Pairing Craft-making and Interactivity with Mandarin Learning

How Mobile Devices Can Be Better Used To Help Migrant Preschoolers Maintain Mandarin As Their Heritage Language

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Abstract

The use of Information and Communication Technology (ICT) has become a prevalent aspect in how we learn in schools and at work. For many migrant bilingual ethnic Chinese parents/carers who are concerned about their preschoolers' learning of Mandarin, they are allowing their children access to Mandarin language applications on mobile devices, in hope that it would be useful to the maintenance of its use at home and within their cultural community. Hence with parents/carers readily cascading mobile technology to the children, they have grown familiar to gesture-based interaction and non-linear navigation on smartphones/tablets. However the effectiveness of solely using mobile devices as a learning tool for preschoolers remains debatable.

This thesis's objective is to investigate the potential of formulating a more holistic framework by bridging mobile technologies, relevant socio-cultural theories, appropriate language content and complementary adult-facilitated craft-making. It is hoped that through such a framework it would not only promotes interaction between the adults and their children, but also generates greater interest the reading and use of oral Mandarin. The findings from field activities, using different craft-based design probes adapted from the proposed framework, suggested that the pairing of tangible and onscreen activities has the potential for further development by designers, educators and developers in edutainment content and toy objects. The pairing of co-created craft/toy objects between parents/carers with their preschoolers provides interesting opportunities to integrate the maintenance and transmission of Mandarin with a materially relevant yet imaginative experience.

Keywords: bilingualism, craft making, design, education, eLearning, heritage language, Mandarin, migration, play, preschool, language maintenance, interaction, tangible interaction, toys, sustainability

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Declaration of Originality

This thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

Wil-kie Tan
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"Project FunBus". International Tangible Interaction Design Lab (Monash University) Poster Presentation at Qinghua University, China. 2013

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Chapter 1
Introduction, Research Question & Its Currency

1.1 Introduction

ICT's (information and communications technologies) impact on school-going and adult learners has been well researched and documented. In recent years, the proliferation of digital mobile devices such as smartphones and tablets and their increasing affordability, has seen a wide adoption of such technology for young children. This research project sought to investigate how mobile devices can be better used by preschoolers from bilingual background to learn Mandarin. The structure of the thesis (refer to Figure 1) is divided into 5 chapters, by addressing the currency of the research question, mapping out the space, enablers and methodology involved, formulating a framework for designing resources for children and identifying the considerations for parents/carers and their children. The framework will be illustrated by a series of design probes, before the thesis concludes with discussions on how the probes had been adapted from the framework, and charting of future research areas.

The first part of the research will be to establish the currency of the research project. A personal narrative of my family's move to Australia contextualizes the research question. My background as recent ethnic Chinese Singaporean migrant in Australia, with an anxiety for the cultural and language learning in my child (caused by years of official bilingual policy in Singapore), is shared by other local recent ethnic Chinese migrants who are motivated to retain their Mother Tongue. The cultural dislocation affecting recent migrants feeds this anxiety and catalyzes the search for relevant Mother Tongue/ Heritage Language (hereafter HL) resources to educate their young children, before formal school years. Parents/carers recognize that this may be the only window to provide the necessary exposure and foundation of HL before the children experience a language shift during formal school years and in the process erodes part of their cultural identity. The theoretical considerations in family language policy (Fishman, 1991), motivation and interaction (Gardner and Lambert, 1972) and HL language maintenance (He, 2009) will be discussed. These will also help pinpoint relevant approaches some researchers are putting forth for these young HL learners, and why the siting of the research within the learners' home space would form an integral part of the proposed framework when it comes to designing for this group of preschoolers.

The next part of the research will look into mapping technology with the current understanding of the significance of play in preschool learning. Mobile technology is considered a key enabler while play and interaction between the child and parent/carer will be the methodology contributing to the formulation of the framework. Mobile technology, currently recognized as the most accessible and ubiquitous computing device to adult users, is being cascaded to young children for many reasons. Details from a survey conducted in 2010 to assess the

attitudes of 48 parents/carers have towards mobile technology and edutainment (a blend of education and entertainment) applications for their children painted a general positivity in the parents'/carers' attitude towards technology, though there was a note for balance and cautiousness with the access. A field investigation was then undertaken to see how well preschoolers manage the operation of smart devices through supervised scanning of QRcodes and access of age-appropriate English and Mandarin YouTube videos. The results was encouraging, with most respondents demonstrating little trouble handling and navigating to the stipulated content. The research also included a survey of over 60 popular preschool toys from 2009 to 2015 to help sieve out the trends and themes which may be helpful in informing the formulation of the framework. Since interaction and motivation had been highlighted as possible angles for HL maintenance, the research sought to explore how technology and play can involve both.

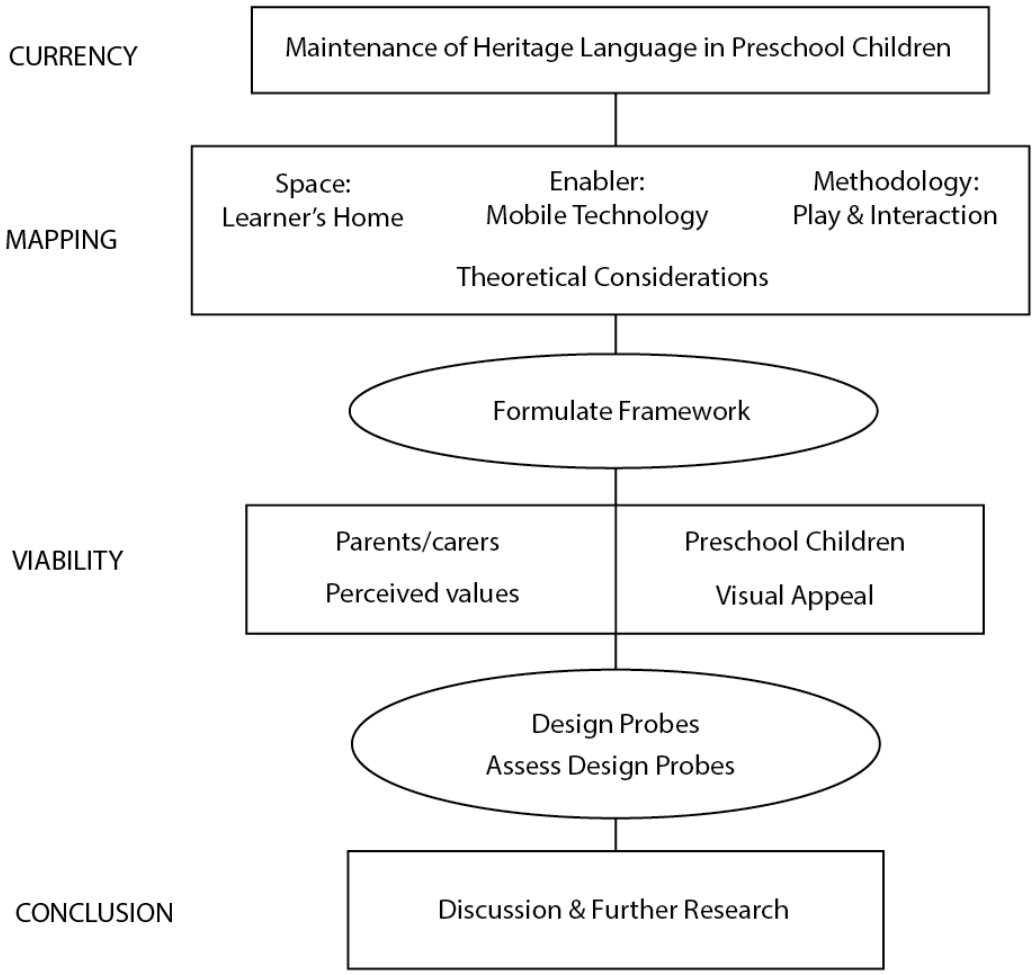

***Figure 1*. Structure of research thesis**

Upon mapping the key considerations, a theoretical framework based largely on socio-constructivist writings of Vgotsky on learning, play and language acquisition is then drawn up. Considerations in visual appeal (from a scan of 45 popular children edutainment programs

found on free-to-air television and internet-based channels from UK, States, Australia, Singapore, China, Hong Kong and Taiwan), character designs and story themes for the child are factored in the formulation of the framework and subsequent design probes. Parents'/carers' perceived value on sustainability, safety, crafting and reading, will also be discussed and tailored as part of the design probes and their methodologies, for engaging children in their learning of HL along with 'analogue' play. The probes utilized basic functions found in today's mobile devices such as image capturing and audio-video playback, which are part of young users' ubiquitous computing experience, to deliver on screen content. But more importantly, they took the form of individualized mobile accessories, craft objects and upcycled toys to provide that additional dimension of tangible play and make learning of HL more interesting to young children.

This research was made possible through the collaboration with a Singaporean eLearning service provider, local technical advisors, and different groups of Singaporean parent/carer volunteers and their children who volunteered for the field activities in testing out the design probes. The probes drew on not just the children's enthusiasm for play and interaction with their parents/carers, but also the latter's motivation for their children to learn and maintain the use of HL. The research will then conclude with a review of the probes adaptations of the proposed framework and provide considerations for its real world application and further development.

1.2 Background to research question – a personal narrative

The impetus for this research journey has been largely personal. My family's recent migration to Melbourne, Australia in 2009 had been a major turning point in our lives. Like most migrants, financial adjustments and security were just a few of the initial issues that we had to deal with, while cultural differences impacted on our ongoing engagement with the new environment. Dislocated from the familiarity and support of a closely knitted Asian household, we were determined to make the move work for not just ourselves but also for our child.

As young parents, we are anxious towards our child's developmental milestones and education, from her infancy to her current formal school going age. We found that it was particularly challenging for any migrant family to retain their cultural and linguistic differences when our children start their formal education years in Australia. While it may be unrealistic to expect the migrant child to grow up with the same level of proficiency in his/her HL as compared to their peers in our countries of origin, today's globalized and interconnected world meant that opportunities and resources are readily available for us parents/carers to source, while it would take only a few clicks or taps on digital devices to connect with overseas extended family members and a little slice of our heritage.

1.3 Migration & language shift

Australia has been a popular destination of migrants for decades and they make up a large proportion of the population. While historically, migrants had been European, there are now more coming from Asia and other parts of the world, contributing to the increasingly diverse demographic. The 2011 Census from Australia Bureau of Statistics figures indicated that 27% of the resident Australian population were born overseas and 20% of Australians have at least one overseas-born parent (Statistics 2012). Of the 1.2 million migrant couples with children, there were significantly more recent migrants with dependent children (40%) compared with longer standing migrants with dependent children (35%) (ABS 2013).

Our family arrived on the Migration Program and contributed to the 168,600 (ABS 2012a) pool of arrivals in 2009-2010, who were mostly from the United Kingdom, China (excludes SARs and Taiwan) and India. According to the census, the proportion of migrants born in Asian countries had increased from 24% in 2001 to 33% in 2011. Census data in 2006 and 2011 indicate that China, Malaysia and Hong Kong contributed to 2.15% and 2.33% respectively of the total residents in Australia (refer to Table 1). Thus, there might have been about 4,391,000 and 5,215,000 migrants who are ethnically Chinese that have been included in the census. It was only in 2011-12, when immigrants from China formed the largest migrant intake, overtaking those from the UK for the first time (DIBP 2014).

Country / Year	2006 (in '000)	2011 (in '000)
China (excluding SAR and Taiwan)	252	387.4
Malaysia	105.7	134.1
Hong Kong	81.4	NA

Table 1. Estimated resident population extracted from ABS 3412.0 Migration Australia, 2013-2014 (ABS 2015)

According to the 2011 Census of Population and Housing, there were 651,328 people who still spoke Chinese languages[1] (comprising of dialects like Cantonese, Mandarin, Hakka, Wu and Min Nan) at home. Part of which, there were 336,410 speakers of Mandarin. In terms of

[1] The Australian Bureau of Statistics' definition of Languages Spoken at Home is 'languages spoken by a person in the home, on a regular basis, to communicate with other residents of the home and regular visitors to the home'. It is one of the five language variables. The others variables include First Language Spoken, Main Language Spoken at Home, Main Language Other Than English Spoken at Home and Proficiency in Spoken English (ABS. 2012b. "Languages Spoken at Home - Underlying Concepts." Australian Bureau of Statistics. Accessed 20 March 2014, http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/03C67C4DC7868656CA257A840015E432?opendocument.)

percentage, Mandarin speakers made up of about 1.6% out of the 21,507,719 respondents[2].

While migrant populations hold distinct languages and traditions, the desire to shape cultural identities and values in their children are universal. Children's often connect with their culture through their first-hand experiences with their immediate family members and within the safety of their own homes. This helps children from migrant families develop a sense of confidence in their own cultural and personal identity. It is also integral in the wellbeing of the mental health of the children as they go through their early childhood programmes in preschools (KidsMatter 2012)[3]. The move away from family, friends and caregivers meant a transplant from one social fabric to another. It is difficult to gauge how different or difficult each migrant may feel about settling in a new country, let alone commit adequate resources to educating their children. This may be impacted further when migrant children entering preschool. They may have difficulties communicating with other children, teachers and professional carers. This may also lead to not only the children's, but also their parents'/carers' aversion to communicate and form social connections with others, although some preschool and day-care centres offer integration and interpreting services for families (Education.vic.gov.au 2014).

More recently, with the increasingly recognized importance of immigrants' languages as an immensely valuable resource both for the individual and for the society, there has been national initiatives such as the Diverse Australia Program by the Department of Immigration and Citizenship (DIAC) (ABS 2010) and the inclusion of Mandarin in Languages Other than English (LOTE) (Education.vic.gov.au 2016) in Australian education system. In 2002, LOTE involved 41 languages in both primary and secondary levels. Officially, the Department of Education and Early Childhood Development in Victoria expects schools to provide LOTE from Prep to Year 10[4]. In 2012, Mandarin was the fourth most-studied languages, with it making up 11.1% of all primary languages enrolment in government schools (DEECD 2013). Although it should be noted that there are other significant Asian languages, such as Thai and Filipino, which were not included[5]. It may be as a refragmentation of language policy, with many language programs competing for funding (Clyne and Kipp 2006), and there would be an even greater need to fund more recent migrants' languages. Usage of these languages like

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[2] The second largest group of language, Indo-Aryan Languages, stood at almost half the of Chinese Language speakers, with 382,844 (---. 2011. "Language Spoken at Home by Sex." Australian Bureau of Statistics. Accessed 10 July 2015, http://stat.abs.gov.au/Index.aspx?DataSetCode=ABS_CENSUS2011_B13.)

[3] While discrimination and racism may not be readily felt by young children, early childhood programmes are usually the first time when children experience differences between themselves and others, and form attitudes and knowledge about these.

[4] A LOTE program offers classes for 150 minutes per week taught by a qualified LOTE teacher. In Victoria, LOTE is a domain within the discipline-based strand in the Victorian Essential Learning Standards (VELS)

[5] In 2012, the LOTE languages taught in Victoria schools includes Aboriginal languages, Auslan, Arabic, Chinese, Dutch, French, German, Indonesian, Italian, Japanese, Karen, Korean, Spanish, Hindi, Latin, Turkish, Macedonian, Portuguese, Serbian, Greek and Vietnamese.

Mandarin and Indo-Aryan Languages, will rise nationally and result in less differences in the composition of language spoken between major Australian cities.

While government schools in Victoria are funded[6] to provide programs (including LOTE) that will enable their students to achieve the Victorian Essential Learning Standards, only 1 special school, 12 primary schools and 2 secondary colleges in Victoria, offer designated bilingual programs (Education.vic.gov.au 2010). Parents are to then source for other language education programs[7] in community languages schools. These schools, (previously known as 'after hours ethnic schools') are run by incorporated community-based, not-for-profit organisations, offer only "out of school hours" lessons for students of school age but not at preschool level.

In Department of Education and Early Childhood Development (DEECD)'s *The Victorian Government's Vision for Languages Education 2013–2025* published in 2013, it was noted that many schools also do not provide sufficient time to enable students to develop proficiency in their chosen language and may be reluctant to invest in LOTE the expense of other learning areas, citing constraints within a 'crowded curriculum'. Schools also have difficulty teaching and connecting language learning to 'real-life' situations. So while school-going children go through limited time spent by children within LOTE programmes, there is a lack of incentives for them to accrue their learning beyond Year 6 in schools. The lack of continuity is also a major challenge, especially when students enrol into different primary schools or move onto secondary schools. In such instances, the same language may no longer be offered and any prior language learnt is often lost. Quality language staff are not easily trained and replaced, and the general shortage of qualified language teachers remains a major factor affecting quality of the languages programs (DEECD 2013).

1.4 Language shift and Family Language Policy amongst Singaporean Chinese

My family, like many ethnic Chinese families in Singapore, is multilingual through formal education, social interaction with other ethnic communities and marriage. It is not uncommon for ethnic Chinese from different dialect groups (such as Cantonese, Fujianese and Hainanese) to marry, and for the next generation to inherit two sets of dialects while learning

[6] Government schools in Victoria are funded through their Student Resource Package (SRP) to provide programs in all curriculum areas, including Languages (Education.vic.gov.au. 2015. "Policy, Government School Funding and Curriculum." education.vic.gov.au. Accessed 27 May 2015, http://www.education.vic.gov.au/school/teachers/teachingresources/discipline/languages/Pages/policy.aspx.)

[7] Bilingual program schools provide students with the opportunity to learn curriculum content in, and through, both English and another language. In the Victorian government school system one special school, twelve primary schools and two secondary colleges offer designated bilingual programs.

Mandarin and English, in schools. High population density also creates opportunities for the integration of languages from non-Chinese races like the Malays and Indians, into a colloquial speech known as Singlish. However English had always been promoted as the lingua franca – the language of government, business and education since the adoption of bilingual policy in 1965. Along with Mandarin, Malay and Tamil, the Mother Tongue Languages (hereafter MTL) languages of the other major ethnic groups, they became the official languages of Singapore. These languages other than English then ceased from being the language of instruction in schools and became MTL subjects (Ee-Ling 2013) by the late 1960s.

This top down approach by the Singapore government continued in the 1970s when other interventionist policies permeate through the entire population, including language policies that drive towards bilingualism[8]. Singapore's Ministry of Education (MOE) views the bilingual education policy as 'the cornerstone of [its] education system' (MOE 2013). This policy requires students to learn a first language as well as a mother tongue language in 6 years of primary level schooling and 4 years of secondary level schooling. In Singapore, a child's first language and MTL is different from common linguistic definition. English is the prescribed first language, and generally allocated one of three MTLs, according to racial group or paternal ethnicity rather than the child's dominant home language (Tan 2006). English hence became the medium of instruction for every non-MTL subject in school (such as humanities, sciences and mathematics) while MTLs was taught as a singular subject with a smaller proportion of time allotted to it in schools (Xie and Cavallaro 2016). Continual bilingual educational policy in Singapore portrays bilingualism as being intrinsically linked to economic benefits to its ethnic Chinese population. By mastering English, one would have better career prospects, and with Mandarin proficiency, a certain cohesion between different dialect groups. In recent years, to be proficient in Mandarin also meant that it is potentially useful when connecting economically and culturally with China, the world's current second largest economy.

As such, many from the post-1970 generation like myself, were enabled to speak Mandarin, the standard variety of Chinese while learning English as the default language for social and official situations (Refer to Figure 2). For instance, families who claimed to use Mandarin as the dominant household language increased from approximately 13% (Census 1980) to 47.7% (Census 2010) (SDS 2000; SDS 2010). However, there is a rise in English as Chinese families' dominant home language, with data pointing to a 21% increase from 1980 to 2010 (SDS 2000; SDS 2010). This trend of English gaining traction in the family language policy is further confirmed by census data from 2010 (SDS 2000; SDS 2010) which indicated that 55% (78,936 out of 143,473 respondents) of 5-9 year-old Chinese Singaporeans stating English

[8] The Speak Mandarin Campaign was launched by then-Prime Minister Lee Kuan Yew in 1979. It targeted different segments of the community almost annually, for example, the campaign targeted Chinese parents in 1984 and on Chinese Singaporeans, with an emphasis on bilingualism in 1991. (SMC. 2015. "Speak Mandarin Campaign (Smc) Milestones." Promote Mandarin Council. Accessed 27 July 2015, http://mandarin.org.sg/en/about/milestones.)

as their home language (Refer to Table 2). The census data showed the growing prevalence of English as the dominant home language amongst young Singaporeans. This created a complex generational language shift in ethnic Chinese Singaporeans from the dialects to Mandarin and then to English, which has parallels to the aforementioned observation in language shifts by Clyne & Kipp (2006) in Australia.

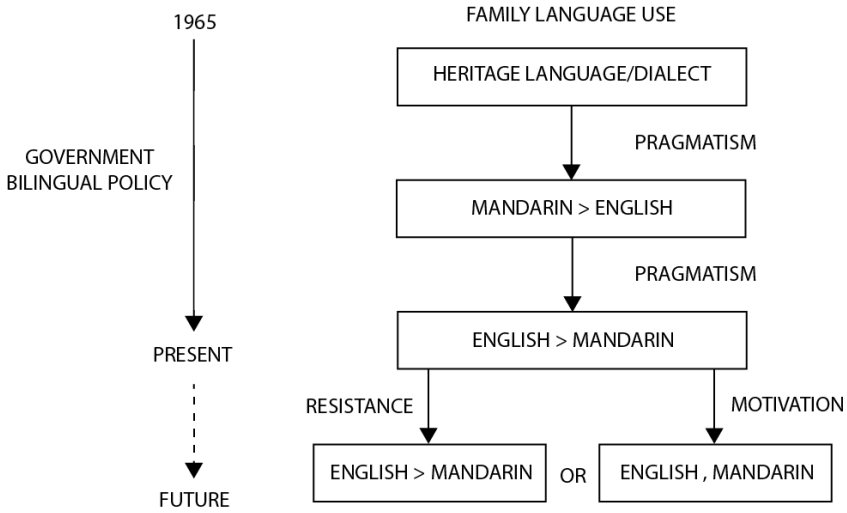

Figure 2. **Language shift in Singapore Chinese families**

Age Group (Years)	Chinese			
	English	**Mandarin**	**Chinese Dialects**	**Others**
5-9	78,936	62,020	1,911	606

Table 2. **Extracted from Table 49 - Resident Population Aged 5 Years and Over by Age Group, Ethnic Group and Language Most Frequently Spoken at Home (SDS 2010)**

Presently, there are families who struggle to retain the use of their MTL both at home and in school (VoicesToday 2013). In these families, it seemed prevalent for MTL to be spoken from birth to preschool, but with a shift to the use of English once the child enrols into more formal schooling.

While it may not be as drastic as the entire loss of spoken Kven by the Bugøynes in Norway (due to a policy of “Norwegianization” from 1840 to 1960), which by 1970 only Norwegian was spoken by adults to the children, it would take time for language policies (on the macro level) to be internalized and later materialized in action through language choice of the individuals (on the micro level) (Lane 2010). This is evidential in Curdt-Christiansen (2015) research where the aforementioned language shift from Mandarin to English marked by concession made to the mixing of both languages to ensure a smooth communication.

1.5 Reconciling Language Shift and Heritage Language Maintenance as objective for research

There is much documentation on the impact of language shift by children of various migrant and ethnic groups in the United States (Hernandez, et al. 2012; Hernandez, Denton, and Macartney 2008), but how it impacts heritage loss and a language shift (such as to English) in Australia, is less understood. The relationship between the extent of language shift and age vary by the birth country of migrants in Australia. Unlike the 2010 Singapore Census, the 2011 Australian Census had no data to extrapolate a linear relationship between age and language spoken at home (Karidakis and Arunachalam 2016). Clyne & Kipp (2006) attributed a recent language shift from Chinese languages to English, to migration trends and intergenerational transmission. They opined that the Chinese community's linguistic demography and its future trends would continue to depend on intergenerational transmission. This intergenerational shift in Chinese languages reflects the pragmatic role of language in the Chinese community, where families aim to provide their children with access to an English-medium Australian education, while perhaps even excluding Chinese or favoring Mandarin over that of other Chinese dialects (Clyne and Kipp 2006).

Studies of transnational families have also shown that families tend to give way to external forces such as political policies, socio-economic pressures leading to/from migration, and education, causing intergenerational language shift (Curdt-Christiansen 2015). My family could relate to the language shift and difficulty in HL maintenance as we noticed a linguistic acculturation in our child and the children of other recent ethnic Chinese migrants from Singapore when they start formal schooling in Australia (Refer to Figure 3); and as Schumann (1986) had theorized that, this process of acculturation happens when there is a social and psychological proximity with a dominant language.

Acculturation takes place when the learner is psychologically welcoming and socially integrated into another language group; or if the learner has desire to adopt the lifestyle and values of the new language group (Schumann 1986). Schumann's highlighting of factors such as social dominance patterns, integration strategies, enclosure, size of the minority- language group, intergroup attitudes, intended length of stay, and cultural congruence, are highly relevant to new migrants, as differing degrees of these factors may lead to varying concerns and motivations in maintaining their heritage language. Even early studies of some European schools in the 1970s have also pointed out that in formal school years, classes 'on language and culture' or 'language and social studies', only reinforced linguistic skills at best and failed to promote cognitive functioning in both languages, and did not develop "balanced co-ordinate bilingualism" in the children (Tosi 1979).

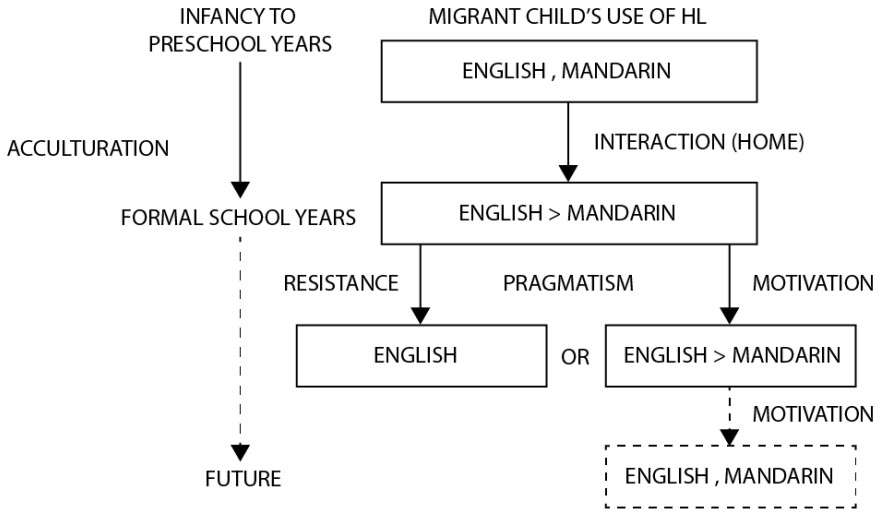

Figure 3. **Acculturation impact on language shift**

For this research project, I will only be concerned about children's learning of Mandarin as HL during the preschool phase and not extend to experiences within the child's formal education period. The learning of HL usually start from migrants' own homes. Like a national language policy, migrant parents/carers usually decide and act on the learning of the HL for their child in terms of status planning (where and when HL is used with their children), corpus planning (when HL to use for certain activities) and acquisition planning (when and how HL is to be taught) (Tsung 2015).

