THE SCHOOL. PLEASE ADVISE US OF ANY WAY YOU CAN VOLUNTEER – WE NEED CLASS PARENTS – FUNDRAISERS, ETC.

VI ENROLLMENT – Admission to our program is open to all children ages 2.6 to 6 years of age, regardless of race, gender, color, religion, political persuasion, national origin, handicap, ancestry or sexual orientation.

VII EXTRA CURRICULUM ACTIVITES AND COSTS – We provide a variety of extra-curricular activities. The costs for these activities are not all covered under our school budget and so throughout the year you will be asked to participate in school fund raising activities to help defray the cost.

Extra-Curricular Activities include:

Karate – Studio in a School Art – Yoga
Cool Culture – Music