While children's language behaviour may be predominantly shaped by parental beliefs and attitudes, but the inverse can also be true. Their children's changing language choices could influence the parents/carers on how much more time and resources they were required to set aside for HL maintenance, on top of other formal educational needs. Hence as Tsung (2015, 281) puts it, defensive strategies are often then unconsciously deployed to protect the integrity of the family system, despite the challenges involved.

The language shift for a Singaporean ethnic Chinese migrant family might seem less of a leap than for a Mainland ethnic Chinese migrant family, it represented an about-turn with the present emphasis placed on the use of HL[9] at home. Recent migrants like myself, still have strong emotional connections with our home countries and cultures. Hence, the insistence of maintaining our HL extends beyond economic prospects for the younger generation, but an attempt to ingrain and retain part of our cultural and ethnic identity. It can be said that it is driven by ideological, pragmatic and emotional factors, as most migrant families will have no issues with their child adopting the community-dominant language (or even the local accent).

[9] From this point on, Mandarin is the HL for maintenance since the family has lost the ability to converse in dialect (the traditional sense of HL) after two generations of bilingual policy in Singapore.

This points to the fact that there is more than one strand of argument for the maintenance of HL even within an ethnic community, and is certainly more than common beliefs that it is the community's reluctance to assimilate and play down on their ethnic identity. HL education and multilingualism are increasingly accepted and speaking one's own language is a right[10]. Encouraging education in one's HL, within a bilingual or multilingual education context, is also one of the principles set out by UNESCO (UNESCO 2003).

1.6 Current channels of heritage-language maintenance

With the recent wave of ethnic Chinese migrants[11] and the rise of China's strategic and economic status, it would be no coincidence that many ethnic Chinese parents will view it to be either integrative and/or instrumental for their children to be learning their HL. Migrant Chinese parents in Australia who prefer to retain Mandarin, instead of their original dialects, as the HL, have a choice of enrolling their children into schools offer Mandarin as Language Other Than English (LOTE) and/or putting them in weekend Mandarin enrichment classes run by private schools in most major city centres in Australia (though some centres also offer lessons in Cantonese). Even though Mandarin is a more popular choice for parents/carers, it is not a monolithic entity[12]. The consideration is whether they prefer to have their children taught in traditional script (used mainly in Taiwan, Macau and Hong Kong) or in simplified script (used mainly in China, Singapore and Malaysia)[13].

At present, Internet access and satellite television facilitate extended and inexpensive contact with family members who reside at their respective home countries, while preschool edutainment programmes produced in Mandarin can be found over satellite or Internet video stream channels such as Youku[14]. The growing affluence and demand of young Chinese

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[10] International Mother Language Day (which falls on 21 February each year) proclaimed in 1999 by UNESCO.

[11] "Ethnic Chinese migrants" here is referred to as migrants who consider themselves ethnically Chinese and their birth country may be China or other countries such as Malaysia and Singapore.

[12] Mandarin is known as *putonghua* (普通话) in mainland China, *guoyu* (国语) in Taiwan, and *huayu* (华语) in Singapore, it is not Mandarin used in China, Taiwan, or Singapore, varies in lexicon, phonetics, and discourse norm (He, Agnes Weiyun. 2006. "Toward an Identity Theory of the Development of Chinese as a Heritage Language " *Heritage Language Journal* 4, no. 1: 28. http://www.heritagelanguages.org/ViewPaper.ashx?ID=e6YzJ530d%2fzrgPgMlR5aaQ%3d%3d.)

[13] China's State Language Commission issued a list of 7,000 simplified Chinese characters as a way to standardize the written form of the language in 1988. The Chinese mainland first introduced simplified characters in 1956 (Jing, Wu, and Guo Likun. 2009. "China to Regulate Use of Simplified Characters." chinaview.cn. Accessed 09 June 2012, http://news.xinhuanet.com/english/2009-08/12/content_11871748.htm.)

[14] Youku Children Channel features age-differentiated video and animation clips. Foreign programs are licensed and dubbed/subtitled in Mandarin. Licensed material are however

parents for quality edutainment material have in turn, made preschool education into a significant market, and Chinese developers and publishers are answering the demands by delivering both traditional print and interactive digital preschool learning content, for both domestic and overseas markets. There are also mobile-based content by these developers being sold on Apple Store and Google Play, indicating the upward trend in demand for quality Mandarin language material and a growing acceptance of using parents'/carers' mobile devices as a platform for transmitting knowledge to young children. A survey of some of these materials will be discussed in greater detail in a subsequent chapter.

1.7 Understanding theoretical perspectives in heritage-language maintenance

The understanding of theoretical perspectives is highly relevant to the formulation of the design framework as it helps identify key areas from which the framework is to be built. HL maintenance in a migrant child is unlike first language acquisition (hereafter L1), as it does not reflect the linguistic needs for formal education or for interaction away from his/her immediate family/community. Although it may be similar to a second language (hereafter SL) learner, in terms of the physical distance from the locus of language origin, a HL learner's biological identity and intrinsic cultural background sets out a different path for HL maintenance.

1.7.1 Differentiating HL from FL and SL

Unlike the SL learner, who is clearly a member of his/her "native culture" and is attempting to learn the norms and rules of the "target culture", the HL learner has a "multi-faceted identity" as someone who is socio-historically linked with the HL culture and yet experientially displaced from it (He 2006). He (2006) also states that HL speakers are likely to be exposed to HL when they are young and used it during their childhood, but have not developed the language fully that allows them to use it like a native speaker. She shared that a young Chinese HL learner tends to have better speaking and listening skills over marginal reading and writing abilities. As language competencies, choices and ideologies are different over one's lifetime, along with its changing motivations, social networks and opportunities (He 2015), the proficiency level is also harder to define unlike learners of Chinese FL or SL, where there are more rigorous standards (He 2009).

1.7.2 Role of the family

The role of the family unit plays an important role in HL learning in preschoolers. A close–knitted family unit often has a natural boundary that protects itself against external pressures,

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restricted for viewers with Chinese Internet protocol address (Youku. 2016. "Youku Child Channel." Youku. Accessed 19 January 2016, http://child.youku.com/.)

and it can be particularly resistant to outside competition and substitution. Although the migrant family has lost much of its socialization power, it remains “the most common and inescapable basis of mother tongue transmission, bonding, use and stabilization” (Fishman 1991, 94). The desire to maintain and transmit the HL is certainly “not anti-modern” and provides a alternative to the reach of globalization (Fishman 2001, 6).

But not all families are the same nor do they have same level of interest on HL maintenance. Carreira (2004) proposed that the difference in family background in terms of heritage language or culture is a good indicator to differentiate HL to L1 and SL. Due to insufficient exposure to their language and culture, HL learners cannot fulfill basic identity and linguistic needs as expected of L1 learners and its learning takes place vertical (e.g. intergenerational at home and community) rather than horizontally (e.g., through formal education in the classroom) (Carreira 2004). Similarly, core to Asian parenting beliefs is the emphasis on interdependence among family members and Chinese mothers were motivated towards relational goals instead of individual goals favoured by European American mothers (Chao and Tseng 2002).

While an adult HL learner could be motivated by an identification with the inherent cultural and aesthetic values of the language and many of them often cite cultural/social identity as the principal reason for their interest in HL (Carreira 2004), these motivations are difficult to get across to preschoolers and most somehow be initiated by the parents/carers. The challenge is to prevent the seeding of negativity towards HL, so that when these migrant children grows older, they will still consider HL’s use to be relevant, even though differing oral and written proficiency of their HL by then, may affect their psychological distance to the language.

1.7.3 Motivation

In Gardner and Lambert seminar writing on motivation (Gardner and Lambert 1972), they formulated a socio-educational theory that recognized 2 kinds of motives for learning L2 - instrumental motives (such as obtaining job opportunities) and integrative motives (such as getting acceptance into either one’s own ethnic group or the dominant society). While their theory caters primarily to L2 learners, there are parallels to how instrumental and integrative motives may be more applicable than simply for the sake of maintaining their heritage/culture, especially if it worked towards the possibility of their children using the language for future career options, such as working with Chinese business interests. It is also entirely possible that integrative motives on the part of the parents/carers, for wanting their children to maintain a linguistic relationship with their own ethnic community and provide talking points in the subjects of their daily conversation/interaction, are driving the HL learning. A sense of greater personal motivation, be it ‘instrumental’ or ‘integrative’, may also produce a likelihood of attaining HL at L2 level of proficiency (Lynch 2003).

Conversely, motivation may not yield the desired result in reality. In a study by Zhang (2010), she investigated the language experiences of first generation Mandarin and Fujianese migrant parents and their children in Philadelphia, United States. The Fujianese children spoke their HL so as to maintain their connection with their parents and community (as the adults were poor in their command of English) but it was mainly out of necessity and it was rudimentary and lacks the complexity for deeper and more meaningful conversations. The Mandarin children, on the other hand, had opportunities to not only speak Mandarin to their parents, but were also enrolled in weekend Chinese schools. When compared to the Fujianese children, the Mandarin children took a more negative stand to HL as they deemed it inferior or irrelevant to an English-dominant environment.

Hence being bilingual has significant meanings for migrants who have to deliberate on the use of either languages according to different sociocultural contexts (Zhang 2010). While having comprehensive and sufficient input that are of interest to children may be effective for language learning (Krashen 1981), the motivation argument illustrated above shows that the children's language shift stems from little or no motivation in learning HL as it can be deemed difficult or redundant in their adopted countries.

1.7.4 By-choice Hypothesis

Perhaps it would be useful to pin down the definition of a HL learner before finding out ways to help them in their learning. Valdés (2001) definition of a HL learner is broad as it encompasses speakers from different socioeconomic background and degrees of literacy. To him, bilingualism is a dynamic condition and a bilingual speaker's profile can change according to background experiences and education (Valdés 2001). He (2006), who had researched specifically on Chinese HL learners, provides a more focused scope and defines them as someone who is raised where the HL is spoken, who speaks or at least understands the HL and is, to some extent, bilingual in Chinese and English. She had also proposed 10 hypotheses[15] that affect the learning of Chinese HL. From these, 2 are identified to be most relevant to my research. First, the By-choice Hypothesis, which argues that Chinese HL learning by choice (when parents speak Chinese HL because they choose to) facilitates children's language maintenance, in contrast to Chinese HL learning by necessity (when parents speak Chinese HL because their English is limited) (He 2006).

[15] He (2006) proposed ten hypotheses along three dimensions. Along the temporal dimension, her hypotheses are: Rootedness, Benefits, Interaction; along the spatial dimension, her hypotheses are: Positive-Stance, By-Choice, Diverse-Input, Discourse-Norms; along the identity dimension, her hypotheses are: Enrichment, Multiplicity, Transformation. (He, Agnes Weiyun. 2006. "Toward an Identity Theory of the Development of Chinese as a Heritage Language " *Heritage Language Journal* 4, no. 1: 28. http://www.heritagelanguages.org/ViewPaper.ashx?ID=e6YzJ530d%2fzrgPgMlR5aaQ%3d%3d.)

Another case supporting the hypothesis is that, in a child's early years, parents/carers orientate to the children's needs (such as showing the child his/her favourite television), even though these may be perceived as needs by the parents themselves. Unwittingly, the parents are introducing and growing the child's interest and competence in English. Hence to He, HL use and change is sensitive to English discourse and it is both familial and communal, rather than an individual process.

1.7.5 Interaction

Motivation is tied to experiencing success in interacting and communicating with other HL speakers in contextualized activities (such as understanding a Mandarin-language story book, being able to talk to HL-speaking family members or others from Mandarin speaking areas). In He's Interaction Hypothesis, she writes that the child's success in Chinese HL development correlates with his/her desire to communicate successfully in a "moment-by-moment" manner. This hypothesis is particularly applicable to young Chinese HL learner (He 2006) and may be seen as a result of the aforementioned, Gardner and Lambert's integrative motive, practiced by the parents/carers. Likewise, in a qualitative research on the role of active parental support and corresponding literacy practices in low-income Mexican immigrant families, it was found that effective parental interaction around literacy activities with children at home, provided a richer context for the development of bilingualism and literacy learning (Gillanders and Jimenez 2004).

In her Conversation Analysis, she also highlighted that it is more important to focus on the interactional "moment-by-moment" successes in the use of HL and the learner's growing motivation for future use, rather than the achievement of broad goals as suggested by the SL theories. Only when "meanings are communicated, expressed, oriented to, received, negotiated, and modified" during interaction, can a sense of identity emerge within the HL learner (He 2006, 13). The relationship between parental beliefs and children's language development is thus an interactive and not a unidirectional affair, with each party's learning and consolidating their positions through constant interactions.

1.8 Key considerations to HL learning and maintenance for migrant children

The above case studies by other researchers and theoretical considerations have highlighted the need to address intergenerational transmission within close proximity, physical and cognitive constraints of the child and scaling appropriate HL expectations when it comes to helping with the children's HL learning and maintenance.

1.8.1 Home as the domain for learning

Hybridity (Bhabha 2004) rings true for many bilingual families, especially those with migrant backgrounds. For them, home is an ambiguous area that a child a grow up in, where two or more cultures interact readily. This cultural hybridity gives rise to further negotiation of meaning and representation (Rutherford 1990), especially with their expected use and perceived value of HL. It is in this context that many parents/carers are keen adopt novel approaches to maintain HL for their children. The recent proliferation of modalities in language learning, such as screen-based edutainment content on mobile platforms and print material feeds directly to such demand. These examples and the theoretical consideration by Lev Vygotsky's socio-constructivist perspective on language and cultural learning will be discussed in detail in the subsequent chapter, to consolidate the identification of home as the domain that permits successful inter-generational transmission.

Currently home learning of Mandarin seemed to be the only option for migrant Chinese parents/carers, unless it is bolstered by opportunities for enrolment in private weekend Chinese schools[16]. Other aspects of home learning may involve the encouragement of reading and watching of HL audio-visual content. By fostering adequate reading and communication habits may be beneficial to the children's HL acquisition. Reading has always been considered fundamental and teaching a child to love reading can be nurtured at a young age and children will be motivated to read on their own, as they grow older. Stories can serve as tools for role-modelling, putting across morals and may even indirectly affect economic productivity in years to come (Killick and Frude 2009).

1.8.2 Working within constraints

As described in this chapter, we have seen that a migrant child's language learning and use is in a constant flux as it is subjected to many factors. While L1 and SL standards are not expected of HL learners, there are aspects of language transmissions from L1 and SL learning that should be considered with how migrant parents/carers can capitalize on their linguistic realities, and transform them into competencies and opportunities (Curdt-Christiansen 2015). It is important for the parents/carers to celebrate with the children about what they are and what they are learning, rather than for the parents/carers to be insisting on teaching HL dogmatically.

It is vital to also note if the child learner is able to cognitively schematize the interaction he/she is experiencing. Research on both L1 and SL acquisition shows that the frequency of interaction is directly related to the learning and use of languages. The more frequent and

[16] Some private schools run introductory classes for children between 3 to 5 year olds. These are usually conducted in Mandarin or Cantonese.

earlier the child is exposed to such interaction co-relates to when the language is likely to be learnt (Lynch 2003). So a preschooler with adequate exposure to their HL will be able to internalize and reiterate it. Lynch adds that, with regards to pedagogical approach, most evidence from SL studies linked instructional techniques to the development of content-based approaches and a focus on communicative abilities. This could be adapted for HL learners, through acquisition that may be "dialogic, discursive and contextual from the beginning" (Lynch 2003, 36). Furthermore, there is a need to structure these interactions as difference in degree of interaction between the parent/carer and the child can impact on language acquisition (Clarke 1999).

1.8.3 Emergent literacy and type of content for HL learning and maintenance

Prior to ascertaining the type of content, we need to understand about how early/emergent literacy takes place in young children because children do learn a lot about language before attending formal schooling. Rogoff opines that a child's emergent literacy is tied to their interactions with learned others (Rogoff 1990) and according to Sénéchal et al (2001), young children's conceptual knowledge[17] about literacy is closely related to their emergent oral language skills while their procedural knowledge[18] then contributes to the development of reading skills and phonological awareness. Phonological awareness then impacts on their ability to read and contributes to fluency, before picking up vocabulary, once the children are reading more fluently (Sénéchal, et al. 2001). Longitudinal studies of 166 preschool children have also established the importance of early oral language, print, and phonological awareness skills to later reading ability (Lonigan, Burgess, and Anthony 2000). These indicate that phonological awareness should be given priority, over reading and vocabulary building in any child's learning of languages.

In Carreira (2004) study of Spanish HL learners, she yielded four different HL types, each with different combination of his/her membership into his/her heritage context and whether they require single or dual language (bilingual) use. Based on her differentiation, a migrant ethnic Chinese child living in Australia could be considered as having primary or variable membership while requiring dual language use. Carreira went on to prescribe focus of instructions for these learners (Carreira 2004) and the distinctions made for HL3 and HL4 (refer to Table 3) will be key considerations when the design probes, are being developed for this research's field activities later.

[17] Conceptual knowledge refers to knowledge learnt through thoughtful, reflective mental activity and is rich in relationships and understanding (Math.arizona.edu. 2015. "Conceptual / Procedural Knowledge." math.arizona.edu. Accessed 19 August 2015, http://math.arizona.edu/~horak/Concept.Proced%20know.htm.)

[18] Procedural knowledge refers to knowledge of rules and procedures, formal language or symbolic procedures (ibid.)

HL Type	Membership in HL	Type of Language track	Focus of instruction	Relevant to research
HL1	Primary	Single	Group notions of culture, membership in HL community. Preserving cultural and linguistic legacy of community.	No
HL2	Secondary	Single	Individual notions of culture Search for personal identity, in terms of his ancestry.	No
HL3	Primary	Dual	Building linguistic and cultural skills that complement realities of how the HL is used outside classroom.	Yes
HL4	Varies	Dual	Offsetting identity negation, tapping into background knowledge of the child as resource.	Yes

***Table 3*. Adapted from Carreira (2004)'s differentiation of HL types, characteristics and focus of instructions. Source: Carreira (2004)**

Carreira concluded that when teaching HL learners (upon identifying the HL type and corresponding needs), there has to be a selective deployment of child-centric and customized teaching material and pedagogy. More importantly, there has to be an association of HL with the child's sociolinguistic and family background.

Young learners in bilingual families often find themselves code-switch between English and Mandarin, so it would be beneficial if HL is presented to them without variations like the inclusion of phrases in other Chinese dialect. Since Mandarin is an ideographic language, there has to be a standardization of the script that they are being shown and read to at home and Mandarin, rather than other dialects being used as HL. He (2009) further proposed that in terms of reading and writing, character learning should come before Pinyin learning, recognition of characters before writing and reading before writing. HL should also be integrated as part of the learner's life and learning and ensure that there is continuity in the

learning (He 2009), but parents/carers have to be mindful that their family's concept of bilingualism should not be "exercised as double monolingualism" (Curdt-Christiansen 2015).

1.9 Chapter Summary

The chapter has provided the provenance of the research by detailing the personal narrative in migration and anxiety over acculturation's impact on my child's language development. It had gone on to depict a much larger concern over HL learning and maintenance within a migrant community. Understanding the need to differentiate HL from FL and SL provided clarity to the requirements for its maintenance. But the role of parents/carers is paramount, as they could either facilitate learning of HL through mindful motivation and interaction or their dispassionate pragmatic push would inevitably lead to their children's shift towards the dominant language. The chapter also ended with three main considerations for better maintenance, and has identified that it is the parents/carers whom the children are closest to, and who are in the best position to help them in HL learning. The following summary will serve as reference for informing the foundations, on which the proposed framework will be built on (refer to Table 4).

Key considerations	**Home as the domain for learning**	**Working within constraints**	**Type of content for HL learning and maintenance**
Key objectives	Inter-generational transmission	Build confidence Match cognitive development	Complement realities Building identity Simplification
Method	Fostering reading and communication	Frequent interaction Structured interaction Content based approach	Child-centric Customizable Phonological awareness as priority Standardize script

***Table 4*. Summary of key considerations to HL learning and maintenance**

Chapter 2
Mapping the Foundations for Proposed Framework

2.1 Introducing Home as Space, Mobile Technology as Enabler and Play & Interaction as Methodology

This chapter will map out how the 3 foundations of the proposed framework - Home as Space, Mobile Technology as Enabler and Play & Interaction as Methodology, were identified. It will examine related literature, market trends, themes, and samples of existing products that designs will help inform the development of the design probes later.

The siting of Home as the ideal space for HL learning had been discussed in the previous chapter. Gillanders' and Jimenez's (2004) research on the role of active parental support, and Carreira's (2004) emphasis on the importance of accommodating HL learning to an environment that is outside the classroom, point to the potential of the informal yet familiar space we call home. Intergenerational transmission, usually done at home, is considered the best option for young learners since parents/carers are easily the persons these children interact with most of the time.

There has been much research on how ICT can be a tool for learning by young children, even those with special needs. For example, educational games with some degree of tangible interaction designed for attention deficit hyperactivity disorder (ADHD) children (to improve memory and attention) (Guía, Lozano, and Penichet 2015), using iPod Touch to teach activity schedule and on-task behaviour for autistic children (Carlile, et al. 2013) and pairing actual toys with augmented reality for gauging psychomotor skills and providing motivational support for special needs children (Marco, Cerezo, and Baldassarri 2013). There are also non-governmental organizations such as Joan Ganz Cooney Centre[19], that look into the use of ICT in education for young children for intergenerational engagement, gaming and literacy skills (Joanganzcooneycenter.org 2013). While other literature on the use of mobile devices, specifically within the home environment, deals with mostly the issues of cyber-safety and addiction in children.

Play, within a specific cultural context, too, is a very well researched area by early childhood specialists. The cultural-historical notion of play is dynamic and moves between objects to concepts, from understanding of rules to role playing and affordance in moral actions (Fleer 2014, 15). There is also a view that it is a culturally structured activity and it is not homogenous worldwide; it is also largely dependent on the social interactions experienced by

[19] The Joan Ganz Cooney Center is an independent research and innovation lab that focuses on the education children in a changing media landscape. Its founder, Joan Ganz Cooney and her colleagues, used television to educate underserved preschoolers with *Sesame Street*.

the children during play, the material accessible for play and how it is linked to the children's other daily activities (Gaskins, Haight, and Lancy 2006, 179). These ideas are highly relevant when referred to the conclusion drawn from the previous chapter, where it had been advocated that a child-centric and customizable method might be helpful in allowing preschoolers pick up HL. There will be more discussions on play as a potential methodology for this research in Section 2.6.

2.2 Initial parents/carers' survey

To gauge a sense of how parents/carers take to mobile technology, a survey was crafted and conducted in 2010 (the explanatory statement, consent form, the survey questions and its full results can be referred to in Appendix E).

There were a total of 48 respondents who took the survey. The respondents were ethnic Chinese Singaporean parents/carers residing in both Australia and Singapore. The prerequisite for participation was that they must be from bilingual families and that they have a child/children who is less or equal to 5 years of age. The respondents accessed and completed their responses to a set of 30 questions via an online survey site hosted by SurveyPirate[20] in late 2010.

2.2.1 Areas covered in the survey

The answers to the first part of the survey provided a picture of the respondents' demographic. Out of the 48 respondents, most are effectively bilingual with 40% using more English than Mandarin, which is their Mother Tongue Language (MTL[21]), both at home and at work. Only 27% used mainly MTL at home and mainly English at work, while 54% of the parents/carers polled either use English exclusively or admitted to using more English than their MTL with their child/children (hence their indication later in MTL applications as a welcomed option for their children's literacy development).

This result mirrored the situation of bilingualism in Singapore that was highlighted in the previous chapter. Most were from middle-income (81%) and aged 31-40 years (90%), with 75% being professionals and the rest were homemakers. 92% of them posted that they and their spouses had an university education. Smartphones, followed by media players, netbooks and portable gaming devices, were flagged as the top 4 digital devices they own.

[20] As of February 1, 2012 SurveyPirate was no longer available online. The data from the survey in 2010 was screen captured and collated as Part (iii) of Appendix E.

[21] MTL as a term is specifically used to describe languages of key racial communities in Singapore. Mandarin will be labelled as Heritage Language (HL) in later sections and chapters of this research to reflect its use by migrant Chinese communities overseas, like Australia.

The second portion had questions designed to capture the demographic of children allowed access to digital devices. 60% of the children exposed to technology were between 3-5 years old while 75% of the children had access to their parents'/carers' mobile digital devices. For those parents/carers who introduced their children to mobile digital devices, approximately 27% were introduced when they were 2-3 years old. Although there were also about 23% who reported that their oldest child has yet been introduced to such devices.

The survey had also aimed to find out the children's relationship with the devices. 30% of the children were said to have spent an average of 0-15 minutes on the devices, 18% of the children spent an average of 15-30 minutes and 17% of the children spent the longest, at an average of 30-60 minutes on these devices. There were 72% of the parents/carers who felt that the duration of timing was just right and interestingly, 50% of the parents/carers felt that their children were treating mobile devices as a toy, while another 20% was reported to prefer it to the conventional toys. It was reported that only 20% of the children who had access to these devices, needed guidance from time to time, and most parents indicated that their children were self taught or had learnt so, by watching parents use these devices (refer to Table 5).

8. How does your oldest child go about learning to operate your/his/her portable digital device/s?	% of Respondents	Number of Respondents
My oldest child is self taught (intuitive design on the portable digital device/s and applications)	24.24%	16
My oldest child learnt from peers (from sibling/s or from other children)	6.06%	4
My oldest child learnt by watching me perform tasks on the portable digital device/s	36.36%	24
I have actively taught my oldest child how to operate the portable digital device/s	13.64%	9
Not applicable as my oldest child has no access to any portable digital devices	16.67%	11
They have no access to my work tablet nor my smart phone without me around. They're not taught to operate any of them. I will only play some youtube videos to show them. I don't think they understand anything, but just like to hold, touch something they have little access to.	1.52%	1
We turn on the digital devices for him when he asks for it, mainly to watch his cartoons.	1.52%	1
Number of respondents		***47***
Number of respondents who skipped this question		***1***

***Table 5*. Question 8 from survey. "How does your oldest child go about learning to operate your/his/her portable digital device/s?"**

The survey then sought to capture the parents'/carers' concerns of exposure on their children, particularly on one's attention span, cognitive development, health, safety and particularly modified language use. 74% of the parents/carers indicated that they do regulate the amount of time their children accesses these devices and the top 2 concerns were the devices' potential effect on their children's eyesight and attention span. Some noted that they were concerned that early exposure will be detrimental to their socio-interactive development.

The survey provided an opportunity to find out more about what are some of the popular applications parents/carers were installing on their devices. Of the applications that they had installed, word recognition & vocabulary building applications/content came out tops, followed by puzzles (such as shape sorting and colour matching activities) and arithmetic-related content. There were 43% who indicated that they purchased learning applications infrequently, with some indicated that they did not purchase such applications. It may also be due to the sentiments in majority of the parents (49%) who felt that such applications were expensive.

Their top 5 concerns when it came to procuring apps (refer to Table 6) – (1) level of interest of their child/children, (2) relevance of content, (3) appeal of graphics and audio clips, (4) degree of interactivity and lastly (5) cost of application/content. This reflected that learning applications have to be child-centric and it is the children's interest that drove the demand and purchase of the applications.

18. What do you look for when you procure the above selected preschool material for your child/children? Please tick on all your considerations.	% of Respondents	Number of Respondents
How much interest the child/children has/have on the material	12.93%	38
How relevant is the content to his/her/their school's curriculum	7.14%	21
How appealing are the visuals in the material (e.g. colourful graphics)	12.24%	36
How interactive is the material (e.g. for battery operated toys)	8.50%	25
How expensive is the material	9.52%	28
How long can your child use the material for (e.g. greater age range)	11.22%	33
How current is the material (e.g. is it the latest version/print)	4.76%	14
Whether other language options are available (e.g. provision of corresponding text in your mother tongue)	5.10%	15
Whether the material is produced by established publishers or manufacturers	6.80%	20
Whether the material has identifiable elements (e.g. same characters from existing children TV/video programmes)	5.78%	17
How safe is the material for the child/children (e.g. choking hazard)	12.59%	37
not sure	0.34%	1
	Number of respondents	***48***
	Number of respondents who skipped this question	***0***

***Table 6*. Question 18 from survey. "What do you look for when you procure the above selected preschool material for your child/children?"**

The respondents were then asked about other types of educational material they provided for their children. Storybooks and puzzles were the top picks from a wide range of traditional/print/non-digital learning material. Factors like (1) the level of interest of their child/children, (2) how appealing are the visuals in the material (e.g. colourful graphics), safety, (3) how long can their child use the material for (e.g. greater age range), are the parents'/carers' top concerns when procuring traditional/print/non-digital learning material. 64% of parents polled believed that such material would be beneficial to their children's literacy development. Although, there were 27% who were unsure of whether they were

beneficial, but would continued to provide such material. 35% polled were also unsure if their children would learn better from education-related applications/content on mobile digital devices than from traditional printed books, even though 17% were in favour of using mobile digital devices. All the parents/carers are interested in child-oriented applications/appropriate content being delivered in their MTL with 90% noting that MTL acquisition for their children was important/very important with their retention of “cultural affinity” and “maintaining traditions/identity” cited as the top reasons for their children acquiring MTL, while other reasons given ranged from what their children will be learning in schools and future employment credibility.

Most parents were also concerned about the exposure's impact on their children's attention span and health. What seemed to be prevalent, was a sense of dilemma or uncertainty about technology, with many believing in harnessing traditional ('tried and proven') approaches to learning while being receptive to using digital devices as one of many possible learning tools for their children.

2.2.2 Considerations learnt from the survey

The survey yielded broad findings that complemented much of general assumptions about mobile technology, especially on parental attitudes and their concerns for the education of their children. They raised further concerns about parents/carers being unsure which “educational” content is good for their children and in the process, displace traditional sensorimotor or hands-on play (Radesky, Schumacher, and Zuckerman 2015).

While the results from this survey are not exhaustive of the current attitudes parents/carers have towards mobile devices, it did prove that mobile devices are gaining popularity amongst the respondents, and screen-based gadgets will play a key role in any prototyping within the scope of this research. Their portability and form factor were also part of the reasons why technology seemed to be taken up by both parents/carers and they are being cascaded to their children. It also identified the introduction of technology starting with children who are 2-3 years old (Refer to Question 4) and indicates the starting age of the research’s target group.

The other consideration identified the degree of control parents/carers feel they need to exert over the use of mobile technology. While most parents are comfortable with daily exposure, they regulated the duration on which the children spend accessing and using the devices (refer to Question, 3, 5, 9). The responses from Question 7 (“Is your oldest child confident in the use of your/his/her portable digital device?) and 8 (“How does your oldest child go about learning to operate your/his/her portable device/s?”) showed that more than 60% of the children were noted to be confident and about 56% of them were taught to operate a device by a family member. These results were important as they helped identify that the target

group was largely able and confident of learning and using such devices. This was to be followed up by a tailored field activity with QRcode scanning for preschool children later.

From the survey, the parents/carers were identified to be conscientious about their efforts in educating their children. The results showed that they were generally keen to try out anything that were possibly beneficial to their children's education (Refer to Question 17, 19, 20) but they are nonetheless also stringent with their expectations and demands of the resources they procure. It also surfaced a conflict between proponents of preschool learning through minimal technological involvement and others who saw the potential of technology and embraced what were becoming available and affordable.

Responses from Question 17 ("What other preschool educational material have you provided for your child/children?") illustrated that the children were playing/learning with a variety of other material such as flash cards, story books, puzzles, pretend-play toys and building toys while concurrently being exposed to the use of digital devices. This suggested that the children's environment at home is often rich with pre-existing learning resources (storybooks and puzzles remain popular choices) and these resources may provide the necessary considerations when we look at designing prototypes for the proposed framework. It is difficult to determine how different family values on child-rearing and parental management affect parents'/carers' attitudes and readiness to cascade technology on their children. An inconclusive result polled from Question 20 ("Do you think your child/children learn better from education-related applications/content on portable digital devices than from books?") illustrated that apprehension towards investing too much on such devices, while retaining a degree of preference for more traditional resources.

There was also an overwhelming interest in applications featuring language-learning content, especially those that are deemed useful for MTL, when they were asked to gauge their interest in MTL applications/content and how important MTL is to their children's literacy development (refer to Questions 21 and 24). Similar a survey on 86 ethnic Chinese parents in San Francisco, the parents/carers were very supportive of developing bilingualism in their children, though she conceded that high level bilingualism and biliteracy were difficult to achieve when exposure to the language is limited in daily life (Lao 2004).

The parents/carers pooled were shown to be highly involved in the education of their children. Almost all the parent/carer respondents and their partners/spouse invest personal time on the literacy development of their children, with 90% of parents, 83% of their partners, 65% day carers reading to them from daily to at least once a week. This was a strong indicator of the importance of literacy to these respondents (refer to Table 7). Video-communication technology on-board mobile devices, provides the channel for "face-to-face" interaction with distant family members such as grandparents, and it may have great potential for developing literacy skills via reading and phonetic modelling (Radesky, Schumacher, and Zuckerman

2015) and may be helpful in maintaining HL use, if such active interaction occurs frequent enough.

26. How often do you, your partner and/or caregiver (e.g. day-carer/grandparent, if applicable) read to your child/children?

	Daily	On most days of the week	At least once a week	At least once every 2 weeks	At least once a month	Never	Number of Respondents
You	43% (21)	25% (12)	25% (12)	2% (1)	4% (2)	0% (0)	48
Your Partner	31% (15)	29% (14)	23% (11)	4% (2)	6% (3)	4% (2)	47
Caregiver (e.g. day-carer/grandparent, if applicable)	23% (9)	15% (6)	26% (10)	2% (1)	7% (3)	23% (9)	38
						Number of Respondents	***48***
						Number of respondents who skipped this question	***0***

***Table 7*. Question 26 from survey. "How often do you, your partner and/or caregiver (e.g. day-carer/grandparent, if applicable) read to your child/children?"**

In terms of design, the survey provided clues on how to proceed with the prototyping for the research. When asked what would they look out for when procuring resources, they responded that the design should be visually appealing to children and also their children's interest level on the material. Safety, cost and longevity in usage came through as key considerations as well. About a decade ago, there was little data on the effects of device usage on children's cognitive and physical developments (Bennett 2007) as most of the studies then were based on adults using adult-centred technologies. Medical professionals have voiced out in recent years over the improper use of portable devices, noting that there had been an increase in concerns and cases of affected eyesight and bad posturing. It is now known that light emitted from devices' screens can contribute to eyestrain and discomfort, affecting vision and lead to premature aging of the eyes, while bad postures during use have a detrimental effect on children's spines (Fischer 2015).

On the other hand, cost is a subjective factor affecting the use of application by children. The current Google Play and Apple Store are stocked with both free and paid applications and the price ranges from $0 to more than $10[22]. App Brain (2016) showed that free Android applications received more downloads (VoicesToday 2013; AppBrain 2016a) than paid applications, with the most paid downloads from applications in the $2.50 to $5 band. Information from the same site also indicated that education was the top genre of applications downloaded and data retrieved (AppBrain 2016b) indicated the average price of children educational applications was $2.71, while adults' educational apps cost $4.19 on average (refer to Table 8).

[22] Prices indicated here are in USD.

Category	All apps	Average rating	Apps with >50K downloads	Paid apps	Average price
Education (adults)	163087	4.14	6749	26187	$4.19
Education (children)	26196	4.09	2186	3943	$2.71

***Table 8*. Statistics for educational applications available for adults and children. Source: Appbrain.com (AppBrain 2016b)**

Moving forward, the survey helped to point out the kind of devices would be considered for the research, how it should be positioned to parents/carers, the genre of material that children are exposed to and design considerations for the development of such content (refer to Table 9). These will be further investigated in subsequent sections of this chapter.

Key considerations	Choice of device	Parent's/carer's attitudes	Material and content	Design
Responses	Mobile devices (smartphones, tablets)	Control access to technology Keen but wary of technology Involved parenting	Mix of new technology and traditional With HL learning is a huge plus	Visual appeal Cost Longevity Safety

***Table 9*. Key considerations and responses**

2.3 Locating the Home as the site for HL learning and maintenance

In the past decade, there had been a wider push for "innovation" in formal school settings, to design pedagogies with ICT and "create 21st century schools" in Australia (Moyle 2010) and in many other countries in the region, even though the efforts are not uniform across different countries (Trucano 2014). Researchers have also been investigating how mobile devices can be better integrated into curriculum for literacy learning (Hutchison, Beschorner, and Schmidt-Crawford 2012), how ICT can be integrated in physical environments to enable personalized learning opportunities in schools (Higham, Hopkins, and Ahtaridou 2007) and how effective it was to have preschool teachers use mobile devices to explore different applications to prepare their lessons in the classrooms (Ainsa 2013).

However, little literature is available on the potential of learning by preschoolers' with these devices within their home environment, and many of these take reference from the exposure to television programmes and television screen-based console games. As mentioned before in the previous chapter, the migrant home is a hybrid space and unlike school, the home may not have clear demarcations for play and the children's interaction with the adults happen fluidly. Nonetheless, it is still the primary zone of interaction and learning with their parents/carers. In this section, the discussion will focus on the discussion of the theoretical considerations for identifying home space as the site for HL learning and maintenance and highlighting 3 loci of considerations, in intergenerational support, multimodal screen access and physical configuration, for such space to work.

2.3.1. Theoretical Consideration: Constructivist Learning in the family space

The location of home as the site for HL learning does not imply the propositioning for home schooling as part of the research. For a preschooler, forming attachments to key people from the age of 2, is important and affects the overall development of the child (SirenFilms 2014b). Familiarity and trust of the child towards his/her attached parent/carer helps build confidence (SirenFilms 2014a) in learning from his/her immediate environment and reaching out to others, while responsiveness of a child towards the attached parent/carer is crucial. Traditionally the home is the primary space for transmission of knowledge, where the family members share not only chores and interact with one another at close proximity, but stories and experiences that form the collective identity of the family unit. The child also learns to make meanings from a setting that offers a cultural context to who he/she is.

Constructivism as a learning theory is featured prominently in writings about early childhood development, especially those of Jean Piaget and Lev Vygotsky. Piaget's work on cognitive development and his proposed preoperational stage of learning for the preschool age group, places language as only as a form of symbolic representation and its development as a result of the child's cognitive development, rather than the other way round (McLeod 2010). But Vygotsky opined that the child learner is not a blank slate (tabula rasa) (Rieber 1993) but is seen to be constructing his/her own knowledge or subjective representations of objective reality with the amalgamation of his/her previous experiences and cultural influences to every new situation. Instead, Vygotsky placed learning within social situations and the role of language and cultural transmission is core to his notion of social constructivism perspective. His notion of "scaffolding" proposed that a child learns from a more experienced person and it occurs within a "zone of proximal (or potential) development" (hereafter ZPD) (Vygotsky 1978).

However for ZPD to be effective, the child has to be an active rather than a passive learner. It is often the quality of interpersonal relationships between the child and the parent/carer, that

creates a more fruitful interaction and hence better learning outcomes (Stone 1998). Other factors of effective ZPD, includes the knowledge of the parent/carer, the nature of the task, the goals of the activities, and the concurrent developmental levels of the children. Vygotsky also wrote that a child's cultural development appears on two psychological planes, first appearing between two people as interpsychological and later within the himself/herself as intrapsychological. This is also when HL is fostered and learnt when a child experiences speech interaction with HL, usually within the home context for his/her initial years. The amount of learning needs can also be orientated to the extent of collaboration and interaction the child has with the parent/carer. In Kravtsova's (2009) writing, she adapts the ZPD according to the child's personality development. Their ability to accomplish an objective with the assistance of a learned adult, is mapped by how close or far the parent's/carer's "orbit" is in relation to the child's ZPD. A child exhibiting greater independence will require a different form of interaction from his/her parent/carer, to make the child's learning effective (Kravtsova 2009).

2.3.2 Locus 1: Intergenerational interaction and support

The nature of interaction and learning in the home environment is different from that in a school setting. Question 27 of the survey conducted showed that out of the 48 respondents, there were 75% who quoted that a day-carer or grandparent read to their children and this showed that the relationships between family members/adults in the household varies. Hence the ZPDs are distributed across more than one family member and Stone's (1998) suggestion transcribed above can play a role in effecting HL learning and maintenance.

Typically in an Asian household, where respect and trust is conferred based on seniority[23], having an older family member may be influential in effective scaffolding besides being a transmitter of HL. In a survey on exchanges between children between 3 to 6 years of age, and their grandparents in Sylheti/Bengali-speaking families of Bangladeshi origin and mono-lingual English-speaking families of mixed ethnicity in east London, the interplay of visual contact, gesture and spoken language between the children and grandparents has an authentic dimension which differs from the traditional classroom (Jessel, et al. 2011). The home space, in this instance, became a place where both trusting parties accommodate and learn the language required to communicate with one another. Close participation between children and other family members helps to maintain closeness and through communication and care, helps the children to grow up confident.

[23] Parents and other elders in the Asian household are usually highly involved, responsible for decision making, and caring for children throughout their lives. Children, in turn, are expected to consult with parents and other family members on all important decisions. (Chao, Ruth, and Vivian Tseng. 2002. "Parenting of Asians." In *Handbook of Parenting. Volume 4: Social Conditions and Applied Parenting*, edited by B. Webbs, 59-95. Mahwah, NJ: Lawrence Erlbaum Associates.)

One's family economic background also affects learning at home. The survey participants' middle class profile (Refer to Question 29, 30) and the responses garnered, had parallels with Bennett, Kymberley, Weigel, Daniel, Sally's (2002) study on middle-income families environment and preschool children's language and literacy development. Their study gave evidence that parents from middle income bracket are more likely to provide better literacy environment at home (due to their own better education) and have correspondingly higher parental expectations. The middle-income families environment was also noted to be more resilient to changes in relationships at home and income fluctuations, thus setting better foundations for language and literacy development. Their study reinforced the importance of parent/carer-initiated, literacy-related activities, such library use and book reading, in preschool children's acquisition of language and literacy.

Imported Chinese learning content such as books and wall posters may be procured or borrowed from community libraries (often limited in selection and subject to availability) by ethnic Chinese migrants as a form of learning resource for their children. The difficulty lies in shortlisting appropriate resource if the parents/carers are not proficient in HL themselves, though some of these books would indicate the target age group on their covers. The range of print material is varied and traditional board books are still popular amongst parents/carers due to their durability and relative low cost (refer to Image 1). While over the past few years in China, sales in the children's book market have grown by an average of 7-8% per year, accounting for a 16.5% share of the total book market in 2012. Its online book distribution platforms like Dangdang, Amazon and Jingdong, account for 60% of the market (BIZBeijing 2014), though little of it has made its way to overseas bookstores and libraries, as currently most do not offer overseas shipping. Hence, ethnic Chinese parents/carers living overseas, such as those in Australia could only source them through private importers and retailers with specialty sections like Books Kinokuniya[24] or via China Books channel on Amazon[25].

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[24] Books Kinokuniya in Sydney, Australia, stocks books in Chinese, Japanese, French and German as well as those in English (BooksKinokuniya. 2016. "儿童□物 Childrens' Books." australia.kinokuniya.com. Accessed 08 March 2016, https://australia.kinokuniya.com/t/books/chinese-books/er-tong-du-wu.)

[25] China Books Channel was launched by Amazon in 2011 with cooperation from China International Book Trading Corp. It now offers 500,000 titles on China or in Chinese to readers from 185 countries or regions. As of June 2015, 260,000 books had been sold on the international market through Amazon. China has also exported $2 billion worth of digital products such as e-books, data journals and video games in 2014, up from just $230 million in 2010 (Jia, Mei. 2016. "World's Readers Delight in Chinese Books." *China Daily*. Accessed 20 February 2016, http://www.chinadaily.com.cn/china/2016-02/15/content_23484822.htm.)

Image 1. **Samples of preschool Mandarin Chinese reading material**

There are some researchers who are unsure that shared book reading between parents/ carers and children would contribute to the development of children's literacy skills (Scarborough and Dobrich 1994) as there was no strong evidence that supported the widespread acceptance of the hypothesis. But with the emergence of media-rich (containing soundtrack, narration, animation and limited interactivity) eBooks, there are also concerns parents/carers now have a diminished role to share-read once automated reading features are enabled in the eBooks, leading to comparisons made between parent–child interaction when they share a paper-based and eBook (Kim and Anderson 2008). This research will be using shared eBook reading as one of the later design probes, developed for investigating the currency and validity of this technology on HL maintenance.

However some migrant families today are finding it difficult to maintain this level of interaction as the grandparents are either residing in their home countries or parents/carers need to travel often for work. Time difference between migrants and their relatives in home countries remains one of the few challenges in telecommunication that is unlikely to be solved, as the parties involved will still have to rely on synchronous communication (Cao 2013). To date, keeping a phone conversation can also be limiting in terms of engagement between parents/carers and their children and there is little existing age appropriate technologies that could project shared activities for physically separated family members (Yarosh, et al. 2009). Perhaps mobile technology can be better leveraged and design choices better informed so that they can contribute to positive outcomes in the maintenance of HL, but for now the closest research prototype to "live" augmented synchronous communication is the holoportation project by Microsoft's HoloLens (Microsoft.com 2016; Barrett 2016).

2.3.3 Locus 2: Multimodal screen time at home – from television screens to smartphones and tablets

Today's pervasiveness of affordable digital technology has made screen time for today's children different from a decade ago. In comparison to research in child development in the context of screen-based technology, much of it is still drawn from studies of more than 40 years of educational television programs (Robb and Lauricella 2014). Programmes like Sesame Street, has often been touted as a good educational tool and early studies in its 45-year run, pointed to accessibility to television screens as a factor in better performance in elementary school. Other positives included a greater awareness of diversity in social status and ethnic identities (Wong 2015). There are now many other television programmes specifically written and produced for preschoolers (Refer to Appendix C) and they are now also mostly readily available on television channels, portable media (on DVD and Blu-ray) and the Internet.

Children today are watching and consuming edutainment from not only television screens at home, but also through screens on mobile devices that are either their parents'/carers' or those which are gifted to them. Their experiences of edutainment are no longer restricted within the boundary of the common living room, in front of the family's television set, but are increasingly "on-demand". Their consumption pattern no longer follows a published television programme schedule and content is conveniently accessible between different screens, hence becoming not only mobile and fluid, but also fragmented and non-linear.

For example, parents/carers now find overseas Mandarin language programmes more accessible with affordable digital streaming devices (refer to Image 2) than before. These devices often stream a varied selection of cached or "live" high definition quality content (refer to Image 3) for their children. Parents/carers who are less proficient in HL, may find these Mandarin digital satellite television programs from overseas or other Internet-streamed audio-visual Mandarin content[26], to be helpful in projecting some degree of Mandarin exposure into their children's media environment. They could also easily customize their accessibility by choosing what to watch, when to watch, where to watch, how often to watch and which device to watch it on.

[26] Android-based "TV boxes" – digital streamers, like UBox (UnBlock. 2016. "Ubox Gen2." Accessed 19 February 2016, http://www.unblocktech.com/en/ubox2.html.) and Xiaomi's Mi Box(Xiaomi. 2016. "The New Mi Box." Accessed 12 February 2016, http://www.mi.com/en/mibox/.), allows users to access cached or live stream movies and television programmes in Mandarin. The programmes are mainly from China and may also include Chinese subtitled programmes from overseas, such as Japanese anime and American television series.

Image 2. **Affordable digital streaming devices (images taken from the companies' respective websites)**

While the objective of this research is not to recommend or dissuade the use of screen time as a dedicated form of HL transmission, the following findings from other researchers are highlighted so as to understand how the take-up amongst young children may be useful for maintaining HL.

It has been elaborated earlier that parents/carers who are physically closest to the child usually affect learning. Young children spend a lot of their time at home observing the actions of their parents/carers and it should not be surprising that includes observations of how their parents/carers access television and mobile devices. Question 8 on the survey conducted supports this observation as up to 42% of the parents/carers felt that their children learnt to operate the device via watching them or learning from peers. Parents'/carers' own media usage and how they perceive and react to media technology may have direct impact on the media experiences of the children (Lauricella, Wartella, and Rideout 2015). The children may initially mimic their parents'/carers' use of devices, and later model the attitudes the adults exhibit during their use, hence affecting how a home media environment is created.

In Lauricella's, et al. (2015) survey of 2326 parents of children aged 0-8, on their time spent across four different type of digital devices, they concluded that parents who spent the greatest amount of time with TV, computers and mobile devices had children who correspondingly spend most time on the same devices. For preschoolers, there was an additional hour of screen time recorded though that was factored as time the parents used, as they were watching the programmes with the children. This gave evidence that parents do try to be active in their control of screen time on television and computers especially in younger children and parental rules determine the frequency of media use by preschooler, though they did add that parents are less influential when it comes to use of mobile devices. This result tallied with the responses to Question 10 in the earlier survey, where close to 15% of the parents/carers logged that either they had either tried to regulate the time their children spent on mobile devices or that their attempts do not work.

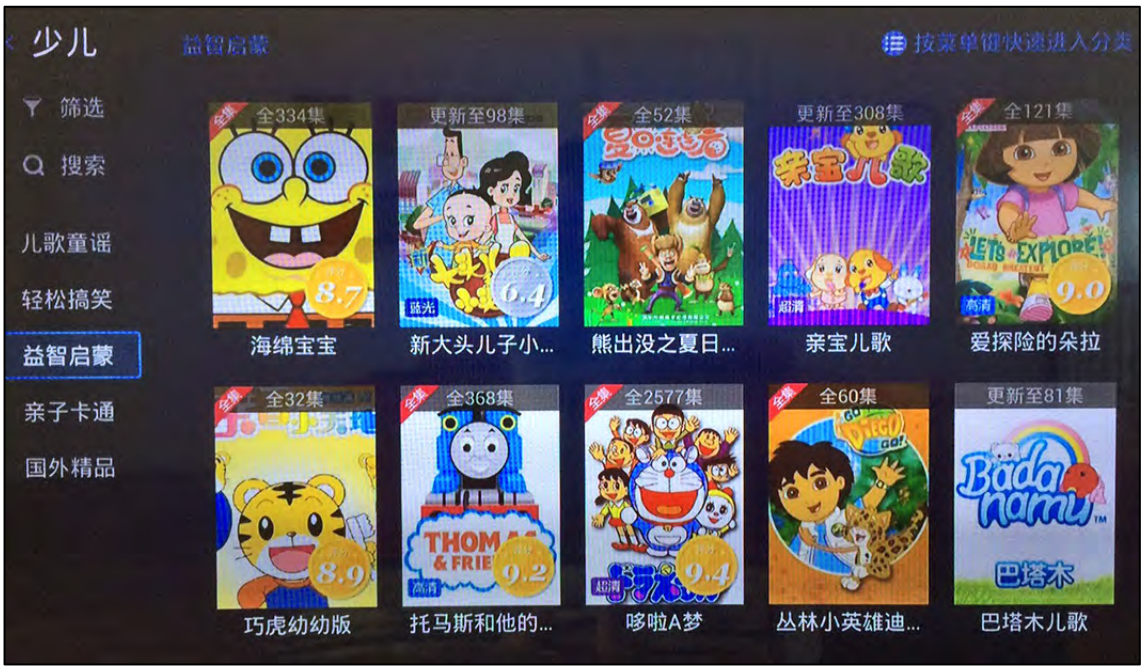

Image 3. **Screen capture of programme menu on one of UBox's children channels**

While the direction of causality of screen time is most likely to be from parents/carers to children, it should not dismiss that all screen time to be detrimental. Positives had been learnt from research in early childhood programmes like Sesame Street and aspects of ZPD could be fine-tuned to substitute or enhance the use of screen time for something creative and more family focused within the home environment. Usually when technology can have a positive effect on their child, be it behavioural or linguistic, it in turns improves parents'/carers' attitudes toward technology.

2.3.4 Locus 3: Physical configuration of Home Space

Unlike a classroom space where it can be easily broken to different smaller specialized play areas, the home space varies from family to family and not all families can afford to dedicate specific room space for their children's play/learning. The physicality of the home space – walls, floor and doors are often regarded as utilitarian and not all parents/carers see a need, nor could all of them afford to duplicate or emulate the physical environment that the children experiences at day-care centres. The areas in every household is demarcated by adults, so as to instil a sense of order and segregate private living/sleeping spaces from common spaces for dining and entertainment. The children are constantly instilled with this sense of segregation during daily encounters with parents/adults, as they go through routines from toileting to eating and to resting. It is in these in-between times where the child explores and plays at home, though in reality, the children's domestic play/learning spaces are often amorphous, often flowing from one room to another, stretching to wherever their imagination allows.

Image 4. **Sample bilingual wall posters for preschoolers**

Some parents/carers opt to aestheticize the children's bedrooms or dedicated areas with commercially available prints of syndicated cartoon characters and the most common way of adapting the domestic home space into a learning space would be to affix language learning material such as cards and posters in Mandarin and English on the walls (refer to Image 4). However more could be done to their environment. When furnishing a child's space, taking on their perspective and adjusting to their eye-level is important (Reimer 2015). The environment is considered as the 'third teacher' by the Reggio Emilia approach[27] to education. Some preschool centres strive to create aesthetically learning spaces, paying attention not just to the decorations that go into the classrooms but also how the space is arranged so that children may be inspired to learn. The parent/carer may not be trained as a preschool classroom teacher but it would not be surprising to find some are willing to devote resources and time to create a more adequate learning environment at home for their children.

Children often use objects and spaces in ways that unintended by parents/carers. Sometimes such ad hoc activities or use of space within the home by the children at home, results in conflict between them and parents/carers (Rasmussen 2004), hence creating some form of differentiation to the spaces helps to enable children to make personal choices as to when and where to do certain activities. This is not to diminish the imaginative energies in children but rather help parents/carers regulate some form of order in the way children approach learning and playing. For example, children can be tacitly allowed to access views using

[27] The Reggio Emilia approach focuses on the natural development of the children and the close relationships that are forged with their environment. Children are seen as social beings and the child's relationships to others, like friends, family, teachers, and the community, are more important than focusing on each child in isolation (Thornton, Linda author. 2015. *Understanding the Reggio Approach : Early Years Education in Practice*. Third edition. ed., edited by Pat author Brunton and Corporation Ebooks: Abingdon, Oxon, New York : Routledge.)

existing windows and platforms and small spaces can become spaces for them to hide and indulge in some alone time (Pairman and Terreni 2001).

Another element when considering the use of home space for learning is to include area for stocking craft supplies and books. Just like in a childcare classroom, books, craft material and equipment could be labelled and made accessible, while children could be taught how to organize and pack these away when they are done using them, so that they learn to take ownership and responsibility for the material and spaces they play and learn in (DEEWR 2011). This provides the opportunity for parents/carers to use both Mandarin and English as labels to the material and equipment and the child can then incorporate these as an element in his/her immediate learning environment. More importantly, the provision and storage of material by the parent/carer and the child respectively can also be seen as an extension as to how a reciprocal relationship can be cultivated, between himself/herself and someone whom he/she trusts and respects (Thornton 2015).

If the opportunity arises for parents/carers to the partially model the children's play space within their homes as a scaled down preschool classroom, it may project some form of continuity for these young children heading to preschool or currently attending preschool. The challenge however is to transform the space into a meaningful context of learning for the children, rather than just positing it as a utilitarian space for family. It is also important to explore the creation of rich contexts (i.e. a marketplace), where everyday objects can trigger memories and experiences to foster interaction and engagement with people around them (Strong-Wilson and Ellis 2007). As such, children will then find their own affordances for learning. This idea of using everyday objects in active learning will be explored later as part of the design probes used in field investigations for this research. Key considerations highlighted in this section (refer to Table 10) on the use of home space will also be suggested to parent/carer volunteers participating in the field activities and incorporated as part of the layout design of the eventual exhibition examination.

Home as Hybrid space			
Theoretical Consideration	**Constructivist Learning:** Forming attachment, Vygotsky's ZPD, Reggio Emilia approach, Active Learning, Internalization		
Loci	**Intergenerational interaction and support**	**Multimodal screen time**	**Physical configuration**
	Trust and respect of parent/carer	Anytime, anywhere, any media access	Visibility and availability of material

	Middle-income stability	Parent/carer modelling and control	Everyday objects

Table 10. **Key considerations for choosing Home as the site for HL/MTL learning and maintenance**

2.4. Technology as Enabler - Acceptance and cascade of technology from parents/carers to children

In the previous section, mobile technology was highlighted as a mainstay in the contemporary lives of parents/carers and their children. The motivation by parents/carers to maintain the use and learning of HL has seen them taken an interest in any potential media that would be useful even though they may be unsure of its impact at the present juncture. Technology usage now could be ubiquitous, no longer used just for entertainment (nor on just one singular screen) but also for intergenerational communication across time zones.

Technology adds on to the children's daily media exposure within print-rich surroundings and this creates greater opportunities for children to learn about reading and writing and is affecting the cognitive development of young children. Researchers should be looking at how i it can be harnessed or limited to effect the necessary change (Bavelier, Green, and Dye 2010). This section will illustrate how technology has permeated through to other aspects of the children's learning and play experience. A field activity was also designed and conducted to suggest how mobile technology may be used as an enabler for preschool children.

Technology has been integrated into the child's growing up years long before the recent inclusion of interactive screen-based toys in the repertoire of consumables targeted at young children. Electronics were first introduced in toys in the late 1950s and early 1960s such as the first talking doll "Chatty Cathy" by Mattel, which had a lo-fi phonograph record embedded within and it could be triggered pulling a string at its back (Townsend 2011a). Others like "Creepy Crawlers/Thingmaker" incorporated a small hot plate to melt and make rubber-like toys; "Rock'em Sock'em Robots" had two robots in a boxing ring, operated by 2 players on tethered joysticks; and the first radio-controlled cars emerged from the 1960s. The first commercially available "educational" toy was "See 'n Say" (released in 1959 by Mattel, refer to Image 5) which used gramophone technology to playback the sounds of barn animals once they were selected from a clock face decorated with different animals (Townsend 2011b), but it was only in 1977, when the first screen-based electronic handheld toy "Classic Football", was released by Mattel.

Image 5. **A recent Fisher-Price reboot of "See 'n Say" (Fisher-Price 2016) and Texas Instruments' "Speak and Spell" (© Bill Bertram 2006, CC-BY-2.5)**

But it was only until 1978 that Texas Instruments' "Speak and Spell" (Frantz and Wiggins 1981)(refer to Image 5), incorporated an vacuum fluorescent display (VFD) (and later a liquid crystal display (LCD)) screen, integrated circuit speech synthesizer and expandable cartridges, which started an entirely new genre of electronic reading and learning toys and also generated interest in the integration of synthesized speech's use in everyday objects such as typewriters and phones for handicapped use (Slivinsky and Givens 1983). Toy companies' involvement in research and development usually went hand in hand but it was only in 1990, when Nintendo Co Ltd, established a fund at Massachusetts Institute of Technology Media Laboratory, to support research involving Dr. Seymour A. Papert in gaming and learning (Imanishi, et al. 1990).

The introduction of mobile devices into the hands of young children can be attributed to the growth of mobile technology in recent years. Moore's Law dictates that the number of transistors (microprocessor performance) doubles every two years. It is especially evident in the recent commoditization and price plunge of digital products ranging from computers, television to mobile devices. According to 2014's Deloitte's report for China, Chinese consumers have been upgrading their mobile phones[28] in shorter intervals every year. Comparatively, less than one in 10 Australian smartphone owners are switching phones or getting refurbished phones (Deliotte 2015). Research has indicated that consumers from Asia

[28] In China, consumers upgrading their phones is expected to form over 70 per cent of handset demand in 2010, up from 50 per cent in 2008 (ibid..) According to a Deloitte's report, 97% of respondents (Chinese mobile phone owners) replace their smartphone in the past 5 years, while 81% have changed at least twice, more than half of Chinese consumers have changed at least three times. (Deliotte. 2014. *Age of Mobility - Deloitte Global Mobile Consumer China Survey 2014*: Deloitte TMT Center of Excellence.)

Pacific region are contributing to the growth in mobile technology[29]. At present, Asia is not only driving the consumption in mobile technology in terms of hardware, but also in the market for mobile applications. The increasing affordability of mobile telecommunications coupled with surge of domestically produced, hence cheaper hardware, had already spiked the number of mobile users in the region and that affected an increasing demand for mobile applications[30]. With the region already invested heavily in manufacturing over the past couple of decades, its increasing affluent population will not only lead a demand for consuming what are 'trending' in digital mobile technology, but also serve as a catalyst for domestic innovation and research in the adjacent sectors (de Villemandy 2014), such as applications development.

Mobile technology was not intended as an enabler for preschool learning initially. Literature on its potential for education ten years ago focused mainly on the use of its integrated camera as a scanning device to load information off the phones' General Packet Radio Service (GPRS) network (Mitchell and Race 2005). With slow and expensive Internet access, small screen size and alphanumeric keypad, even if parents/carers had perceived it useful as a learning tool for their child, it was not ideal for a preschooler. None of the mobile phone iteration prior to the arrival of capacitive touchscreen really took off as learning tools, although it paved the way for 2D scanning capability and nascent data sharing to be popularized.

The high level of usability, in terms of navigation and functions on today's mobile devices, has translated to the ease in which even the very young are able to operate the device without much difficulty. In a press release by UK comparison company uSwitch, its research indicated an extrapolated figure of 3.4 million under 8 year-olds in the UK owning a tablet while nearly 4 million children would have mastered the use of such devices by the time they were 3 (uSwitch 2014). Often usage and acceptance of technology bore down to its perceived usefulness and perceived ease of use. The former being a person's belief that the technology could be used advantageously and the latter being the degree which he/she believes the use would be effortless (Davis 1989). Presently, these mobile devices, incorporate mature technology of audio, video recording, photo-taking, drawing and text input, and have sufficient processing power to deliver animation, high definition video and online streaming content. Specification-wise, they are more than adequate to deliver most preschool applications that play back animation and load content off the Internet. Having used pre-touchscreen iterations of the mobile phone, it is not difficult for any user to perceive that his/her relationship with current touchscreen devices is more user-positive.

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[29] Smartphone adoption rates across 29 Asia-Pacific countries have spiked from 48% to reach 60% in 2014, according to data gathered from users of the Opera Mini browser (Operasoftware.com. 2015. "Smartphone Growth in Asia Boosts Expansion of the First Mobile Ad Platform Built for Brands." OperaBusiness. Accessed 10 July 2015, http://www.operasoftware.com/press/releases/general/2015-02-04.)

[30] Research firm Gartner stated that between 2008 and 2012, over 50 billion applications were downloaded, with over US$72 billion in revenue generated globally.

Aggressive advertising of today's mobile devices on their ease of use and simplicity in form factor contributes to how such technology gets subsumed in the consumers' consciousness. The popular advertisement by major device producers like Samsung and Apple deals not in sophisticated computing prowess but rather focused on the ease to adopt a networked lifestyle, should one choose to purchase one of their latest products and buy into their interconnected suite of services. Often any mention of the technology embedded in the devices is strategically placed away from the products' feature pages (refer to Image 6). Advertising media has thus been shaping consumers' perception of its usefulness via a perceived ease of use.

Image 6. **Advertising for Apple iPhone 6s (Apple 2016) and Samsung Galaxy S7 (Samsung 2016)**

As seen in Table 8, with the average price of children educational applications at about USD2.71, the choices for parents/carers have become inexpensive and varied. Even if they may not be sure of the inherent quality of the applications, it was still a cheap risk they can well-afford to take. It is perhaps also the reason why they are being appropriated by parents/carers as "toys" and the paradigm shift in its use correlates to an increase in the development of the adjacent sector previously mentioned, particularly in games, entertainment and education. This meant that more Mandarin language preschool applications will be developed, and thus more choices of resources will be made available over the past few years.

These factors affect a behavioural intention on the part of the parents/carers to share this technology. Behavioural intention (hereafter BI) is defined as a person's perceived likelihood or readiness to perform a given behaviour. It is assumed to be an "immediate antecedent of behaviour" based on factors of attitude towards the behaviour, subjective norm and perception of behavioural control (Ajzen 2002). Question 12 from the previous survey conducted had close to 90% of parents/carers indicating that they had either procured or intend to procure more and install child-oriented applications/appropriate content for their devices in the near future. Coupled with market availability, low cost and innate motivation for HL maintenance

shared amongst other ethnic Chinese parents, the parents/carers can be said to be in a group with high BI and is thus most likely to share their devices with their children. This then influences the BI of children when it comes to using something that is being “handed over” by their parents/carers.

Unlike the adults who deemed mobile devices as convenient, interactive and ubiquitous in relation to their increasingly technology-driven lifestyle, these mobile devices shared to preschoolers are essentially just physical objects that the children readily associate with play. Preschool children are also developing their cognitive, motor skills and speech at this juncture. Their initial BI to use these devices is simple and is no more different from the exploration and play of toys or the reading of books in a traditional tangible form. It is the content within the applications, not the physical phone that has determined its actual use by the children. For instance, some functions with speech playback can allow the children to mimic speech while others require fine motor skills (such as using fingers to tap, swipe and drag).

Since the emergence of touch-screen-based iterations of mobile devices, they have been readily adopted by the toy and education industry as part of their expanding repertoire of product offerings for children. Some of these offerings include “appcessories” (physical toys that are designed to customize ownership experiences), puzzles, picture eBooks (digital versions of storybooks with illustrations or animations, with audio-visual playback). Features like multi-touch interface, video conferencing, smart codes and augmented reality are gradually incorporated as part of the device users’ experience.

The potential for education on mobile devices is varied, for example, parents/carers and children can now access and maintain their own playlist of podcast programmes from popular culture such as Sesame Street (Ching, et al. 2009). As usage of these devices cascades from parents/carers to their children, Ching, et al (2009), also see possibilities for interactivity, equity and coordinated research and development for child education specifically in education technology. They reported that in a project for aiding low-income parents become better mentors to their pre-school children, the parents/carers were also comfortable with the use of affordable handheld devices to document their children’s activities during play. The writers were however, mindful that technology remained part of the repertoire of tools for parent-child engagement.

The only significant difference between a mobile device and a toy is the ownership of the device, its value (for example, the parents/carers may stress repeatedly to child that he/she must be careful with the device as it is fragile) and how its access is regulated. This differentiation is ambiguous for the child, as sometimes parents/carers do not exercise clear control over the place, time and duration of the child’s usage of the device. It had been previously discussed that young children model the usage according to their observation of

other users, particularly of their parents/carers, and that affects the children's BI to use the device. It becomes conflicting and frustrating to a preschooler when his/her desire to use these becomes more regulated than other toys that are made freely available to him/her. However behavioural issues arising from conflicting usage and how it may even affect HL learning will require further investigation beyond the scope of this thesis.

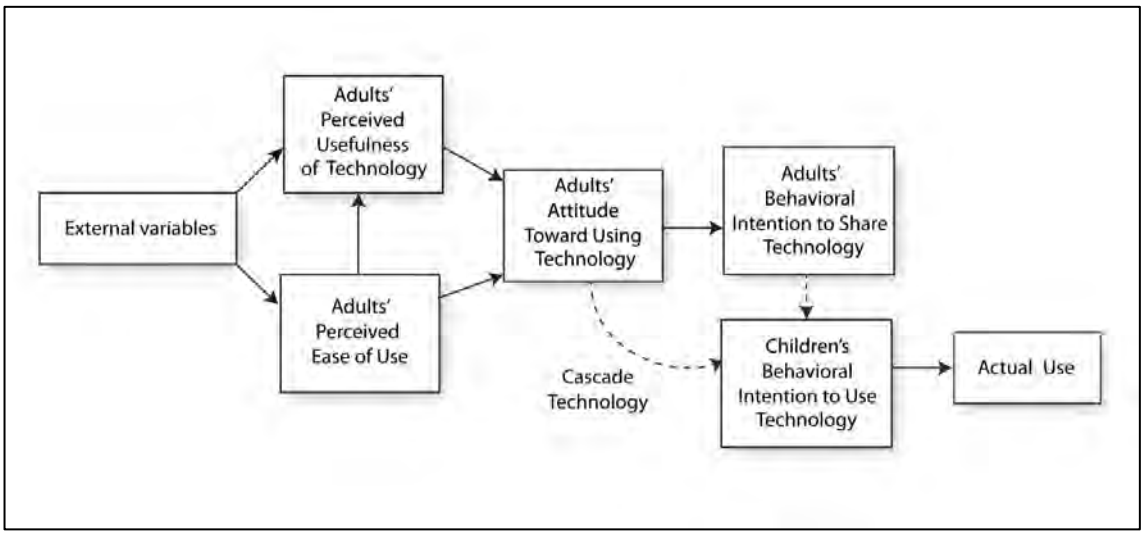

***Figure 4*. Cascading of mobile technology from parents/carers to children**

Walter Benjamin, in his 1936 landmark essay "The Work of Art in the Age of Mechanical Reproduction" projected traditional narratives to be obsolete in societies in which mechanical reproduction is popular and feasible (Benjamin 1936). But contemporary digital technologies have made these narratives accessible through an even more rapid pace and ever increasing audience size. This has also created a spectrum of attitudes towards new technologies. While some claim that overexposure of children to these media will fail to develop their imagination (Kornberger 2008), others presents technology as having very different meaning to children since it has made how we function and access information invisible. Tapscott (2009) refuted the notion that the digital age will 'stupefy' the new generation. Instead he urged that users tap into these new technologies and goes on to elaborate how the 'Net' generation's time spent online is no different from other activities but they are becoming active participants who, through customizable and collaborative technologies, have better management of their multitasking environment (Tapscott 2009).

2.4.1 Field activity: QRcode[31] scanning exercise

[31] A QR Code (quick response code) is a matrix barcode readable by any mobile device with a camera or a QR scanner. A reader application needs to be installed on the mobile device to access the encoded information. The information encoded can be text, website/video link or other data, like an SMS message. The code can also be used to track information depending on the number of times it was scanned and associated actions taken. (Rouse, Margaret 2013. "Qr Code (Quick Response Code)." Whatis.com. Accessed 12 March 2014, http://whatis.techtarget.com/definition/QR-code-quick-response-code.)

The first field activity conducted for this research project primarily looks at how children's BI to use technology is affected by exposure to a function (QRcode scanning with the in-built camera) on their parents'/carers' smartphones, which they had not learnt to use previously. Data, from the response times taken to learn and apply this new skill and general observations by the parents'/carers' who were facilitating this activity, would be used to support the hypothesis that preschoolers have little to no difficulty in picking up a 2–step access of content. It is also hypothesized that they can be interested in retrieving information in an abstract manner, by associating content with a 2D QRcode. 2D QRcode was chosen as they could now be easily generated online and be decoded with free applications designed for smartphones and tablets. It is also now commonplace in advertisements in papers, magazines and billboards, which may have been part of the environment print the children have encountered.

Web links to identified age appropriate edutainment videos (2 clips in English and 2 clips in Mandarin, refer to Table 11) on YouTube were converted to QRcodes and included as part of the activity sheet for this group of participants.

The videos selected were:

Code	Title	Description	Duration (min:sec)	Web link
For demo	Sesame Street. Elmo's Ducks	Puppetry: Sing Along with Elmo and his Duck Buddies (Sesame Street segment)	2:06	http://youtu.be/0LEYwoooVfw
Code 1	拔萝卜 (Pulling the Turnip)	Animation: Song about Harvesting a Giant Turnip (in Mandarin)	2:41	https://www.youtube.com/watch?v=kEOZTeuzlfI
Code 2	刷牙歌 (Brushing Teeth Song)	Animation: Song on Brushing Teeth (in Mandarin)	2:52	https://www.youtube.com/watch?v=bAOYjwvgRAE
Code 3	Sesame Street: Feist sings 1,2,3,4	Live-action: Feist sings with Muppets from Sesame Street (Sesame Street segment)	2:20	https://www.youtube.com/watch?v=fZ9WiuJPnNA&index=2&list=PL93C142AB158CCB86

Table 11. **Description of YouTube video clips selected for QRcode scanning exercise**

The criteria for the investigation were: (a) the child participant is between 2 to 5 years old and (b) is from a bilingual (English and Mandarin) family. The parents/carers were also notified

that they were to assist with the administering the activities, logging down the time spent and photo/video documenting the process. The explanatory statements, consent forms, instructions to parents/carers, the activity sheets and full results of the activity can be referred to at Appendix F.

2.4.1.1 Number of participants & basic information

13 participants from Singapore and Melbourne participated the investigation. These parents/carers provided basic information on the participants' age and experience with smartphones prior to starting their activities. The 4-5 years old group is the largest age group in this investigation with 6 participants, followed by 3 for the 3-4 years old group and 4 for the 2-3 years old group. All responded that their children had prior experience using or had exposure to smartphone before this activity. The devices used were also logged (refer to Table 12) but the difference in platform did not impact on the children's performance when accessing the code scanning application and video content, since the processes were identical.

Make / OS / Model	Apple / iOS / iPhone 4	Apple / iOS / iPhone 5	Apple / iOS / iPhone 6	Samsung / Android / Note 2	Samsung / Android / Tab	Samsung / Android / S3	Sony / Android / Xperia
Number	3	2	2	2	1	2	1

Table 12. **Smartphone models used for QRcode scanning exercise**

2.4.1.2 Averaged time logs of code scanning activities

A significant part of investigation was to have the parents/carers log the time the children took to complete the scanning of 4 QR codes and the loading of 4 linked video clips (refer to Image 7). The children had displayed little or no problem locating the code scanning application on their parent's/carer's smartphones or tablets, launching it to scan the printed QRcodes, and in turn triggering YouTube into loading and playing the video clips (refer to Table 13).

Average time taken to demonstrate the use of application to the child	91 seconds
Average time taken for the child to load the demo video clip independently	56 seconds
Average time taken for the child to scan CODE 1 and load the corresponding video clip independently	44.6 seconds
Average time taken for the child to scan CODE 2 and load the corresponding video clip independently	31.8 seconds
Average time taken for the child to scan CODE 3 and load the corresponding video clip independently	27 seconds

Table 13. **Average time taken to scan and load video clips**

Image 7. **Child participants scanning the selected QRcodes on activity sheets and accessing linked YouTube videos.**

2.4.1.3 Responses to post-activity questions

Parents/carers were required to log down their observations and answer 5 post-activity questions based on their observations. 60% of the children were noted to be able to handle the devices comfortably while other parents/carers cited other reasons such as their devices being too big, distraction by other applications, unfamiliarity with applications for causing slight discomfort in use. Most children had no issue learning to use the scanning application though there were slight challenges when they had to toggle between applications. All the children expressed interest in scanning and loading the rest of the clips after their parents/carers demonstrated the first clip. Most were confident of doing so independently for the rest of the codes (refer to Table 14).

Question 3: Was the child interested in using the application to capture and load the DEMO video clip after your demonstration?		
Answer	Number of respondents	Remarks from parents/carers
Yes	13	-
No	0	-
Question 5: Was the child confident in using the application independently?		
Answer	Number of respondents	Remarks from parents/carers
Yes	12	-
No	1	Participant was too distracted by other applications

		found on the device.

Table 14. **Responses to post-activity questions 3 and 5.**

2.4.1.4 Feedback by parents/carers and future considerations

The group of 13 child participants produced results that were consistent with popular views that preschoolers take to mobile devices at an early age and they are generally comfortable operating them; though the size of phones to hands ratio provided some challenges in navigation for a couple of participants. The average timing logged over their independent scanning of 4 QRcodes indicated most of the children needed only about half of the initial time their parents/carers used to demonstrate the processes involved. The time taken for subsequent independent scans were also slightly shorter than those of earlier attempts.

While the exercise did not set out to gauge the interest of the participants in watching the English and Mandarin clips, all the children did finish viewing the clips and were interested in repeated viewings. All but one child were also interested in using the application to capture other QR codes (from their environment, such as from magazines) and load more video clips. The exercise did indicate a certain level of confidence in the children accessing up to 2 different applications (code scanner and YouTube player) and a sustained interest in edutainment video clips as part of today's multimodal screen experience.

The observations gathered from the parents/carers also provided important points to consider when developing future investigative work involving young children.

Feedback	Future considerations
• While all had said that their child had prior experience using a smartphone, there was a couple of the parents/carers who noted that their children could not handle the smartphone comfortably during the course of the activity.	• Importance of phone-hand ergonomics. • Importance of familiarity of layout to the child. • Minimise visual distraction on screen.
• Most of the children did not find it difficult to learn to use the application from their demonstration. • Some noted that it was distracting for children as there were other application icons on the home screen. • There was a slight learning curve to exit the video playback and rescan another	• Minimise visual distraction by isolating the relevant application icon on a blank page on smartphone home screen. • Reduce the number of steps involved / provide visual-audio cues to assist children if integrating scanning function to application design.

QRcode.	
• All finished watching the clips and were interested in repeating them. • All but one child was interested in using the application to capture other QR codes and load more video clips.	• The condition of the child participants is paramount when conducting any field activities. • It will be highlighted to future volunteer parents/carers that they must provide the suitable environment and timing when carrying out the tasks with young children.

Table 15. **Excerpts of feedback from parents/carers and future considerations when working with children and technology**

The use of QRcode as an eLearning approach is not new and had been used in public institutions such as museums and art galleries to allow visitors to utilize their smartphones as guides when accessing online information on the exhibits, like in Ueno Zoological Gardens and the National Science Museum in Tokyo, Japan (Arita-Kikutani and Sakamoto 2007), before the advent of touchscreen smartphone. While in a research survey on 132 university staff in Romania, their interest in integrating the use of QRcodes to support their instructive practice and, more importantly, as a do-it-yourself and just-in-time exploration of resources (Chicioreanu, Bilal, and Butnariu 2015), has relevance as to how parents/carers may like to introduce online resources to their children by tapping into the expanded functionalities of today's mobile devices.

This part of the investigation hence pointed out that a 2Dcode reader, when used on the current generation of mobile devices, is a good baseline tool for integrating ICT into learning for preschoolers. The decade-old 2D code reading technology has matured with the arrival of current generation of smartphones with larger displays and greater processing capabilities. It is ideal for families as they are inexpensive and can be incorporated in a non-obtrusive manner in a physical play area, serving as springboards to dedicated resources online and on-board the devices. Preschoolers were also identified as the suitable age group for subsequent field activities in this research.

2.5 eLearning as Methodology – Trends, Devices and Mobile Applications

The previous sections have established that for HL maintenance in a migrant family, the research has to be situated the learning within the home space and accept the relevance of mobile technology as an enabler for learning. In this section, the research will illustrate eLearning and play as the methodology required in its eventual proposed design framework.

It had been previously briefly mentioned that the availability of preschool Mandarin video resources available from online streaming may have helped migrant ethnic Chinese parents/carers skirt around the difficulties in accessing printed resources in their adopted countries. Resources like flash-based animations, audio and song recordings, text from nursery rhymes and poetry are often freely available online and can be easily found on websites like Yes!Chinese (Yes-chinese.com 2015) and baobao88.com (Baobao88.com 2016). However, limiting factors such as the parents' sublevel of language proficiency (UNESCO 2007), content being not readily sized for mobile devices and parents/carers requiring Internet access to retrieve these resources exist. The key shortcoming of these online content is that they require parents/carers to not only facilitate access, but also preselect and "curate" for their children to experience. Hence the easiest and most manageable approach is still to have applications that are optimized to run natively on mobile devices. A review of some recent preschool Mandarin applications for mobile devices, with the focus on the trends and their chosen pedagogies, will be highlighted later, to help with the crafting of relevant content for the design probes used in this research.

2.5.1. eLearning Trends

In a survey on future purchasing choices for devices by American parents, most of the parents referenced purchasing a device primarily for their children's learning, and some Spanish-speaking preference parents felt that e-readers could help their children with bilingual literacy. In other questions about parents' attitudes to their children playing games on devices, the Spanish-speaking preference parents tend to be more conservative about using applications for literacy and numeracy, citing concerns about their children being more easily distracted (McCarthy, et al. 2012). The parents/carers surveyed earlier for this research also embody a similar paradox in their attitudes towards mobile devices. While they are willing to embrace and cascade technology to their children in the name of education, they have reservations about the degree of exposure best suited for their children's future needs. This paradox runs parallel to two convergent trends in eLearning for preschoolers.

The first trend is the growth of demand for innovative technology-enabled learning devices (i.e. the hardware) and the second trend is the development of software or applications that run on the former. Nowadays parents/carers are turning to devices to help educate their young children and manufacturers recognize that the early education market is a sizable one and has since been launching products that cater to this demand. ELearning companies from Europe and the United States, like Leapfrog and Vtech[32], are still leading the market

[32] VTech is a world leader of children learning products such as InnoTab, MobiGo, and V.Reader handheld toys. It has been developing high-quality, innovative educational products that enrich children's development through fun and smart play since 1980. (Vtechkids.com.

innovations for device design, but in Asia, especially China and Hong Kong, manufacturers have been quick to adapt and manufacture similar products for the export and domestic consumption.

2.5.2 eLearning devices for Mandarin learning

In this section, there will be a discussion on some of the eLearning devices or electronic products that are currently popular with Chinese consumers (refer to Appendix A for samples documented during my visits to international trade fairs for toys and children products in Shanghai and Hong Kong in 2012 and 2014). It will also include the types of applications that are available for mobile device users and how it is gradually supplanting the learning devices as the all-in-one eLearning product parents/carers are getting for their children.

The range of electronic products developed by Chinese electronics manufacturers for learning is broad and they vary in build and quality. Some with often sold as toys and do not offer high-end interactivity like actual smartphones or tablets (refer to Image 8). Samples of these products in Image 8, have form factors are often modelled after popular adult devices such as laptops, smartphones and tablets. As toys, they allow children to mimic parents/carers' behaviour when using their devices. Some of these devices have pre-assigned tactile buttons for different functions, to allow young children to select learning modes (such as numbers, alphabets, colours, shapes). While others have a small LCD display with a miniature keyboard and mouse for input. Some models, designed for export, may also feature preloaded bilingual speech, subject to their international clients' requirement. These low-end devices are significantly cheaper but offer no upgrade or memory expansion options like the higher-end tablets that are now gaining popularity amongst retailers and parents/carers.

Some Chinese electronics manufacturers[33] have turned their attention to developing products for the language learners market, by adapting existing computing technology, adopting interactivity and engaging language content consultants. There had been 2 categories of higher end digital products that had gained traction over the past few years. The first category is the Reading Pens, which uses sensor technology to decode content on actual books and provide audio feedback off the built-in speaker in the pen. The second category is the android tablets, which are often sold with preloaded proprietary educational applications and may feature different brightly coloured 'skins'/casings, designed specifically for children.

2016a. "About Vtech." vtechkids.com. Accessed 06 January 2016, https://www.vtechkids.com/about_vtech/.)

[33] Chinese electronics companies and publishers such as NoahEdu (http://noahedu.com) and BuBuGao (http://www.gdbbk.com) have launched digital learning tools and devices such as modified laptops and interactive readers for school-going children. Their content incorporate national curriculum and claimed to be co-developed with curriculum and education specialists from leading Chinese universities.

Image 8. **(1) 25 Functions Intellective Computer (with Mouse) (model: b140010) by Brilliant Ind'l (China) Ltd, Hong Kong, (2) Kids' Learning Tablet (model: Q1/Q2) by Readboy, Indonesia, (3) Kids' Computer Learning System (model: SX1423) by Solar Tune Electronics Ltd, Hong Kong, (4) Learning Pad (model: HM1803A) by Hung Kwong Trading Company, Hong Kong, (5) Educational Pad (model: 8102) by Best Learning Materials Corp, Taiwan (6) Mini Tablet (model: 996) by Shantou Chenghai Huile Plastic Toys Co Ltd China (Guangdong). Images sourced from Hong Kong Toys and Games Fair 2016 website.**

The Reading Pens that were on display at the toy fairs were technically similar to Leapfrog[34]'s LeapReader (Leapfrog 2014) (refer to Image 9 (1)). They included a complete package of hardware, with upgradable firmware, downloadable learning content and complementary printed textbooks or storybooks (customers have to purchase additional specialized books if they want more content that are to be used with these readers). One parent reviewer of the LeapReader noted that her children used it as a book and the older sibling would engage the younger sibling in shared reading (Leonard 2013) while another parent wrote that it kept her son entertained for a long time and thought it to be helpful in encouraging writing and reading at home (Gruber 2013). On a larger scale, Leapfrog had teamed up with iChild in 2014, a child development and education consumer website in the UK, to provide 200 teachers with the LeapReader to be used in classrooms with children between 4 to 8 years old, including pupils with special needs. 86% of the teachers reported they would recommend the device to

[34] Leapfrog, based in Emeryville, California, designs and creates eLearning solutions specifically for children (Leapfrog. 2012. "About Leapfrog." Accessed 15 July 2012, http://www.leapfrog.com/en-us/about-us/index.)

parents for home use to assist with their children's reading and writing skills, after the 2-month trial (iChild 2015).

A Chinese 点读机 (Reading Pen) kit for preschoolers is similar in its use of optical sensor mounted on a touch pen. The sensor picks up the invisible dot matrix printed on each page of the books and in turns triggers the related audio clips from one end of the pen. The audio playback may be from their external "bookcase" (refer to Image 9 (2) & (3)) if the model features a built-in speaker. Other features may include a LCD screen, a microphone for voice recording, navigation buttons for media selection and pre-installed English-Chinese dictionary. These devices are often advertised as an all-in-one student enrichment toolkit, from preschool level content that features Chinese national culture (国学 Guo Xue), foundation mathematics, general knowledge and bilingual language learning for preschoolers, to primary-level Science, Mathematics, Mandarin and English.

These Chinese Reading Pens are very popular amongst parents due to the inherent cultural emphasis on education, even at the preschool level. Muxuan (2013), noted many parents/carers believed that such technology affords better cost efficiency compared to the engagement of a personal tutor and the devices with its text to speech functions bring value-addedness to a child's home reading habits, especially if the parents are not around to coach or engage in shared reading. The manufacturers were also selling the idea of "self-directed learning" and offered monitoring tools to these parents/carers. The parents were particularly attracted to the assessment modules that are included as part of the learning packages. Thus highlighting the level of emphasis these parents/carers have for the education of their children. Professional pre-recorded speech could also possibly offer opportunities for the child to learn and correct their pronunciations when reading, while the animation and interactive display would be attractive to young learners (Muxuan 2013).

Another eLearning product that has caught on in China and other Mandarin-speaking countries in recent years, are touch screen tablets and often offering brightly coloured silicon/plastic protective case for degree of individualization (refer to Image 10). Again there are similarities between these products and Leapfrog's LeapPad series (Leapfrog 2016b) or VTech's Innotab series (Vtechkids.com 2016b) of learning tablets. Almost all of the tablet devices designed for the education market come installed with Android operating system, built with capacitive multi-touch screens and are Wi-Fi-enabled. These are shipped with proprietary applications that require user subscriptions to download content and support services. The devices, usually with built-in parental controls, also allow for application downloads from Google Play (if the devices are for overseas market), or their proprietary application stores. They are essentially consumer-level tablets with audio, camera and video recording functions with sufficient processing speed for interactive content and multimedia access and playback.

Image 9. **Preschool eLearning devices (1) Leapfrog's LeapReader, (2) BuBuGao's T900-E(BuBuGao 2016), (3) NoahEdu's NE600 (Noahedu 2016). Images sourced from their respective product sites.**

Image 10. **Preschool eLearning devices (1) Kids Tablet Q3 by Readboy, Indonesia, (2) Cute Cartoon Kids Babypad Tablet SpongeBob (model: FS995058) by Firstsing Co Ltd, China (Guangdong), (3) Kids Tablet by Shenzhen Koridy Educational Technology Co., Ltd, China (Guangdong). Images sourced from Hong Kong Toys and Games Fair 2016 website.**

Data from statista.com shows that for the second quarter of 2015, these "white box"/"no name" tablet manufacturers using Android operating system (OS), were dominating the market (Statista.com 2014a). The OS's high adaptability to various types of hardware has made it a popular choice for these Asian manufacturers, as it helps lower prices from

development to retail. There are however concerns and opposing views to the effectiveness of these devices. Recently there had been negative consumer feedback on these Chinese devices. The main concern is about radiation exposure from some of the manufacturers' devices. It has also been pointed out that there were issues with quality control (with devices turning up "dead-on-arrival") and discrepancies between the download content and printed books. Some of the content were noted to be pirated[35] and "professional" voiceovers and speech content were sometimes either irregular, incorrect or incomplete. Some parents/carers have also pointed out that the children were distracted by the interactive features and mini 'educational' games that were uploaded onto the devices, while educators in China voiced out that, both young children and parents/carers have become over reliant on such devices and the children no longer paid attention to actual lessons in class. Some children had also developed issues with their postures and visual fatigue from prolonged use of these devices (Baby.ce.cn 2011).

2.5.3 Mobile applications for Mandarin learning

The popularity of applications catered to children has risen in tandem with sales of mobile devices. Apple's iPad recently topped other established children-based brands such as Nickelodeon, Crayola and Eggo in a market research by Smarty Pants (Milot 2014) as the most popular toy. Traditional definition of a toy being a plush or an action figure or even a handheld gaming device is being displaced by a device that should have been nondescript and too fragile for any preschooler, this has conclusively proved that the cascading of mobile technology as mentioned in the previous section is well and truly complete.

The number of iOS and Android applications developed for education are growing by the day. Much of it is in relation to the increasing sales of mobile devices[36]. Figures gathered from 148apps.biz[37] indicate that educational-related applications make up the second highest number of applications available, after Games in iTunes's App Store. On the other hand,

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[35] Noahedu had been accused of provided pirated learning resources from Jiansu Educational Press on their download portal. It had previously been charged for pirating English resources in 2008 (JiangNanShiBao. 2009. "诺亚舟涉嫌使用盗版教材 点读机行业待规范 <Noahedu Alleged Use of Pirated Learning Resources>." Ccidnet.com. Accessed 17 April 2014, http://www.ccidnet.com/2009/0430/1755529.shtml.)

[36] Europe has been a leader in the global market since 2013, when the region held about 28 percent of the global market. Analysts predict that by 2018, the Asia Pacific region will ship close to 108.6 million tablets. (Statista.com. 2015. "Global Market Share Held by Tablet Vendors from 2nd Quarter 2011 to 4th Quarter 2015." statista.com. Accessed 10 February 2016, http://www.statista.com/statistics/276635/market-share-held-by-tablet-vendors/..))

[37] App Store applications are listed in their top-level categories. The current active application count indicates that there are 72,448 apps listed under Education and it constituted 10.01% of all active application categories (Pocketgamerz.biz. 2012. "App Store Metrics." pocketgamerz.biz. Accessed 20 December 2012, http://148apps.biz/app-store-metrics/?mpage=catcount..)

education-related applications Android Market was in sixth place in appbrain.com's[38] top 10 categories. The figures should only be approximations since an application can often be found listed under more than one category by its developer.

Education as a category in online stores encompassed learning content designed for all ages though it can be assumed that a significant portion are developed for preschoolers since key findings by The Joan Ganz Centre's iLearn II (2012) report noted that over 80% of the top selling paid applications in iTunes Store's Education category target children and 72% of these top selling applications targeted preschool or elementary aged children (Shuler 2012). A report from Common Sense Media in 2011 also shows that more than a quarter of all American parents have downloaded applications for their children to use, ascertaining the trend for developers continuing to push out more preschool related applications.

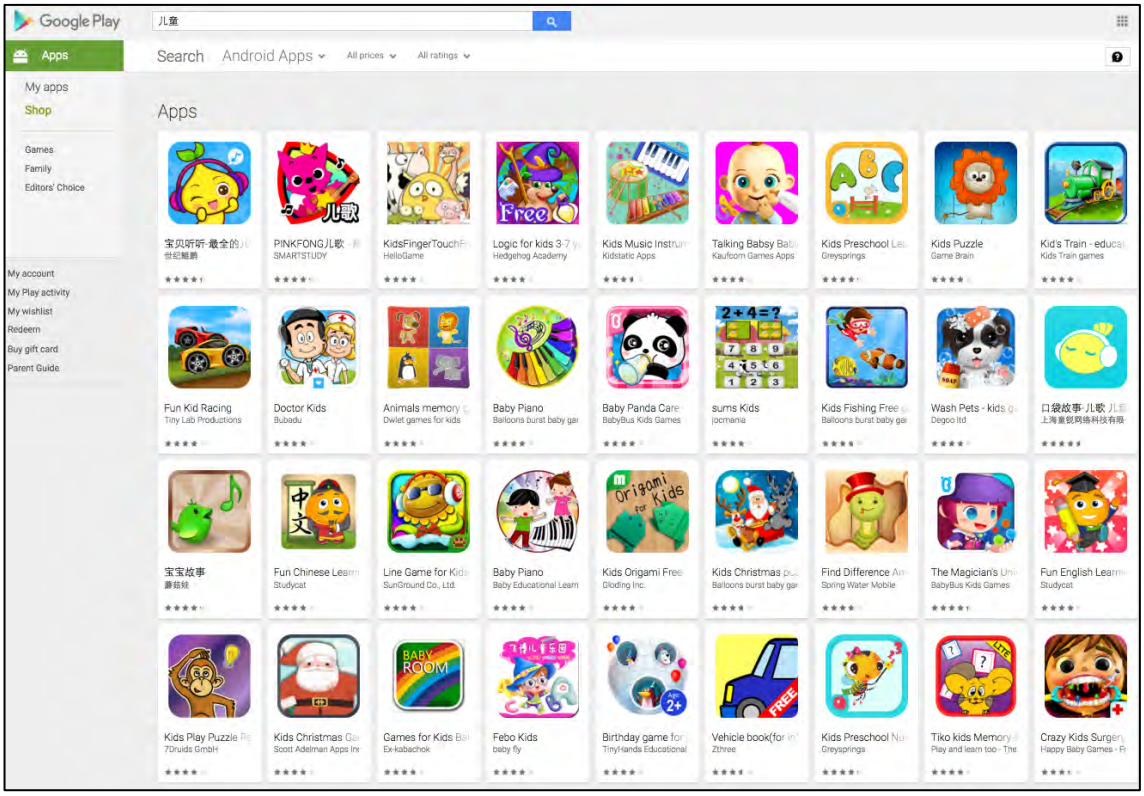

Image 11. **Screenshot of Google Play Store with a keyword search on "儿童" (children)**

A recent search on Google Play (Australia)[39] in late December 2015, with the keywords "Mandarin", "Chinese" and "Preschool" yielded 75 applications (refer to Image 11) while a search on the China's online Apple App Store with the keyword "儿童" (children) resulted in

[38] The current active application count indicates that there are 161,934 apps listed under Education. The figures were updated on 2016-02-28 at the point of access (AppBrain. 2016a. "Free Vs. Paid Android Apps." Accessed 03 March 2016, http://www.appbrain.com/stats/free-and-paid-android-applications..)

[39] China bans Google Play, so local developers upload their applications on various third party application markets, usually developed by the makers of devices themselves.

176 results[40]. While, this result may not contain solely Mandarin applications and is not conclusive of the total number of educational applications currently available globally for download and purchase on both popular mobile platforms[41], it does illustrate that parents/adult carers nowadays do have many choices when it comes to procuring educational mobile applications their children.

Educational applications from unfamiliar application publishers are generally free or cheaper to purchase. Given that the wide variety of applications, they are often procured in a 'cherry-picking' manner since parents/carers spend the minimal amount to procure and try out new applications for their children. Parents/carers, who are already more attuned to procuring at a low cost or even paying nothing for content on the Internet environment, may find the higher prices charged by more established publishers (some which have migrated from traditional print[42]), somewhat disagreeable, even though they would often have higher production value. Over time, these consumers have also become more discerning or even grown tired of trying out new applications[43]. So the popular strategy adopted since 2010 by many application developers was to post "freemium[44]" applications in the online stores[45], and at present,

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[40] Searches made in Mandarin will often yield a slightly larger pool of result as there is a significant number of applications with solely descriptions in Mandarin. Parents/carers, who are bilingually proficient, would also benefit from more precise search results if the developers had provided accurate bilingual tagging of their applications on both Google Play and Apple App Store.

[41] On a separate report by chinainternetwatch.com, as of November 2014, the number of educational applications exceeded 70,000, which was about 10% of all total applications available on the Chinese market. Preschool study applications ranked top among all education applications. (Cecilia. 2014. "China Education Mobile Apps Exceeded 70,000 in Nov 2014." Accessed 04 May 2015, http://www.chinainternetwatch.com/11481/..)

[42] Now application developers are seeking partnership with traditional publishers who are looking to expand their services to digital publishing solutions. Brands like FamLoop and BelugaBloo, provide services to identify existing publications that may be suitable for shared experiences on mobile devices. The new application may then revive print runs, or spark off a whole new range of Interactive e-books for future audience. (Tan, Teri. 2013. "A Mix of Translations, Originals, E-Books, and Apps: Publishers across the Region Contend with a Changing Marketplace and the Advance of Digital Technologies.(Children's Books in Asia)." *Publishers Weekly* 260, no. 3: 26..)

[43] According to Deliotte's 2014 China report, between 2013 and 2014, there was a sharp decline in users downloading 1-4 apps from 47% to 22%. The percentage of mobile device users who have not downloaded an application also increased from 24% to 47%. This may suggests that many consumers have reached point of fatigue with the expansion in the number of mobile applications over the past few years, and unless developers are able to innovative or can provide breakthrough features, it will be difficult to convince users to download new applications. (Deliotte. 2014. *Age of Mobility - Deloitte Global Mobile Consumer China Survey 2014*: Deloitte TMT Center of Excellence..)

[44] The word "freemium" is a combination of the words free and premium, and as a business model, a core product is given away for free to a large group of users, then premium products are sold to a smaller portion of this user base. (Freemium.org. 2016. "What Is Freemium?" Freemium.org. Accessed 08 January 2016, http://www.freemium.org/what-is-freemium-2/..)

[45] Analytics firm Distimo attributed the jump in applications posted application stores to "freemium" applications. In fact, two-thirds of Android apps are freemium, establishing the Google Play (formerly known as Google Android Market prior to March 2012) as the largest free mobile app store in the world. (Distimo. 2011. "Distimo Publication 2011." Distimo.com.

applications with freemium business models account for 98% of the revenue in Google Play and 95% in Apple's App Store (Freemium.org 2016).

The Mandarin-medium learning applications that are presently available can be grouped to a few broad genres, (a) eBooks, (b) puzzles and games (but they may also be embedded as part of the eBooks or other applications), (c) flashcards and (d) educational video clips compilers. In this section, examples from 3 eBooks, 2 language games and 2 flashcards mobile applications that were published between 2011-2015, will be used to highlight the strengths and shortcomings of each genre.

The most complex of these are the eBooks which often incorporated functions that enabled text selection (in traditional or simplified script), auto or manual flipping of pages, display of text and audio recording functions for parents/carers to substitute the original voiceover or for the children to practice re-reading of the text (refer to Image 12). Their content were usually based on Chinese national culture (国学 Guo Xue) such as popular folklores, idioms stories (refer to Image 13), Tang and Song Dynasty poems and other classic texts like The Three Character Classic (三字经 San Zi Jing). These content fitted well into the eBook format, as they were mainly abridged versions of the original stories and were no more than 15 pages long. During normal audio playback, the text became secondary to the illustrations, just like any other printed picture book, but the parent/carer or the child could also view the story solely in text mode.

Image 12. **Screenshots of eBook 元宵节 (Lantern Festival) by Rye Studio[46] (2011), from Google Play**

Accessed 13 January 2012, www.distimo.com/download/publication/Distimo_Publication_-_Full_Year_2011/EN/archive/..)

[46] Rye Studio currently has 46 eBooks published on Google Play. Its Mandarin titles are offered as free downloads while bilingual (English, Chinese) titles are priced at USD0.99 per download. Google Play lists it as having 10,000-50,000 installs. (RyeStudio. 2011. *元宵節 Lantern Festival*. Google Play: RyeStudio..)

Image 13. **Screenshots of eBook 成语故事 上册 (Idiom Stories Part 1) by Max Stage[47] (2011), from Apple iTunes Store**

Image 14. **Screenshots of eBook 宝宝故事书-成语故事（识字篇）(idiom stories for toddlers, with character learning) by XueLeYou 学乐游 (2014), from Google Play**

The eBooks generally were well produced, with clear navigation and some degree of customization, such as allowing it to be read or co-read with parents/carers (refer to Image 13). Additional components included mini games for writing/tracing exercises of key Chinese characters (with the use of finger strokes on the touchscreen, refer to Image 14), short matching quizzes for character to its Pinyin[48] and sometimes incorporating flashcards or jigsaw puzzles of visual elements from the stories. More recent eBooks had been updated

[47] Max Stage currently has 11 eBooks and language games published on Apple iTunes Store. The same titles are not available on Google Play.(MaxStage. 2011. *成语故事 上册 Idiom Stories Part 1*. Apple iTunes Store: MaxStage.)

[48] Pinyin is the official romanization of written Mandarin Chinese. Each Mandarin Chinese character is made up of syllables of initial and final sounds. The hanyu Pinyin system is often used to teach Standard Chinese.

with higher resolutions for iPad and Android tablets, wile retaining their main functionalities. The eBooks' publishers tended to adopt a freemium model and required users to pay to unlock or download further chapters of the books or increased functionalities such as bilingual audio tracks and texts.

While the visuals were well illustrated and often comparable to printed books, there were issues with navigation and space constraints. For example, when viewing eBooks off a smartphone screen, instead of a tablet, the hotspots became smaller. There might also be issues with the vocalizations of the text in the stories. Voiceovers can be subjective and the accent of the speaker may not be one that is universally accepted. Even when the productions employed native speakers, migrant children learning HL may have issues with the spoken form of Mandarin Chinese from Beijing or Taiwan, as they would unfamiliar with certain intonations when compared to how it is spoken in their households[49].

Image 15. **Screenshots of mobile language games (left) Kids Learn Mandarin Free by Fingerprint (2014), and (right) Fun Chinese: Mandarin Chinese Language Learning Games for kids ages 3-10 by Studycat Limited (2015), from Apple iTunes Store**

Games are a good way to incorporate learning for a child and developers have introduced simple game mechanics such as coupling characters to items, timing, score counters, stickers as rewards and personalization through choice of players' avatars to heighten its appeal. The applications were structured as compilations of integrated mini games or thematically organized (such as numeracy or word groups like "animals", "colours" and "fruits") and often

[49] In addition, many ethnic Chinese Singaporean parents/carers who may not have Chinese as L1 backgrounds, may find such eBooks with the amount of text and level of difficulty daunting, and may think twice about introducing them to the children.

they relied on popular gameplay like matching 2-of-a-kind bricks, drag-drops and speed tapping, with Mandarin instructions as voiceovers (refer to Image 15). Most of such applications also claim of training users' motor skills and eye-hand coordination. This genre may be more accessible to children from HL background as the language content is being fed by piecemeal instead of having to read or being read a substantial paragraph of text, page after page like an eBook.

Again like the eBooks, the freemium model applies to these applications. They often did not feature complete games, as additional content for more challenging levels or themes had to be purchased prior to being unlocked. Some language game applications also allowed parents/carers to track the children's progress and generate up to date reports that could be exported for future reference. This feature is a plus for parents/carers who are keen to monitor their children's learning, though the frequency of a child's attempts and the rates of getting correct answers, may not be an accurate indicator for language learning and usage. Sometimes the games' contexts (such as background illustrations and soundtracks) had little or no relevance to the lessons it is trying to get across. In addition, the children might be unnecessarily distracted with the sound effects and animation or even emotionally stressed by ticker tapes/ stopwatch counting down to the remaining time he/she has to clear the stage.

The other popular genre that was available for preschooler language learners were based on the flashcard format, with audio playback of not just the items in English and Mandarin Chinese, but also for additional content such as nursery rhymes and songs. Some flash card applications featured Chinese character tracing/writing and mini games, such as matching characters to pictures via drag and drop. The tactility of the touch screen interface and tracing element built into such applications might be potentially helpful with early writing in children but further research on this is needed.

The depth of content varied from application to application, though there were minor concerns with inconsistency in the Mandarin Chinese labelling, the varying accent in English vocalisations and differences in choice of visual representations. For example, tomato is often pronounced differently between English and American-English, while in Mandarin Chinese it is transcribed differently as 番茄（fan qie) or 西红柿（xi hong shi) (refer to Image 16). This again poses minor inconveniences to young learners whose family members' understanding and usage of the term might be different from that found on the application.

Image 16. **Comparison between 宝宝卡片一大百科 双语发音 Free (Toddler Flashcards Collection – with English and Mandarin vocalization) (1 & 3) by Xian Shen (2014) and HappyReading - 宝宝识蔬果 (Toddler Veg&Fruit Flash Cards) (2 & 4) by Childhood Fine Arts (2015), from Apple iTunes Store.**

The last genre of Mandarin learning applications are compilations of nursery rhymes, children songs or video clips retrieved from online video stream sites, similar to what had been mentioned in the previous section. Although the applications featured playback controls and swipe navigation across its content, the quality could vary, according to the source of the external media clips from which the content was drawn.

From the examples surfaced, certain “good to have” features for designing literacy applications for young children were identified. They have to be (1) age appropriate, (2) visually captivating to encourage children to explore elements on screen, (3) clear in the navigation and simple in interactivity to keep the children on task, (4) has short instructions or questions so children can understand clearly and respond accordingly, (5) simple in tasks so as to encourage levelling up on previous knowledge gained and (6) distinct in providing visual or audio feedback when certain actions are selected by the children. While these are good features to have, a strong pedagogy for language learning is still paramount.

Some of the applications illustrated above aimed to introduce aspects of basic character recognition and cultural awareness (such as through folklores, songs and idiom stories eBooks), others taught singular characters and seldom were they introduced in relation to how they are matched with other characters to form short phrases, or within contextual usage as part of age-appropriate short sentences. These would have been more helpful in the children’s daily interaction with other family members. The current reliance on reiterations of content related only to Chinese culture (国学 Guo Xue) by developers might limit interests in ethnic Chinese families from other nationalities, who have a slightly different cultural heritage to the mainland Chinese. Parents/carers might also find repetitive content from applications

familiar, hence bypassing the installation of potentially well-designed language applications. On the other hand, children may also find such repetition uninspiring.

The critical factor other than application and content constraints as highlighted above is that parents/carers will differ in their provision of language stimulation to their children. Parents/carers who talked and interacted more with their children in an engaging and supportive way were likely to develop their full intellectual potential than children who hear very little child-directed speech (Carey 2013), hence while mobile applications and devices are rightly or wrongly used as a nanny to young children at times, it is clear that they alone cannot be used as the sole transmitter of HL learning. An overview of this section on Technology as Enabler can be seen in the Table 16 below.

Technology as Enabler				
Parents/carers			**Young Children**	
Driver	**Evidence**		**Driver**	**Evidence**
Personal Motivation Affordability Increased Usability	Owns more devices Increased usage at home		Cognitive, motor and speech development Attachment & interaction Motivation to play	Speech Modelling behaviour Motor skills, play activities
BI to transfer use ➔		**Technology**	➔BI to adopt use	
Driver	**Evidence**		**Driver**	**Evidence**
Motivation to get child to learn HL	Purchase eLearning product	Devices such as Reader Pens Tablets Mobile applications	Motivation to explore and play	Decrease time taken to learn Spend time with products
Issues of Parents/carers		**Issues of Devices**	**Issues of Young Children**	
Over reliant on eLearning product, not enough interaction Different cultural heritage when compared to content developers		Concern about radiation Inconsistency in content and audio	Ergonomics Distraction from games Bad postures and visual fatigue	

	Similar content	Unfamiliar terms or intonations

Table 16. **Overview of section on Technology as Enabler**

2.6 Play as Methodology – Understanding Attitudes, Trends and Affordances

This section will focus on how cultural differences may possibly impact on the choice of using play as a method for HL maintenance and technology as the enabling tool to achieve that. Then the focus will shift to understanding international consumption trends in toys and devices and survey some of the popular and relevant toy objects, parents/carers have been procuring for their children's learning. The final part to this section will highlight some of the models other researchers have come up with and attempt to find commonalities that can be relevant and useful for my design framework.

Integrating play and learning has been the mainstay for most preschool programs[50]. While play is widely recognized to build physical and intellectual skills in children, there is no conclusive research on the positive impact of play on learning with mobile technologies. Even with research stating the potential for technology in learning, there is still a lack of understanding for age-appropriate technology-based pedagogy for educators to mediate and support the building of individual child's competencies (Aubrey and Dahl 2014). Early childhood educators are aware that for children needs to be engaged with a myriad selection of activities such as interacting with adults, exploring, moving, constructing, reading and listening, conversing and engaging in play, in order to develop holistically; hence some believed that technology's "screen time" should not supplant these important childhood experiences. Others feel that technology can be made productive if they can be tapped on to enhance children's engagement in these activities and provide a venue to reflect upon their own actions and experiences (Barron, et al. 2011). As the use of technology grows in day-care centres and at home, parents/carers need to know urgently, what would work with young children.

An understanding of socio-cultural position on play is essential in framing trends in toy consumption for later discussion. In Vygotskian approach to play, he did not accept that a child can create a conceptual world on his/her own. Instead these conceptual worlds are appropriated from his/her existing cultural world imparted from the parents/carers. This is usually done through the language and communication and anchored with artefacts before the child internalizes the knowledge. He theorized that during the preschool ages, the child has a multiplicity of needs and desires which can only be realized through fantasy in play

[50] Technology's initial impact in a school setting is often on streamlining processes in administration and on enhancing communications in teaching and engagement with parents/carers, suggesting that technology may encourage learning that is social, autonomous, and continuous.

(Nicolopoulou 1993). Vygotsky added that ZPD is formed through play in the early childhood and it is the highest form of preschool development as it is a process of internalization of social rules, formation of real-life plans and intentions on the part of the child (Vygotsky 1933).

While Vygotsky did not write extensively on play or differentiate the types of play, Kravtsov & Kravtsova (2010) elaborated on his writings and categorised play into 7 different types. Only 5 will be highlighted here as they pertain closest to preschoolers - (1) Director's Play, where the child learns to create a plot and control the play situation with his/her toys, (2) Image Play, where the child assigns an object a differernt identity and function according to his/her needs, (3) Plot-role Play, where in a culmination of the previous two types of play, creates an imagined plot with different objects and different roles for these objects, leading to differernt types communication between the child and the objects, (4) Rules Game, as an exension of (3) but with the setting out of rules and the child's willingness to choose to play by the rules and lastly, (5) Literature Play, where the child is introduced to different positions during play so that they learn about empathy (Kravtsov and Kravtsova 2010). While these categories apply more to a "classic" (not screen-based) play environment, these are helpful in the designing of tangible probes to be played by child participants in later field activities.

2.6.1 Attitudes towards Play

In a study on attitudes towards play, Chinese immigrant parents in the United States displayed the least positive attitude towards play, when compared to European Americans and Mainland Chinese. The researchers concluded that one possible reason was that these parents were first-generation immigrants and had a more stringent experience in, and hence expectations of, education (Jiang and Han 2016). This results is similar to those from studies done in the United States by Chao & Tseng, (2002), citing that the main parental concern is their children's schooling, as it is regarded as the primary responsibility of Asian parents; and first-generation immigrants often emphasizes on the children's academic performance and strong work ethics (Chao and Tseng 2002). The attitudes can perhaps find parallel evidence in ethnic Chinese migrants in Australia, where a recent report indicated that the top school performers in Victoria and New South Wales were of Asian descent (Donnelly 2015). While Chinese parents traditionally do not associate play with learning, there is no evidence that play is totally frowned upon in this segment of the Australian population.

As far as my personal narrative goes, my family and friends share similar concerns and expectations about our children's education and work ethics, but are willing to afford the space and resources to encourage our children to play, explore and reach their potential, both at home and in school. In Duncan et al. (2007) longitudinal studies, they found that children with good math and reading skills at the point of school entry are consistently associated with higher levels of academic performance in later grades and having good attention-related skills in young children also predicted later academic achievement with any consistency (Duncan,

et al. 2007). Therefore, if playing with the right tools/toys or even educational mobile applications do affect these skills and cognitive development, translating them to being school ready and subsequently being predictive of later achievement, then majority of parents/carers will certainly embrace play as a necessary facet of childhood.

While we could understand adults' attitudes towards play as one that is primarily driven by the belief that it is well-meaning for the child, the need to understand the child's attitudes towards play or his/her engagement with a toy is also relevant to this research. Play exists when children use toys/tools/artefacts passed on from their parents/carers to achieve its objective. According to Vygotsky's basic Mediated Action Triangle (Cole and Engeström 1993) (refer to Figure 5), the subject in the relationship is the child and in the process of play, he/she uses artefacts/tools, like toys or even found objects to achieve his/her intended goals/outcomes (object) of the play, imaginative or otherwise. Dewey (1929) rightly pointed out that "the role of tools is subject to a condition supplied by language, the tool of tools" (Dewey 1929a). He also noted that the invention and use of tool is significant in helping to associate meanings as it is a mean to an end and that is "relational, anticipatory and predictive" (Dewey 1929b). Hence in young children, it is evidential that the provision of the physical artefact of a toy object is secondary to the language from adult-child interactions, as it would later manifest as their own language of thinking and learning.

In reference to Yamagata-Lynch (2010) description of Vygotsky's concept on mediated action, children in this instance, during play, are not passive participants, waiting for their environment to initiate learning processes for them. Instead through their directed interactions, they make sense of their surroundings and learn through creation or modification with tools. Play is thus a process that involves various tools available in the environment that is readily available or provided by parents/carers. Vygotsky mentioned that upon interaction with tools, impressions or signs are made on individuals. Signs are not represented within this triangle nor are they physical manifestations of the mediation. Instead they are knowledge gained which can be used to create future tools to be used or shared (Yamagata-Lynch 2010).

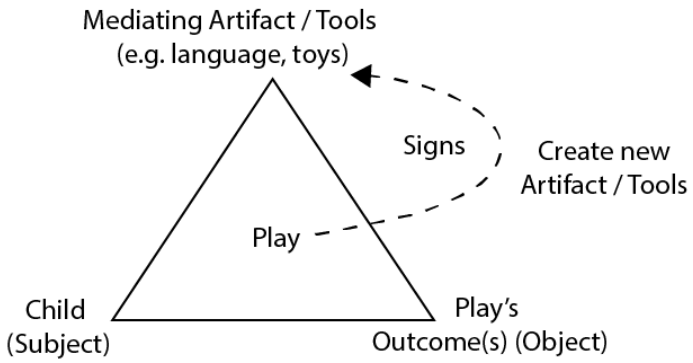

Figure 5. **Child's Mediated Action Triangle during play modelled after Vygotsky's basic mediated action triangle**

This means that a toy must be well-designed to facilitate a mediation that not only helps the child make sense of what he/she is learning, but also aid in the creation of impressions/signs that could be the basis of new knowledge. As children grows within this technology prevalent environment, their familiarity with technology-enabled toys/tools would bring about different levels of mediations when compared to their parents/carers. One can also infer that Vygotsky's mediated action triangle could be similarly adapted for a child's mediation within an emergent literacy environment, with his/her parents/carers in the child's ZPD. This could foster language learning, as the child picks up the phonological awareness via interaction, as what had been opined by Dewey. As such parents/carers play an important role not only as provision of a good tool/toy for play but also act as mediators themselves within the process of their children's development.

There have been recent calls by educators for new ways of thinking about play. It was proposed that play needs to be seen as "playful explorations" where the child experiments and creates his/her own meaning through activities scaffolded by the teacher (Yelland 2011). The teacher, whose role is to enrich the learning environment for the child, can use new technologies to create new opportunities for meaning making and open up more channels of communications and interactions for the child to explore. At home, parents/carers should also not be overly reliant on the use of devices or take on a laissez faire attitude to their children's access to a new toy or application that they have recently purchased. Instead Yelland (2011) saw the new toy to be a shared learning context that can serve as a point of interaction and conversation between parents/carers and children, which may in turn lead to positive outcomes, especially for HL maintenance.

2.6.2 Toy trends

The trends in edutainment run parallel with what is trending in the toy market, as this is consumer-driven situation where parents/carers are constantly playing catch up to their children's rapidly changing appetites. Children now inhabit a high intensity media environment, in which a big part of their play is dominated by visual references from movies to syndicated networks. They have become increasingly accustomed to desiring and changing toys frequently (Zuckerman 2013).

The child's toy selection has always been made by the parent/carer, who exerts control over how much to spend and what is the money spent on but a toy is essentially not a fixed or stable object. The only variation is in its material and function due to how it is designed, manufactured and distributed (Hartmann and Brougère 2004). As the toy object has to be both sophisticated and simple for preschoolers, the research seeks to understand how can such a tangible object facilitate HL maintenance and learning.

The toy industry is a massive industry. In 2014, the combined revenue from international major toy companies Mattel, Namco Bandai, Lego, Hasbro, JAKKS Pacific, Brandstätter Group was approximately USD21.5 billion (Statista.com 2014b) and the industry sales increased by 7% overall, between January to September 2015 (NDP 2015)[51]. But since 2009, the global economic downturn has impacted on consumption pattern[52] across the board and this had led to the continual off shoring and outsourcing of toy productions to China to reduce cost. Consumers have since been sensitive to prices. Toy Industry Association reported in 2012 that manufacturers were beginning to focus on price-value, developing products that combine classic with new play methods and multi-dimensional play experiences.

More affordable toy options priced at USD25 and under were popular though they were mainly action figures and dolls, accessories and child-size role-play toys. Toys of different sizes (but of same characters) or of less gender specificity were introduced to match various price points and widen their appeal. Construction toys, games and arts and crafts were popular due to their reusable nature. There was also a focus on games and educational products that offer skill levelling (for cognitive and motor development). The increase in demand for educational toys in 2013, specifically toys that incorporate electronics and technology, is noteworthy when compared to the decline in popularity for toys across other categories in the United States and Europe (The NPD Group 2013). In recent years, traditional toy manufacturers are also seeing more competition from digital gaming products, or hybrid products that offer “analogue” toy objects but feature digital/virtual play.

Further evidence from the rolling annual sales data of toys in US domestic markets from 2013-2015 (TIA 2016a), published by Toy Industry Association[53] (refer to Table 17), indicated that the category of toys with the strongest growth 2 years running are Building Sets, Games & Puzzles and Action Figures and Accessories. Comparatively Youth Electronics, which had done well in preceding years from 2011, had posted a decrease in 2015. Though Infant/ Toddler/Preschool Toys had posted a minor increase in 2015, its market share of revenue had been consistently above the USD3billion mark and is only second to Outdoor and Sports Toys.

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[51] The NPD Group, Inc. (formerly *National Purchase Diary*) is a market research company. The NPD Group consistently ranks among the top 25 market research companies, that specialize in syndicated services under long-term contracts, in the Honomichl Top 50 report, which the media and the research industry acknowledge as a credible source of information on the market research industry. (Honomichl, Jack. 2013. "The 2013 Honomichl Top 50 Report." American MArketing Association. Accessed 03 April 2014, https://www.ama.org/publications/MarketingNews/Pages/The-2013-Honomichl--Top-50-Report.aspx.)

[52] Although a number of developments helped trigger the crisis, the most prominent one was the prospect of significant losses on residential mortgage loans to subprime borrowers that became apparent shortly after house prices began to decline in the United States.

[53] Toy Industry Association™, Inc. (TIA) is the not-for-profit trade association representing all businesses involved in creating and bringing toys and youth entertainment products to kids of all ages.

	Figures in Billion Dollars			Dollars Percent Change	
Traditional Toy Categories	**Annual 2103**	**Annual 2014**	**Annual 2015**	**2013 vs. 2014**	**2014 vs. 2015**
Action Figures and Accessories	$1.24	$1.32	$1.43	7%	9%
Arts and Crafts	$1.02	$1.04	$1.00	3%	-4%
Building Sets	$1.67	$1.86	$2.04	11%	9%
Games and Puzzles	$1.36	$1.46	$1.61	7%	11%
Infant/Toddler/Preschool Toys	$3.04	$2.89	$3.06	-5%	6%
Youth Electronics	$0.58	$0.63	$0.60	9%	-5%
Outdoor & Sports Toys	$3.18	$3.30	$3.59	4%	9%

***Table 17*. Selected US domestic sale figures from key groups of traditional toys (TIA 2016a)**

However the traditional definition of toys has been blurred with the inclusion of technology and multimodality of play these days. In their annual trends updates (TIA 2016b), Toy Industry Association (TIA) also announced in that technology will continue to be an important player in 2016, with the likes of mini drones, robots and robotics that offer blended play with traditional toys. This is a continuation from TIA's projection of augmented reality on mobile devices, robots or robotic pets and remote control drones that interact with smartphones in 2015. Another important trend that was highlighted consistently in recent years is the rise of a "maker movement" where children are empowered to create their own toys, helping them develop cognitive and physical skills through play. Building sets and Art and Craft toys have begun to include more instructional components to cater to parents/carers who want their children to push what they play to a more accomplished level. The focus on acquiring technical skills and then having the platform to share their "masterpieces" with friends and family, are deemed important to consumers in 2016.

2.6.2.1 Identifying key themes in recent popular preschool toys (2009-2015)

A list of "most popular toys" from 2009 to 2015 (refer to Appendix B), from parenting websites (such as parents.com, parenting.com) and industrial (toyassociation.com) or news (gizmag.com and usatoday.com) sites was compiled as part of the research into understanding toy trends. From a survey of these toys, several key themes have been identified in the types of toys popular with preschool children. They may be broadly illustrated as toys that seek to be, or deliver content that are (1) Entertainment-themed, (2) Aspirational, (3) Educational, (4) Device-centric, (5) Positive Lifestyle and (6) Retro.

(1) The Entertainment-themed toys are most commonly associated with figurines and action figures licenced from popular movies or cartoons (refer to Image 17). The “Disney Frozen Snow Glow Elsa Doll” from 2015 is an example of such toys. Other such toys may have whimsical “fun” factor like “Singamajig”. These toys tend to have only a few functions that require players’ activation to provide a set of visual or audio feedback and usually appeal to slightly younger preschoolers.

Image 17. **Examples of Entertainment-themed toys. “The Disney Frozen Snow Glow Elsa Doll” (2015) (left) and “Singamajig” (2010) (right). Images sourced from amazon.co.uk and thehottoys.com, respectively**

(2) The Aspirational toys are very broad in terms of form factor. Essentially, these toys sought to encourage children to think about grown up vocations (refer to Image 18). Toy manufacturers are developing new toys and games that engage kids in interactive, “hands on” experiential role-play that emphasize “learning through doing”. These toys allow children to explore their interests and mimic certain adult skills. They may also include socially aware elements that showcase “everyday heroes” such as policeman, fire fighters, teachers, parents, and other positive role models. Examples are the “Servin' Surprises Cook ‘n Serve Kitchen & Table” (2012) and “The Doc McStuffins Get Better Talking Mobile” from 2015. Both examples have built in audio feedback and sound effects when certain parts of the toys are activated.

Image 18. **Examples of Aspirational-themed toys. "Servin' Surprises Cook 'n Serve Kitchen & Table" (2012) (left) and "The Doc McStuffins Get Better Talking Mobile" (2015) (right). Images sourced from canada.com/news and media4.popsugar-assets.com, respectively.**

(3) Educational-themed toys that teach or reinforce Science, Technology, Engineering, Arts and Mathematics (STEAM) (refer to Image 19) help children to develop "spatial, reasoning, critical thinking and problem solving skills". Some of them also deal with language and history (TIA 2016b). The focus can be very broad for the products in this category, not only do these toys encourage experimentation, they can be about skills, memory and knowledge building. Traditional modelling toys are redesigned to challenge young children to think spatially. Examples are "The Magic School Bus" (2010) and new spatial puzzle like "Toys Squigs" (2013). Some toys allow limited customization by children or encourage parents/carers to collaborate and help instruct their children.

Image 19. **Examples of Educational-themed toys. "The Magic School Bus" (2010) (left) and Fat Brain's "Toys Squigs" (2013) (right). Images sourced from images.johnmorlu.com and fatbraintoys.com respectively.**

There is an overlap of Device-centric toys with Educational-themed as device manufacturers target young children's learning and they have dressed up the devices to appeal to children

(refer to Image 20). Certain enhancements such as the inclusion of a physical stylus, navigation pad, option buttons and front facing speakers are useful to the young children can be seen in “Fisher Price iXL 6-in-1 Learning System” (2013). They come preloaded with proprietary or third party educational applications, based on classic toys such as tangrams, jigsaw puzzles, flashcards with audio and video content. Others like “Osmo” make use of image capturing technology on-board devices to allow interaction between players and content. Some applications allow archiving of children’s onscreen artworks and photos into albums or “achievement stickers” for sharing and boosting self-esteem. As mentioned before in previous sections, the device may also be loaded with applications that encourage early literacy and the freemium applications often require purchases to unlock additional content.

Image 20. **“Fisher Price iXL 6-in-1 Learning System” (2013) (left) and “Osmo” (2015) (right). Images sourced from winarco.com and playosmo.com respectively.**

(4) The Device-centric category of toys also includes objects that contain a tablet or customised digital device (refer to Image 21). The device is usually not seen as a toy object on its own right but rather an interface for manufacturers to deliver content. In some cases, device-centric toys are traditional toys that uses technology features such as the accelerometers built into the devices to provide audio-visual feedback, like “TheO™ SmartBall” (2014) or “Imaginext Apptivity Fort” (2013) that allows players to experience enriched narrations and limited interactivity via the device’s touchscreen interface.

Image 21. **"TheO™ SmartBall" (2014) (left) and "Imaginext Apptivity Fort" (2013) (right). Images sourced from geekalerts.com and saposyprincesas.com respectively**

Others can be remotely controlled by mobile devices or they may be modelled after popular game consoles' controls to introduce virtual reality and augmented reality content to younger children. These may also feature remote and movement sensors that get children to engage with the physical world around them, making it into an enhanced play experience (refer to Image 22). More recently, they have also sought to leverage on their wider product spectrum and integrated them into a larger ecosystem of play for the children. Products like the "VTech Kidizoom Smart Watch Plus" (2015) allow access to Vtech's Learning Lodge where users can purchase download new applications and games, and Leapfrog's "LeapTV" (2015) requires purchased from their LeapFrog App Centre (Leapfrog 2016a).

Image 22. **"VTech Kidizoom Smart Watch Plus" (2015) (left) and Leapfrog's "LeapTV" (2015) (right). Images sourced from vtechkids.com and leapfrog.com respectively**.

Image 23. **"Healthy Gourmet Salad for Green Eaters" (2011) (left) and Razor Jr. "Monster Kix Scooter" (2015) (right). Images sourced from amazon.com and walmartimages.com respectively.**

(5) Positive Lifestyle toys are built on the push for building healthier lifestyle (e.g. to combat obesity) in children (refer to Image 23). There are many traditional favourites like "Healthy Gourmet Salad" for Green Eaters for (2011) for imaginative play and FirstBIKE Street Bike (2013), Razor Jr. "Monster Kix Scooter" (2015) for outdoor use. But in recent years, "brain games" and competitive sports titles have been released specifically for gaming consoles' sensor technology, like Nintendo's Wii, Sony's Move, and Microsoft's Kinect. They are designed to encourage children to use their minds and bodies, by merging imagination with physical play in games that require participation in sports, dance or role-play.

Image 24. **LEGO "Ultimate Building Set 6166" (2010) (left) and "Camp Site" by Playmobil (2015) (right). Images sourced from amazon.com and playmobil.us respectively.**

(6) Retro-themed or family-oriented toys are noteworthy as they are becoming popular over the past few years. Parents/carers are choosing toys that look not only interesting but offered

familiar gameplay as there is a sense of assurance that such products offer an easier learning curve for the adults. TIA noted this group of toys as one of their key trends for 2013, 2014 and 2016 reports. These toys not only represent nostalgia to parents/carers, but they were also keen to share their childhood memories with their children or grandchildren. Manufacturers often retained elements of their original form factor such as building blocks, such as Lego "Ultimate Building Set 6166" (2010), figurine play sets like Playmobil's "Camp Site" (2015) or relied on tried-and-tested gameplay in their recent "reboot" of classic toys such as Monopoly and other puzzles (refer to Image 24). Many manufacturers are also diversifying their existing building lines by incorporating licensed characters, for example LEGO Disney, DC and Marvel Heroes and Barbie range of building sets to capture today's market. Some product lines like the Lego Juniors (Lego 2016), have proprietary story lines, games and activity sheets developed specifically for young children.

Although this research's focus is on preschoolers, an interesting trend for the slightly older children and youths' market should be highlighted. Game developers like Activision's Skylanders, Nintendo's amiibo, Lego's Dimensions and Disney's Infinity[54] range of figurines-game have been successful in targeting slightly older children with both their repertoire of collectible figurines and innovative sensor-based gameplay on console manufacturers Sony, Nintendo and Microsoft. Often these developers also offer a "lite" version of the games that can be played on mobile devices, with the same login that players used to subscribe to additional content on the developers' websites. Game developers and console manufacturers are partnering up to tap into the multimodal world that was mentioned earlier, where experiences overlap between devices, and from the real to the virtual. The games also have authoring components for players to build new game scenes or "worlds" individually or collaboratively online with other players. This could be seen, as ways how children literally build upon their understanding of game mechanics and create "worlds" that are imaginative and fun. Traditional three-dimensional play has always been viewed as laying the foundation for the child's future abstract or symbolic thought (Yelland 2011), so perhaps building a virtual 3D "world" on games which afford such features would do the same for children too.

This overview of the 7-year trends in top selling toys indicates that toys like any consumer commodity are subject to market demands. While these products' popularity do rise and ebb, many of recent toys can be said to encompass aspects of technology and are differentiated only by the theme of how the toys are being played. These pairings suggested how technology is having an impact on not just a product's playability and interactivity but also its

[54] Infinity's launch in August 2013 has helped Disney's Interactive division reach full-year revenues of US$1.1 billion. Disney Interactive's third quarter revenues were up more than 100% from US$191 million in 2012 to US$396 million. During the three months before Infinity, Disney Interactive saw a 7% dip in revenues to US$183 million, and was up overall only by 2% for the first nine months of the fiscal year. (Getzler , Wendy Goldman 2013. "Mobile Gaming's up, but It's Not Costing Consoles." iKids. Accessed 23 September 2014, http://kidscreen.com/2013/09/12/mobile-gamings-up-but-its-not-costing-consoles/#ixzz3LalOFIDZ.)

longevity. It can be inferred that with such rapid annual changes and the increase in the use of "latest" technology in toys, it is adversely creating shorter life cycles for device-centric toys or toys with technology built in. According to Mattel in its 2012 Annual Report, there is also a phenomenon of "children getting older younger," so they outgrow their toys earlier while being influenced by popular media (Malhotra 2013). It does not take long for the children or the parents/carers to view past year's embedded technology as "obsolete" when compared to the latest gadget advertised for the coming festive season.

Due to the immense resources required for research into technology integration, development and marketing, it is not surprising that only major companies, like Vtech, Leapfrog, Lego, Mattel-FisherPrice and Disney were seen pushing out more extensive blended products in recent years. However successes like Ozmo (2015), Tiggly (2014) and Ubooly (2013) is indicative of parents'/carers' willingness to support products that are well designed via crowd funding platforms[55] like Kickstarter, which can be effective in gauging public's sentiments and gather resources to develop product independently.

2.6.3 Affordances in Play

The previous section has pointed to the relevance of technology in toy design for preschoolers. It had also established the fact that with it representing a major share of the global toy market, preschool toys manufacturers and designers will continue pay attention to how technology evolve and incorporate it into the play experience. There are however challenges when integrating technology into physical toys since each type of blended object has its inherent set of affordances when it comes to user interaction and technology almost always actively places certain experiences above others. One can see that when a child's believes that a toy is no longer fun or is "broken" when its embedded technology fails or relates a non-descript tablet as a toy object on its own right. The current relationship between the child and the device is not transparent even though the child may think of it as such. To them, a toy is expected to work out of a box and requires little or no understanding of the presence of technology. Such relationship between the toy and the child can range from being embodied or hermeneutic or alterity (refer to Section 4.2), but is possibly dependent on the cognitive maturity of the young child, as an older child may be more discerning of how real/imaginative a play/learning experience should be.

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[55] Osmo, Tiggly and Ubooly all launched their successful ventures from Kickstarter campaign (Sorokanich, Robert. 2014. "Osmo Uses Your Ipad to Get Your Kids Playing in the Real World." gizmodo.com. Accessed 9 July 2015, http://gizmodo.com/osmo-uses-your-ipad-to-get-your-kids-playing-in-the-rea-1580046802.)(Hammond, Michelle. 2012. "Aussie Start-up Tiggly Guns for $200,000 Us Fundraise." startupsmart.com.au. Accessed 02 July 2015, http://www.startupsmart.com.au/advice/growth/aussie-start-up-tiggly-guns-for-200000-us-fundraise/.)(Ubooly. 2013. "Ubooly: We're on a Quest to Build a Toy That Matters." kickstarter.com. Accessed 14 July 2014, https://www.kickstarter.com/projects/73256377/ubooly-the-customizable-toy-designed-by-teachers.)

Physically, existing digital mobile devices, sometimes designed too small for adequate adult use, are manageable for young children. Miniaturization and multi-functionality for mobile devices no longer meant consumer satisfaction or even loyalty to the brand/product (Norman 2004), the fragmentation of the mobile devices market has offered a greater variety of modes on which content can be experienced. In terms of the relationship between mobile devices and emergent literacy in young children, a study by Neumann and Neumann (2014) found out that different age groups used different forms of gestures when interacting with screen-based devices. For example, 2-3 year-olds used bigger gestures and learns to press, drag, tap and swipe to make things happen in a cause and effect manner. By the time they were 4-5, they were using more advanced motor skills such as initial press, drag, and swipe and have internalized general gameplay from other toys/games. The younger group of children were also found to be more interested in relating to the familiar character designs on screen while the older children were more keen about challenges within the gameplay (Neumann and Neumann 2014).

Designing for children cannot be only rational and logical in approach. To be effective for children, the preschool toys are designed and built to anticipate intuitive responses. Direct perception of possibilities for action is, essentially, affordance (Kaptelinin 2014) while Norman (1988) calls it “strong visual clues to the operation of things” (Norman 1998). Gibson (1979) did also point out that while affordances are relational, it cannot depend solely on the user’s needs as he/she may or may not be able to perceive or engage with it readily, even if the affordance, is made present (Gibson 1979). Hence it cannot be expected that children will correctly and directly, identify what they can do with a tool/toy and do so without hesitation each time, and effort has to be made to allow children to discover and learn to make that relationship on their own while in some cases, parents/carers would have to encourage and facilitate the children’s exploration.

A child’s complete play experience usually encompasses a series of complex and repetitive actions. There are two types of affordances - sequential and nested, in actions that comprises of many sub-actions. Sequential affordance is referred as “acting on a perceptible affordance leads to information indicating new affordance” while nested affordances is referred as one affordance serving as context for another one (Gaver 1991). For example a sequential affordance in a mobile application may be, a visual representation of a cute creature waving on screen may indicate to the child that the monster can be tapped, and while tapping it, a subsequent visual feedback may hint at another action related to it, like allowing a touch-and-drag. While the affordance of playing and watching a video clip on a mobile phone can be nested within the phone’s affordance of capturing a QRcode from a printed poster with its built-in camera.

As mentioned above, the designing of blended toys may be challenging to get right. Gaver

(1996) suggested that to work on individual affordances of material properties can be difficult and proposed that an ecological approach to understanding social behaviour may provide a better way to support interaction. He also echoed Carroll & Kellogg (1989) view that design serve as either an explicit or implicit embodiment of how theoretical material influences on behaviour (Carroll and Kellogg 1989), and proposed that since new technologies offers new affordances and social behaviour, design can be the methodology in better understanding this new relationships (Gaver 1996).

While some developers may see it as a design objective to reduce the number of hoops the child has to jump through before accessing the device's content, these hoops could be thought of as a series of learning objectives that scaffold the child's learning, or tier the child's learning across various lesson objectives with complementary physical toys before concluding with onscreen content. McGrenere and Ho (2000) pointed out that sometimes designers and developers are more fixated on usability than usefulness in the products they market. A useful design allows its affordances to aid users to match their objectives and complete their task while its usability can only be extended by the information the user can perceive. Usable designs would also include the considerations for cultural conventions and level of expertise of the users (McGrenere and Ho 2000). There is however less distinction between usability and usefulness to a child when it comes to playing with a tool/toy. As McGrenere and Ho had rightly pointed out, children's cognitive maturity may not grasp the full functionality of the object hence having parents'/carers' facilitation may be important in raising the level of play. In addition, interface's and functionality's relationships to affordance tend to overlap when children engages in "playful explorations". This makes usability and usefulness, seem more fluid in a child's play setting (refer to Figure 6).

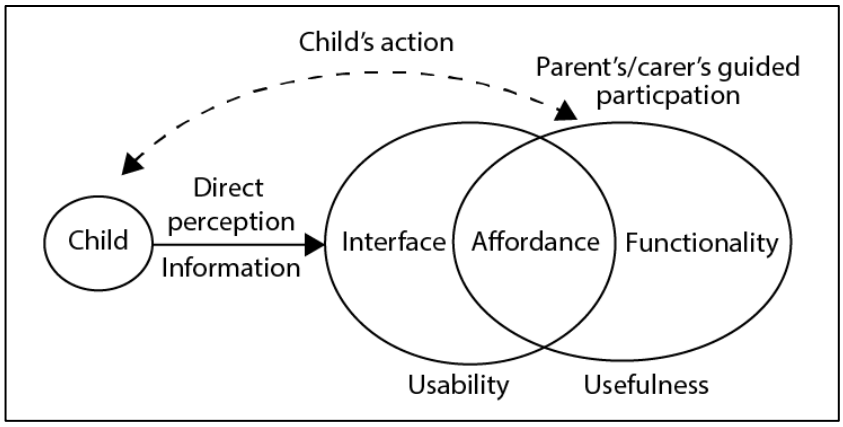

***Figure 6*. Usability and usefulness of a toy to a child. Adapted from (McGrenere and Ho 2000) take on usability and usefulness**

Crawford in his 1982 writing on early games, noted interactiveness as a continuous quantity with a range of values and itself serves as an index of "gaminess" (Crawford 1982). Since then, many other researchers have been interested in finding out if interactivity in games

would necessarily lead to learning. Even though there had been work done to uncover the gap between game design and learning, it involved older children in the designing of a more curriculum-relevant playing/learning experience and the same cannot be easily done with preschoolers (Kim, Tan, and Kim 2013) while existing literature on technology in preschool learning has been on teachers' beliefs, attitudes and/or confidence in using technologies, instead of focusing how children's play as the driver of early childhood education (Edwards 2015).

Hence certain degree of tiered activities with "guided participation" (Rogoff 1991, 254) by parents/carers surrounding a play activity and its tools/toys could potentially be a better way of learning through play, instead of relying on only the child's perception of what are on devices' screens. As such activities both off and on-screen can be designed to complement each other and reinforce learning objectives set out by parents/carers. The following table is a summary of the points highlighted in this section and will serve to inform to how a more holistic design framework, will be proposed in the subsequent chapter.

Play as Methodology				
Types of Play	**Attitudes towards Play**	**Mediating Artefacts – Preschool Toys**		**Affordances to consider**
		Trends in toys	**Themes in toys**	
Director's Play Image Play Plot-role Play Rules Game Literature Play	Parents'/ carers' have positive attitudes towards their children playing Children have intended outcomes during play "Playful explorations"	Affordability and multipurpose use Integration with technology	Entertainment Aspirational Educational Device-centric Positive lifestyle Retro	Direct Perception Sequential & nested affordances Usability & usefulness

***Table 18*. Overview of section on Play as Methodology**

2.7 Chapter Summary

The three foundations of the proposed framework have been identified and discussed in the previous sections as (1) the consideration of home space and its loci for learning, (2)

technology as devices and applications can be an enabler for learning when transferred from parents/carers to children and (3) the use of play as the methodology for learning, by understanding attitudes, trends, themes and how affordances is used to understand the way children play.

Each of these foundations is broad in scope but the discussions in the previous sections have been tailored to focus on aspects that are deemed pertinent for the maintenance and learning of HL in preschool ethic Chinese migrant children, and for the development of subsequent design probes. The parents/carers' personal motivation and concern towards the education of their children remained the driving force behind the adoption of technology and the possible configuration of special learning spaces at home. Interaction through mediated action is still crucial for a young learner, as it is an iterative process between the child and the parent/carer and also between the child and the tool/toy, as it embodies part of a game that the child plays. By referencing themes and inherent affordances in games and toys, there can be greater effectiveness in tapping on the children's perception and subsequent manipulation of their physical and virtual playing/learning experience. This would also help parent's/carer's locate their facilitation to complement the child's learning experience.

The increasing affordability of technology corresponds to today's convergence of the digital and the analogue in many aspects of family life, especially in the parents'/carers' expectations for technology to help booster their children's learning at an early age. This anxiety for the adoption of technology comes with issues, which the parents/carers have to deal with, such as subpar development of bilingual learning resources and ergonomics affecting postures in prolonged usage. However, popular mobile devices' increasing portability, with no fragile mechanical parts that extrude (Mardigian 2015), and ease of child-proofing (with one of many commercially available child proof casing designed for such devices) than traditional laptops, means parents/carers have little fear of the damage to their devices. Kevin Ashton's 1999 term 'Internet of Things[56]' is also becoming apparent in some of the recent popular toys that parents/carers purchase for their children. A child's relationship with a toy is no longer private but one that is connected to other toys and devices, global networked contents and the larger commercial media landscape from which it originates.

[56] Ashton's coined the 'Internet of Things[56]' in 1999, referring to how sensor technology allows the analogue with the digital relate to one another. (Gabbai, Arik. 2015. "Kevin Ashton Describes "the Internet of Things"." smithsonianmag.com. Accessed 18 September 2015, http://www.smithsonianmag.com/innovation/kevin-ashton-describes-the-internet-of-things-180953749/.)

Chapter 3
The Theoretical Framework & Other Considerations When Designing And Working With Children And Parents/Carers

3.1 Building the framework with key components

The findings from the previous chapters provided the foundations for a new design framework that might be helpful to developers and parents/carers in HL maintenance of their children. Institutionalized education after the preschool years offers little room and time for effective experimentation and learning of HL, as options highlighted in Chapter 1 has been limited to date, notwithstanding the socio-economic pressures for relegating the use of HL to functional role between family members. Sir Ken Robinson (2010) talks about challenging our exiting paradigm about the use of ICT as a tool that is not to be simply adapted for education but how it can help with the revolution of the how we learn and teach (Robinson 2010). The preschool years at home offer a less formal test bed for seeding such revolution, starting from the familiar domestic home space and drawing upon the participation of the most influential stakeholder in the children's early years learning – the parents/carers.

The research conducted so far suggested that there are many aspects to consider when designing learning resources for young children who are to become potential HL learners. From a HL point of view, it has been established that parents/carers whom they have an attachment with, will be the ideal player transmitting that knowledge within their home space. The content has to be pragmatically simplified yet strives to build around the child's sense of cultural identity, and with a focus on improving phonological awareness. The overall framework was largely influenced from the socio-cultural writings of Vygotsky, especially ZPD, and the Reggio Emilia approach for setting the home space as the default learning space for HL. It is underpinned by the use of mobile technology that is being widely proliferated and adopted by families who believed in its relevance for learning. The vehicle will be through play, either by themselves through the different types of play, and/or with their parents/carers in the manner of "playful explorations", which is believed to be the best approach for the young children to learn HL. Considerations in terms of themes and affordances will made when designing appropriate type of tools/toys that will go with the on-screen content.

Thus this thesis is proposing a framework that involves a greater degree of parent's/carer's involvement in the customization in their children's learning. If mobile technology is deployed in a laissez faire approach or an approach that has partial parental/carer involvement, the "orbit" of the parents/carers involvement is intermittent in relation to time and space for the child's ZPD (refer to Figure 7). The ZPD's ambiguity is exacerbated with anytime, anywhere access of mobile devices, and when the parent/carer is not around to guide its use. Meanwhile the child's actions during play are modelled after the Mediated Action Triangle as described in the previous chapter. Upon receiving verbal instructions from parents/carers or

given access to a toy object, the child may engage independently with it on 3 fronts. First, by assessing what theme does the toy entail and plan out the play accordingly; second, the play experience is affected by the affordances set in place by the physical design of the toy; and third, the child engages in the relevant type of play with the toy and achieve their intended outcomes for playing. This triangle is expected to be largely unaffected by the actions of the parent/carer since the child is engaged in his/her independent play.

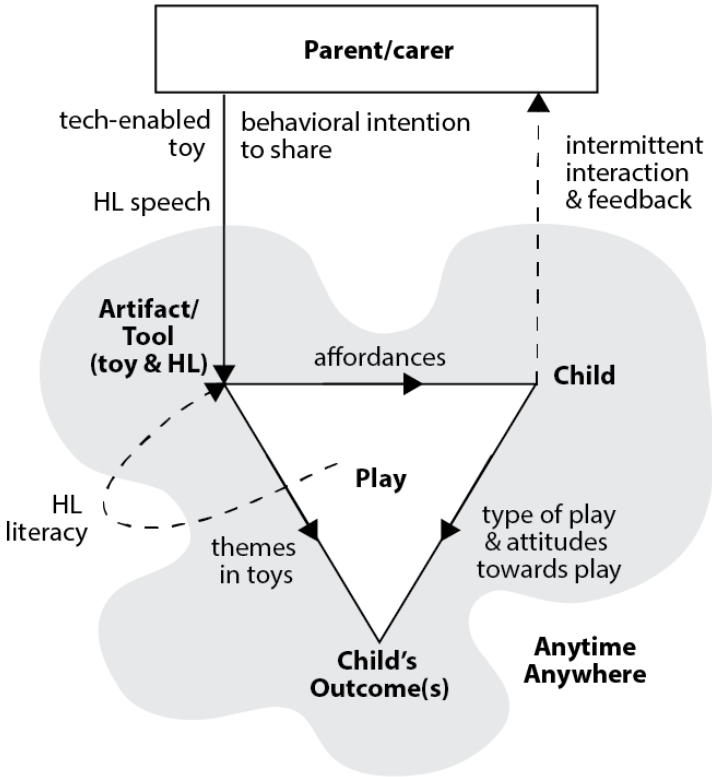

***Figure 7*. Diagram illustrating framework for the use of technology-enabled toys in an anytime, anywhere manner**

When "interactive" devices substitute parents/carers' interaction and the child is given independence of choice to decide and access resources on his/her own discretion, distraction may occur and consequentially affecting learning. While the child does engage in play with the any-screen based device/tool, the screen dominates the child's perception of the toy, and there are limited affordances on the device to aid in play that would have otherwise taken place away from screen. A device-based play also severely limits the type of play that a child may otherwise enjoy, and it in turn informs the attitudes the child has towards the tool/toy and the overall objective of the play. For example, the child may find certain programmes or games addictive and sought to prolong their screen-time. More research has to be done in this particular area as many non-academic writings, such as personal blogs and forum threads found on the Internet, point to a growing concern about adverse behaviour in young children who have grown attached to their devices and in parents/carers who have become overly reliant on devices to model their children's behaviour. The only positive note for the

current trend of integrating technology into toys is that, the child could still enjoy a variety of thematic play as long as the designers and developers produce the content with the appropriate visual design.

The proposed framework (refer to Figure 8) offers a few changes to the anytime, anywhere-sans parent/carer framework described earlier. The hypothesis is that migrant ethnic Chinese parents/carers, with the integration of structured craftwork or play, can provide their children a more enriching interactive experience learning from mobile devices, and resulting in learning and maintaining the use of HL. In comparison with the situation of parents/carers having a more detached relationship when the children uses mobile devices for learning, the child's ZPD is more regular and focused as parents/carers are encouraged to site the play within the familiar home space. The parents'/carers' "orbit" is closer as they need to be the main driver for HL learning and maintenance at home. Their choice of resources has to be streamlined and focused on providing the basic literacy objectives, especially the transmission of phonological awareness to their children. Their proximity and interaction during structured play will help provide focus, resulting in more concerted outcomes and positive attitudes in the children. This proposed framework will be adapted for a series of design probes in engaging young children for HL learning and maintenance. The design probes were created as part of the research process and will be used to shape the final research outcomes.

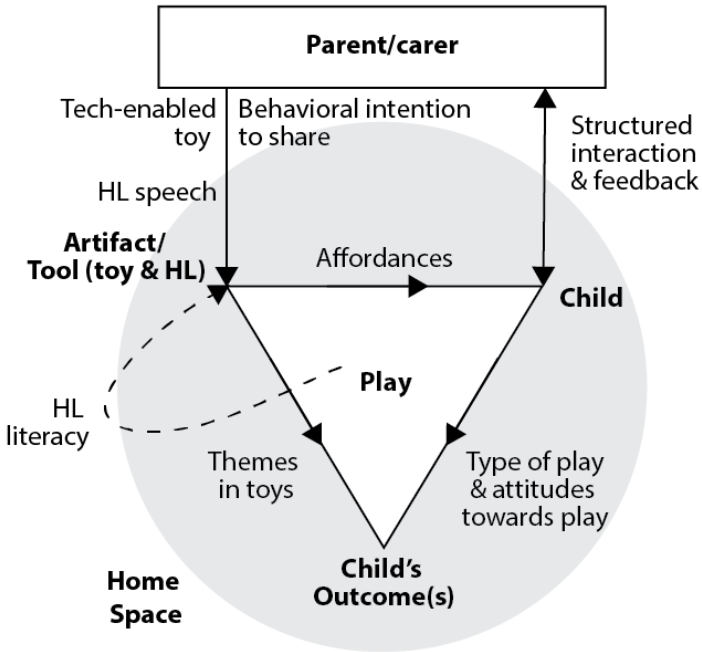

***Figure 8*. Diagram illustrating proposed framework for the use of technology-enabled toys within Home Space and with parent/carer involvement**

The research will not focus on a singular aspect of application design for digital mobile devices but rather create a set of design probes that bridge everyday analogue play within the children's learning environment with content delivered via digital mobile technology.

3.2 Designing and working with children

2 ethics applications to have the design probes field tested by children participants were approved by Monash University Human Research Ethics Committee (MUHREC) in 2015 and early 2016. Prior to these field tests, the experience of working with a child was largely centred on my personal interaction with my daughter. My daily interactions with her helped shaped much of the research direction, as well as providing an insight into how her growth and our parenting found much parallels with the theoretical writings on early childhood, play, language acquisition and cognitive development. The cue taken from my experience as a young parent, is that contemporary parenting meant providing all-rounded exposure to hands-on activities, play, learning and technology.

Image 25. **(left) Screen captures from Sesame Street: "Fun Fun Elmo," Episode 26 (A Mandarin Learning Program), (right) Sesame Street Workshop Letter O. Sources from youtube.com**

Designing for children is about communicating ideas to children in their own terms. Subjectivity aside, there are certain broad themes that attract preschool children and most resonate from popular culture transmitted to them via television, which is still the primary screen in every household. It had been highlighted earlier that research on media's influence on children is still predominantly based on 40 overs years of television programming and that has not changed much, except that there are more quality age-appropriate television programmes available on both public and private networks. Much of the children television programmes incorporate suitable aesthetics such as short and simple texts that allow for repetition and large, clear, bright and cheerful motifs that allow for pictorial identification (refer to Image 25). Some of the educational videos have segments that point out and ask the child audience to air-trace familiar letters and this allows the child to learn, and exerts a positive influence on the child's enthusiasm and self-motivation to write (Neumann, Hood, and Neumann 2009). Using appropriate animations, illustrations and typography, rhyme, repetition and asking open-ended questions, especially when reading to preschoolers (Billings 2009), are also considerations when it comes to developing age appropriate content.

Working with children as a researcher is difficult, as there is much ambiguity about the soliciting of responses from a child who may yet be able to articulate his/her responses to certain stimulus or activities. The tasks required of the children in the field activities involve co-creation of craft, shared-reading between the parents/carers and the children and the introduction of basic Chinese print through visual and phonological stimulus. The activities are designed for preschoolers aged between 3 to 5 years old and sought to capture a pool of participants who are representative of a spectrum of cognitive and linguistic capabilities. A decision was also made to involve their parents/carers as the main facilitators and documenters for the field studies instead of the researcher, as they are in the best position to communicate with and understand their children in terms of language or emotional support. The arrangement will empower the parents/carers to drive the activities, as active participants, similar to daily situations when they would do craftwork, read or play with their children. Not only would the parents/carers assist with observing and documenting their children's responses, they would also provide an opportunity to experience the methods informed by the proposed framework and hence provide invaluable feedback at the end of the field activities.

3.2.1 Understanding visual appeal of characters on screen

Even though the research is looking at the use of Mandarin as HL learning and maintenance for the children, the influences on content used for design probes will be not be solely drawn from overtly cultural specific sources, so as to allow the children to relate to them as simply part of an expanding repertoire of resources they encounter. Such quality can help introduce concepts of tolerance and respect for things different at a very young age (Klanten and Ehmann 2009), while children also tend to be more attentive and respond positively if they are able to make more meaningful connections between what they experience on screen or print, and their own lives.

The creation of a narrative with characters or a metaphors can help often guide a child without relying too much of adult's intervention but the challenge is in designing characters to fade or change as the child grows older (Yarosh, et al. 2009). While the character designs in this research's design probes were not meant to have such an extended longevity compared to those of a television programme, it was crucial that the child participants find them relatable to the milieu of fictitious characters they had acquainted with, from their constant exposure to television, movies or games.

3.2.1.1 Summary of findings from survey of 45 popular preschool programs (English and Mandarin) on television and online channels from Australia, China, Taiwan, Singapore & Hong Kong (2011-2015)

As children's exposure to television programmes and digital content on parents'/carers' devices are taking up a significant portion of their waking hours[57], a preschooler can easily relate to at least 5 sets of concurrent characters from the different programmes they are watching at any point in time. 2 of the design probes discussed later used fictitious characters as conduits for the delivery of content to the children. The probes' characters appeared in Mandarin eBooks, craft objects, as well as elements in a bilingual web-based game aimed at teaching some Chinese characters. The character were designed after referring to data gathered from a 2011-2015 survey of 45 preschool television and Internet video programmes from Australia, China, Taiwan, Singapore and Hong Kong (refer to Appendix C). Some of the characters had made successful crossover from print to screen or vice versa. For example, *Olivia the Pig* (USA) and *Pororo the Little Penguin* (South Korea), are now licensed characters that appear on an array of merchandise found globally; and these in turn, reaffirm the relevance of these characters' stories in the minds of young children.

The information presented here are intended to be illustrative rather than definitive. The survey covered 33 programmes that originate from UK[58], USA, Australia, Canada, Spain, New Zealand and 12 programmes from Japan, South Korea, China, Taiwan, Hong Kong and Singapore. The programmes were picked from free-to-air local channels, archived video material from the television network sites and popular video channels on YouTube (refer to Image 26). The overview provided details on the program title, its average duration per episode screened, the country of origin and production companies, the genre of production (such as live action/ animation/ variety programmes), the character designs and composition of characters on screen (such as anthropomorphic, in groups of 4 and of mixed characteristics and ethnicity), the production's theme/ siting of the stories and general feedback about the series gathered from reviews posted by viewers on the Internet. The complete list of 45 programs can be referred to in Appendix C.

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[57] In 2013, children watched television for one hour and 54 minutes per day when averaged across all television households. Although the OzTAM data shows that children aged 0–14 are spending less time watching television than they did over a decade ago. While each television network provided programming for children of different ages in 2013, ABC2 (also known as ABC4Kids) attracted more children aged 0–4 and an increase in average time spent viewing. (ACMA. 2015. *Children's Television Viewing - Research Overview*. Vol. March 2015: Australian Communications and Media Authority.)

[58] In 2013, 21 of the top 30 programs on free-to-air Australian TV channel ABC2 were sourced from the United Kingdom and only three were Australian, a 75 per cent decrease from the 12 Australian titles in 2012. (ibid.)

Image 26. **Character designs from children television programs – (1) YoGabbaGabba (USA), (2) Peppa Pig (UK), (3) YoYoMan (Taiwan), (4) McDull & Chinese Culture (Hong Kong)**

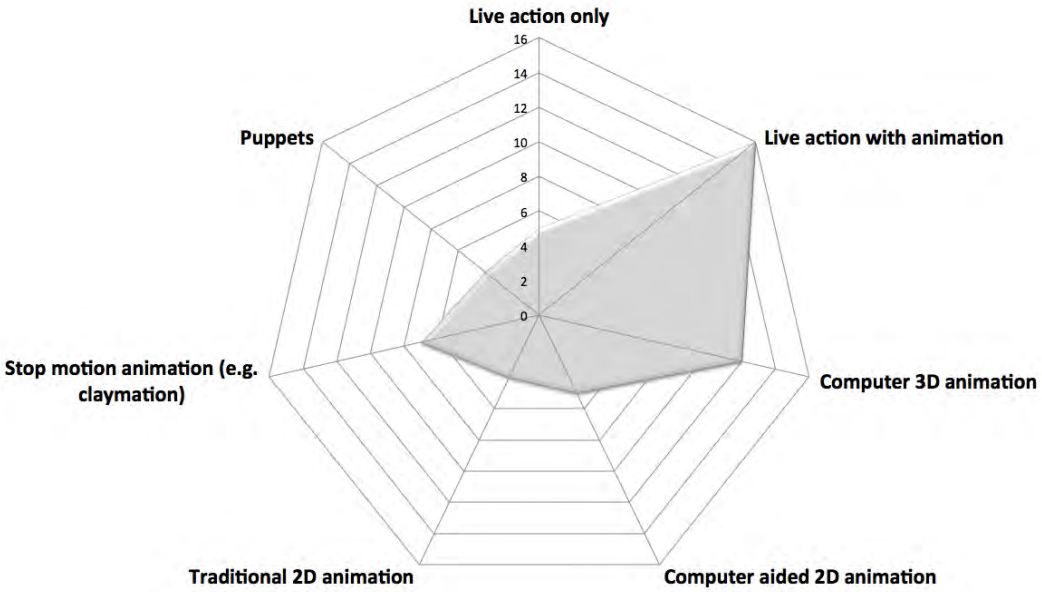

Figure 9. **Distribution of genre of preschool TV programmes**

Most of the programmes were produced or dubbed in English except for 9 from China, Taiwan, Hong Kong and Singapore, which were in Mandarin and Cantonese (Hong Kong). The largest group surveyed were programmes with live action performances with computer-aided animation while animations that were computer-rendered in 3D are in second place (refer to Figure 9). There were more computer-rendered 3D animations surveyed than computer-aided 2D, hand-drawn and stop-motion animation. Live action programmes, such as

The Wiggles (Australia), *Banana in Pyjamas* (Australia) and *LazyTown* (Iceland, UK, US) encourage children to interact, usually by making verbal repetitions, singing, dancing or doing body movements. These were more popular with the younger pre-schoolers while older pre-schoolers favoured more independent viewing of less interactive and more story-based programmes.

The survey also identified what kind of character designs were used in the 45 programmes. While the live action with animation element is popular as a genre, we tend to find more programmes with characters that were of anthropomorphic and animal designs (including animated and puppet characters). Often these characters exist on screen concurrently as part of the programmes' cast or as special segments presenting different learning objectives within the same programme. Examples of programmes with such production style are *Sesame Street* (USA), *StoryTrain* (UK, UAE) and *MOMO 歡樂谷／Momo Happy Valley* (Taiwan). The character designs in most of the programmes surveyed were also widely used in related licensed products such as toys and stationery.

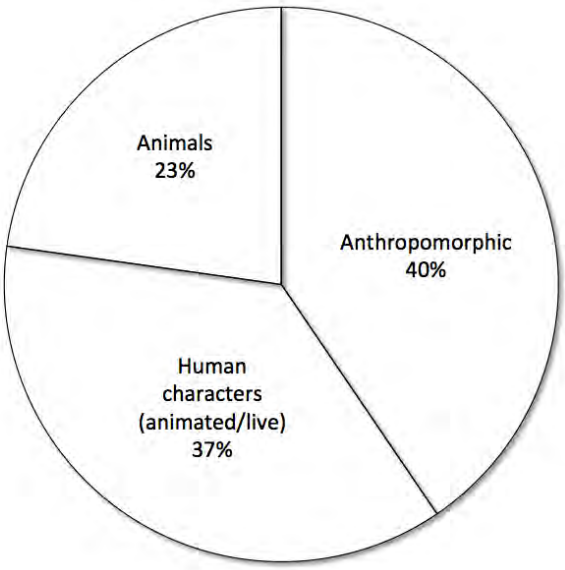

Figure 10. **Distribution of character designs in preschool TV programmes**

The programmes' thematic objectives and productions were very diverse. Only a handful actively focused on literacy such as the promotion of reading, listening, retention and comprehension (*StoryTrain* (UK, UAE)). Younger preschoolers tend to like programmes that include the use of rhythm, rhyme and repetition of stories (*Raa Raa! The Noisy Lion* (UK)). There might also be some segments on simple arithmetic, science and info-education (*Super Rover and Friends*,*小农夫 Fresh Farmers* (Singapore)). Some were targeted at younger preschoolers with minimal sets to allow the children to focus on imagination and the activities the main characters were doing (*PoCoYo* (Spain)). These activities included simple singing and reading, at an easy and reassuring slow pace (*Play School* (Australia)). They had little or no dialogue, with children having to make out the interaction within the episodes (*Pingu* (UK,

Switzerland)). This is in contrast with shows like *Lah-Lah's Big Live Band* (Australia-Canada) and *The Wiggles* (Australia), which featured catchy songs, silly skits and acting or involving some physical activities that promoted healthy lifestyle such as children yoga, simple acrobatics, sing/dance-alongs, reiterations of daily routines such as brushing of teeth and craft-making and drawing (*LazyTown* (Iceland, UK, US), *MOMO 歡樂谷 MOMO Happy Valley* (Taiwan), *小小智慧树/ Tiny Wisdom Tree* (China)).

The majority of the programmes showcased a wide range of topics over their episodes run. While most were set in fictitious worlds to encourage imagination (*Octonauts* (UK)), others were set in the real/ similar-looking worlds (*Arthur* (Canada, USA)) that hosted accurate reflection of issues that a child might face. Themes of identity diversity, multiculturalism were explored (*Gaspard and Lisa* (UK)) along with episodes showing characters working together to resolve differences, especially with siblings within family dynamics, helping them to learn to regulate strong emotions, such as anger, sorrow, fear and impulsiveness (*Caillou* (Canada)), while embracing love and affection for others (*Franklin and Friends* (Canada), *Pororo the Little Penguin* (South Korea), *Timmy Time* (UK)).

Some episodes acknowledge mischief in children but negative behaviours are usually rectified by the end of the stories (*Little Princess* (UK), *Peppa Pig* (UK)) as the children are taught politeness, courtesy, confidence, positive thinking and sometimes about safety and the importance of community involvement and civic consciousness (*Postman Pat* (UK), 放學 ICU Afterschool ICU (Hong Kong)). Other episodes sought to encourage curiosity, problem solving skills, teamwork, and positive role modelling (*Charlie and Lola* (UK)). Unlike Western productions, China and Taiwan produce children song-dance talent programmes modelled after popular adult variety talent programmes. Generally, their production pace were faster, flashier and showcased competitions amongst its children participants/performers (*快乐大巴／Happy Bus* (China), *Think Big 天地 Think Big World* (Hong Kong)).

The survey's results pointed out that production companies were in favour of the use of live-action sequences in their preschool programmes so as to inject a sense of reality when engaging with the children. A combination of animation and live action too helped to feed their imagination and interest. This was parallel to the hypothesis that parents'/carers' physical presence are crucial, when anchoring their children's on-screen exposure to the need for actual human interaction. The character design sifted from the survey clearly pointed to anthropomorphic and animal designs being favourite choices of these content developers as they were used to depict racial/cultural diversity, and helped children understand emotions and behaviours (which can be caricaturized with the characters) they might yet come to grip with.

3.2.2 Working with children and parents/carers in the field

The field activities required the participation of young children and parents/carers. The considerations laid out here and subsequent sections in this chapter were geared towards the practical preparation of the field activities with the design probes. However they are also informed by the theoretical considerations highlighted in previous chapters.

As mentioned in the beginning of this section, children may not be forthcoming with the appropriate responses and neither could preschoolers be expected to consent to the activities. As a researcher, the only resort was to communicate with the parents/carers and seek their approval and assistance with the activities. Parents/carers naturally provide their children with homes that are safe for learning and playing, and by volunteering, these adults took on the responsibility to facilitate, not only help prepare the material but provide the necessary observations on their children's responsiveness to the activities. Explanatory statements were issued to the volunteer parents'/carers' detailing the objectives, nature of each activity, the requirements from the child (for example, the duration and type of activities and what kind of equipment they are expected to use), and invitations then extended to interested parties. The parents/carers were reassured that my channel of communication was open to them at all times.

For the field activities, the young children were required to access their parents'/carers' devices. Not all of these children were expected to affect actions by dragging and dropping, opening and deleting or navigating in a nonlinear manner across the devices' screens. Thus the navigation and actions required of the children were kept to a minimum. It was crucial to consider the children's cognitive and physical load in order to avoid frustration during the experience with applications on devices (Kurdyukova, André, and Leichtenstern 2009). Hence parents/carers were reminded to be sensitive and responsive to children's cues throughout the activities. Then they could better engage with the children and responsibly assess and render any type of assistance required, and ensure that their responses were accordingly child-centred (Rimm-Kaufman, et al. 2002).

As an external person, entering the family space, the biggest issue would be for me to build that repsonsive and trusting relationship with the child participants. It was felt that a stranger would not be able to exhibit a consistency of care that was important in promoting a communicative relationships, like how parents/carers would with their children. The participating children might also not develop trust with the researcher readily, even though it was to be conducted within their familiar home settings. It was thought that the children might not fully understand what to expect of the activities, if they were to be facilitated by a stranger; and the activities might run into certain issues should the children fail to engage with someone unfamiliar.

A decision was made to have technology incorporated non-intrusively by the parents/carers as part of the children's daily 'analogue' play environment. A proposed approach was to apply alternative methods of data access like printouts of 2D matrix codes within these familiar play spaces, so as to pique the children's curiosity and allow the initiation of pre-activity discussions with their parents/carers. As not all preschoolers were able to articulate their emotions or comfort level well, it was the parents'/carers' responsibility to facilitate the sessions as they saw fit. They were recommended durations for the activities, but were also advised on using their discretion, with the option of aborting should their children express any discomfort at any point in time during the activities. They were also advised of the confidentiality clause that they can exercise at any point of the activities, even if they have agreed to the participation. The parents/carers were reminded to be encouraging and mindful of using of HL throughout their interaction with the children whenever possible. Upon completion, each child participant was given a "certificate of accomplishment" to encourage him/her to partake in HL-related activities and interaction in the future.

3.3 Designing for parents/carers

As parents/carers are a crucial component in the learning and maintenance of HL at home, the probes also have to be designed with them in mind. This is especially important as they are required to assist with the field studies for the design probes and assurances in pedagogy, content quality, duration and safety have to be communicated to them to ensure their participation. These factors may positively impact on the parents'/carers' willingness to participate and their perceived value of the field activities.

3.3.1 Understanding perceived value for parents/carers

Most parents/carers have experiences in choosing and using a good variety of educational toys and mobile applications, and they do look for quality and assurances in the resources. For example, they may choose print or basic e-books to read with children if they want to prioritize literacy-building experiences over applications that are just for fun and games. There are concerns that some of the extra features of enhanced eBooks, like over-the-top animations and sound effects, can be distracting to parents/carers and children alike. These may prompt non-content related interactions and affect the details children recall post reading. The quality of the communication between children and their parents/carers during and post reading, is more important than the children being able to articulate the words/text displayed on the mobile devices. However, appeal is an essential tool for driving early literacy development and enhanced e-books may inspire less-motivated children towards engagement of the reading activity which they may otherwise avoid (Chiong, et al. 2012). Parent/carer-child shared reading may also promote language learning, since it creates a

context in which language (in speech) is “repetitive and predictable” and “extra-linguistic cues to meaning are available” (Johnston and Wong 2002) during such sessions.

It was key that parents/carers participants in the activities related not only to the content used in the design probes, but embraced the proposed activities and pedagogy when working with their children. They must feel comfortable spending time and effort collaborating as volunteers and facilitators. Nostalgia can be a big influence on what parents/carers perceived to be of value to their children. As highlighted in the previous chapter, retro-themed toys remained popular amongst consumers who are keen to introduce games and toys of their childhood to their children. Hence if the probes were designed in a similar fashion, it would attract parents/carers who see value in engaging their children in a more “hands-on” tactile manner, and how such an approach would help their children cultivate problem-solving skills.

Last but not least, an emotional bond with the child represent an intangible value that every caring parents/carers work very hard to build, especially for new migrant families facing socio-economic pressures to provide for their families. Sometimes, the adults’ work commitments result in long periods of separation with their children, or them feeling anxious about the gradual loss of HL use in their children, when they enter local childcare facilities. Having closely knitted family ties is highly regarded by the ethnic Chinese household, thus the establishment of an emotional bond with their children probably holds the greatest value of all.

3.3.1.1 Crafting as value

Although Art & Craft toys represented the second lowest revenue percentile (above youth electronics) in global sales as highlighted in the previous chapter, it has been rather consistent in its sale figures of about $1 billion per year over 2013 to 2015. This signifies that a low cost, low/no tech genre of play activity, does continue to attract consumers who are keen to diversify their children’s repertoire of play objects/activities or that such category projects a degree of retro feel to parents/carers.

Affordances in play, especially in mark making by children is unique and different from the experience with a screen-based activity. For example, the activity of a child making his/her own craft object cannot be duplicated on screen as it lacks the obvious tactility and dimensionality. His/her highly individualistic scribbles or early handwriting is also highly informal and is a result of affordances from the child’s markers and pencils, which is still difficult to replicate even with today’s stylus designs and touchscreen technology.

Craft making, on the other hand, can discourage a throwaway mentality that is prevalent in our consumerist society. Electronic gadgets, often with limited battery life span, finite serviceable parts and firmware updates, are increasingly viewed as disposables goods. Craft toys, especially those requiring the use of everyday found objects, allows the parents/carers

to instil upon the child a notion of adaptation, conservation, recycling and sustainability. As seen in the recent interest in “maker culture”, the crafting experience of piecing together and possibly individualizing one’s own toy can be a very empowering experience for the growing child.

Crafting is recognized to be beneficial for the development of visual-processing skills, fine motor skills and building executive function, such as concentration, in young children (Rende 2014). The coupling of the crafting activities with complementary content on devices provides the contextualization necessary within the child in his/her learning process (Pöllänen 2009). Adults crafting with preschoolers, while not spontaneous or self-directed by the child, when planned and elaborated with whatever human and material resource, may become sustained play episodes for the child (Moyles 2012). Unfortunately, craft making is increasingly seen as more about qualitative expression than in economic objectives (Aerila and Rönkkö 2015) and related by many adults to be an activity that is done in day care or child care centres. Some parents/adult carers have reservations to committing their time and effort to make craft with their children as they have little time and/or feel that they are inadequately trained to engage with such activities.

The design probes would have adults take on the role as facilitators and their homes as part of the context for learning. The field activities structured around an adult-child interaction through the co-constructing and possibly play of craft objects is a form of scaffolding. The nesting of affordances within the co-created craft objects would enable a tactile way of transmitting and acquiring of knowledge from both the physical activities and on-screen content. Although the adults’ role may be more unilateral in situations when they had to direct reading with the children, such situations do not always imply a strictly “teacher-to-student” relationships. Parents/carers might then have to assume a more collaborative role in some of the hands-on learning situations.

3.3.1.2 Storytelling and shared-reading as value

Not all parents/carers may be craft-savvy and they prefer engaging in storytelling as a means of spending time interacting with their children. Stories are an essential part of cultural and language transmission. They are often condensed, segmented, abridged into rhymes and songs. As stories are presented in segments, this allows effective repetitions, highlighting distinctness of some ‘units’ (person, act, place or even phrase) throughout the retelling (Kroeber 1992). An understanding of how young children take to the intonations and rhythms within repetitive rhymes and songs will be beneficial in learning how young children pick up rudimentary vocabulary and grammar. When exploring shared reading as an early literacy experiences, it is important for the parents/carers to help the child understand that text has meanings, that it is composed of different word or Chinese characters, and is read from left to right (even for most of the children’s books in Chinese). The child may also learn to identify

elements in the books' illustrations and experiment with drawing and writing, as part of his/her early reading strategy.

Kroeber adds that good narratives often permit reinterpretations, improving the stories and keeping them relevant through changing times and circumstances. That is certainly true as folklores from any part of the world over can be readily found translated, published, shared and read by everyone. In the context of HL maintenance, folklore and its associated characters can be readily adapted as vehicles or embodiments of lessons, although in the case of the design probes presented in this research, the narrative chosen were more generic in nature.

Parents/carers' engagement of their children's visual, auditory and kinaesthetic senses during storytelling, serves as a link between the written text and the spoken word to the children. It may also promote imaginative thinking that enables children to become resourceful when dealing with unfamiliar experiences. Other important skills such as reflecting and retelling are also core to children's language and literacy development. These experiences and lessons learnt during joint parent-child interactions, are often extended into individual play moments when the child mimics his parent's/carer's speech pattern (Eisenberg, Muroff, and Hathaway 2009). Such joint interactions are important for children's language learning, as parents/carers can continually improvise, inform and influence their children (Killick and Frude 2009), even for parents/carers who may not be highly proficient in HL.

In a 2014 School Readiness report published by Sesame Workshop Education & Research Department, they listed 3 key aspects in story-telling that help parents/carers prepare their children for school. First, children can learn to recognize story structure, events, characters and the basic principle of cause and effect. Second, children can demonstrate their understanding of the story by retelling events from parts of the story they are more familiar with, trying to gather responses or learn more about the same topic. Lastly, children can be more observant and pick up text from things in their immediate environment, like from food packaging and street signs (sesameworkshop.org 2014). As mentioned in the previous chapter, school-readiness, when extrapolated into future academic performances, can become a powerful motivator for ethnic Chinese parents/carers.

In the current profusion of digital media and learning content, eBooks' popularity for online viewing and on mobile platforms means that stories continue to be an essential part of cultural and language transmission, and storytelling is still important to language acquisition milestones. But there are some researchers who are unsure that shared book reading between parents/carers and children will contribute to the development of children's literacy skills (Scarborough and Dobrich 1994). There are also concerns where adults have now a diminished role to share read once automated media-rich reading features are enabled in the

eBooks, leading to comparisons made between adult–child interaction when they share a paper-based or eBook (Kim and Anderson 2008).

Hence there had to be prudence and care in selecting and structuring the eBooks in the design probe for parents/caregivers who double up as storytellers. Even when adapting from the existing Mandarin-based eBooks from Dudu, Commontown[59] (a key collaborator for the development of a design probe used in this research), it was not possible to find content that were of strictly Chinese cultural origins as much of the material were adaptations of stories from a myriad of sources, both old and new. It was more important to have the stories that resonate with themes that both the parents/carers and the children can relate to, especially if they had previously encountered similar storylines from channels of popular media.

Kenner (2005) observed a similar trait in her study of about the relationship of children from bilingual background and popular culture. She added that these children experience popular culture no differently from their monolingual peers. In her research on children from bilingual background, they were able to integrate available popular culture resources with identifiable elements from their own culture to create hybridized content that represent their interests. These children identified certain familiar characters from their inter-textural knowledge of television, books, clothing, toys, and movies and associated themselves as the main characters in their retelling of related narratives (Kenner 2005).

3.3.1.3 Safety and sustainability as value

Safety was one of the top concerns raised by the parents/carers in the survey that was discussed in the previous chapter. Toy safety is now a strictly regulated part of the industry [60]. Parents/carers are always advised to ensure that the toys they procure are age-appropriate as the toys' characteristics are related to the stage of development of children and their use presupposes certain aptitudes. International Council of Toy Industries (ICTI) in their official webpage stated that care should be taken when choosing a toy or game as considerations should be made of the cognitive and physical development and disposition of the child. It is ultimately the responsibility of parents/carers to provide the necessary supervision when he/she is playing (ICTI 2015a). In a survey conducted on parents' perceptions, attitudes and behaviours towards child safety across 14 European countries, 9 in 10 parents felt more products should be designed with child safety in mind and 59% of parents reported that many

[59] Dudu is an online environment for self-paced and personalised learning of the Chinese language developed by Commontown, Singapore. (Commontown.com. 2016. "Dudu." Commontown.com. Accessed 02 December 2015, http://dudu.town/.)

[60] There are International Standards for Toys & Children's Products for 20 different countries as identified and maintained by the U.S. Toy Industry Association in its role as International Council of Toy Industries Secretariat. (ICTI. 2015b. "Toy Safety Standards around the World." Accessed 28 December 2015, http://www.toy-icti.org/info/toysafetystandards.html.)

child safety products have unclear or complicated instructions. (Vincenten, et al. 2005). Hence it is important that even for the design probes to be conducted within very controlled environment, parents/carers are still to be informed and assured of the safety aspect of the field activities.

With regards to radiation from smart devices being often quoted as a health concern, to date there is no established link between an increased risk of brain tumours from the use of mobile phones. The World Health Organisation did note that with the recent popularity of mobile phone use among younger people, and potentially a longer duration of exposure, they were looking into furthering research on this matter (WHO 2013).

Sustainability has been a buzzword in manufacturing in recent years. To a parent/carer, sustainability could mean a couple of things. It could be referred to as (1) material sustainability and (2) longevity of their devices. New materials are often used in toys and child-related products as international product safety regulations require manufacturers to do so. Material sustainability is seldom discussed in the toy industry as it largely produces petroleum-based goods. However there are recent trends of manufacturers venturing into "green" options such as using plant-based or recycled material in limited product lines. For example Russimco, a UK maker of traditional wooden toys since 1993, launched a range of electronic toys in 2008 that did not require batteries and as for their packaging, they were made from 100% recyclable pulp and took up two-thirds less space in shipping containers, hence reducing carbon footprint (Bridge 2008). Green Toys, another toy company from the States, prided itself for designing and manufacturing 100% recycled products that were also safe for children and its packaging components were printed with minimal colours from soy-based inks (Greentoys.com 2015). However these examples represent a niche segment of the industry and the price point of green products can sometimes be higher than conventional toys, which may impact decisions of price-conscious consumers.

While technological breakthrough enabled the innovative use of "green" approaches in some aspects of manufacturing, it was more of a contentious issue in the mobile device industry. The current consumption pattern of mobile technology does not work towards maximizing the lifespan and potential of our mobile devices. The competitive mobile device market ensures that manufacturers are in a perpetual race of one-upmanship against their rivals. Quick successive operating system updates, processing speed enhancements, hardware advancement such as optics sensor and increase in size of real estate for onscreen display every year, mean that it can be expensive for anyone who wants to keep pace with these changes. With the latest applications being developed for newer hardware and demanding more processing power, it is difficult not to feel the need to acquire a newer device once every few years. Preschoolers do not require high end device for their play and they may need only upcycled "obsolete" smartphones/tablets from their parents/carers to support child's play at

home, since even a 5 year-old device includes Wi-Fi connectivity, audio, video capture and playback technology with sufficient processing speed to engage young children.

On the flip side of sustainability, there is the issue of a lack of access to technology. The issue of an 'App Gap' was highlighted by Common Sense Media in their 2011 and 2013 reports (Commonsensemedia.org 2013). The 'App Gap' – the lack of or limited access to technologies by low-income families proved to be a point of consideration. While industry commentators note that the App Gap is likely to decrease over time, the fact remains that access is closely tied to families' income level. The report highlighted data from the United States, showing that low-income families (even if they do own a mobile device) are less likely to have downloaded educational applications for their children (57% among lower-income, 64% among middle-income, and 80% among higher-income families). While we did highlight earlier that most of the migrant ethnic Chinese population falls under the middle-income bracket, it cannot be denied that for low income ethnic Chinese migrant families here, they may face very similar predicaments as their counterparts in the States, though more research needs to be done within the local context.

The following is the summary of the main points to be taken into consideration when designing for and working with children and parents/carers, and they will be referenced to when developing the design probes for the field activities (refer to Table 19).

Participants	**Children**	**Parents/carers**
Considerations when designing for:	• Clear themes • Visual appeal • Character design & genre • Text & colour	• Safety • Sustainability • Crafting • Storytelling/Shared reading
Considerations when working with:	• Understand limitations • Understand boundaries and attachments with parents/carers • Need clear communications • Need encouragement	• Encourage responsibility • Work with parents'/carers' inherent motivation • Need clear communications • Need assurance of confidentiality if requested

***Table 19*. Overview of section on designing and working with children and their parents/carers**

3.4 Chapter summary

In this chapter, we have established the overall theoretical framework with the foundation elements covered in preceding chapters. The framework provided the conceptual direction in

which the methodology of the design probes, covered in the next chapter, will draw from. But it was also necessary to highlight what considerations had to be made to the designing and execution of the field activities and probes, especially in relation to children and their parents/carers, prior to their deployment in the field. Detailed discussions of the design probes and their potential and limitations will be covered in the next chapter.

Chapter 4
Design probes

4.1 Informing research with practice

The previous chapters have shown that the research question is multifaceted and highlighted the different research that went into the creation of the proposed framework. However the process is more akin to a type of generative research method (Koskinen 2011) where the doing/making and testing of design probes led to the refinement of the proposed framework. As Koskinen (2011,81) puts it, “paradoxically being too hi-tech and true to design leads to bad research and design” and hence the focus of this research was never solely on technology. It was more about investigating if children could play and learn their HL within a home space, while being driven by their parents/carers. A blended form of craftwork and complementary screen-based content form the artefacts that sustain the children’s interest in learning. The design probes illustrated in this chapter were created at different stages of this research journey and had in due course, became symbiotic with the research outcomes, rather than being complete solutions to a multifaceted research question.

Stappers defines a prototype as investigations into design and an embodiment of design practice, that goes beyond theory (Stappers 2007). Similarly, Frens (2007) in his writing about his prototype camera, noted that the probes are experiential as they needed to be used by participants (Frens 2007). The participants in the field activities were involved in the testing the research’s hypothesis and helped shape the research outcomes. The children's natural enthusiasm for playing easily contributed to an interest in making some of the probes. These probes lacked the polish and the complexity of those made by adults, and neither were they in the same finishes as professional prototypes. However the fact that the children participants could draw, colour or even make changes to the use of some of these prototypes, was a way of demonstrating that the participants themselves had reconstituted the probes as their own toys. The probes themselves cannot be assessed as markers for the child’s HL learning, as they are only a conduit for other activities and learning objectives. Through the probes, the child designed, built and engaged with the onscreen content, while achieving other outcomes such as building confidence, perceptive, spatial and motor skills.

Some probes may prove to be challenging to some younger children participating in these field activities but it might be considered as what Papert would term as “hard fun”, where the children found the probes fun because it was more demanding (than simply accessing content on a device), and as long as they found the probes interesting (Papert 1998). While Papert’s attitudes towards play is more aligned with a Piagetian rather than a Vygotskian approach (in that children learns by doing and by thinking about what they do and hence their intellectual growth is rooted in experience) (Papert 1972), such instances may manifest in episodes

during the activities when the children were left on their own to complete part of their craft or when navigating through the application.

While detailed generic instructions and explanatory statements were issued to participants, the approach adopted towards the participants' parents/carers was also more personal, with direct communication over emails and Internet private messaging to advice on the implementation of the field activities when required. The research recognizes that rapport with the participants is important since they were the sessions' active facilitators, and they were assisting with the collation of feedback and observations, with no monetary remuneration.

4.2 Mediating Interaction with Design Probes

Verbeek, when writing about interaction design, puts the concept of interaction succinctly across as a human being and a technological artefact, having a mediated relation to each other and acting upon each other, and it is the in-between which specifies the activity (Verbeek 2015, 26). Fernaeus, Tholander and Jonsson (2008) had also proposed a shift from "information centric" to an "action centric" perspective on interaction and an efficient relationship physical manipulation and digital representation. Their proposals for flexible sharable use within a range of social practices, and a shift to multiple interpretations and uses in everyday practice (Fernaeus, Tholander, and Jonsson 2008), are aligned with the considerations for children and parents/carers (such as sustainability) highlighted in the previous chapter.

Interaction is core to how the proposed framework is being adapted for the design probes. But it is important to understand how humans relate to technology first. The thesis has highlighted earlier how market forces affected our behavioural intention to share technology but it is our relationship with technology, which affects how we mediate its use. In Don Ihde's post phenomenological approach to technology (Ihde 1990), he had proposed 4 types of relations - embodiment relation, hermeneutic relation, alterity relation and background relation to describe how human-technology-world relations work. Embodiment relation meant how we are wedded to technology when engaging the world, like how we look through glasses when reading; hermeneutic relation refers to how we use read technology's representation of the world, like on-screen prompt or an audio feedback signified a result; alterity relation denotes how we interact directly with devices with the world receding to the background, like how we operate machines for work; and lastly background relation where technology fades into an unconscious use after initial acclimatization, like how machines are left to hum when they are left turned on.

Verbeek extends on these approaches and identifies points of applications and types of influences that accumulate into how humans mediate with technology through different

degrees of interactions. Points of applications referred to using technology physically and cognitively, or contextually and culturally (as expectations of technology); while types of influences meant either how coercive, persuasive, seductive or implicative, technology can affect the way we interact with it (Verbeek 2015, 30). He proposes that human-technology-world relations, points of applications and types of influences converge to define how we mediate our interaction with technology.

The research will be using term Tangible Interaction[61] as part of the description of the design probes, as they are aligned to tangibility, materiality, physical embodiment of data, whole-body interaction and the situating of the interface and users' interaction in actual spaces and contexts (Hornecker 2015). The proposed framework is centred on the relationship between the child, parent/carer, and the artefact (both as the toy and HL) is much larger and technology plays only part of a neutral role. Within an informal setting of the home space and without the pressures of learning HL as a L1 or SL, technology is simply allowed to function without agency and become more effective in engaging young learners. Hornecker also echoes a similar argument in that interaction design cannot "design experiences", and the structure a parent/carer puts in place via his/her facilitation can help further behaviours and experiences, rather than being produced by technology or the artefacts themselves (Hornecker 2005).

The siting of HL at home provided a specific physical context for such interaction to be best situated. This research project's fundamental concern is the context of learning and that children needed to be provided with a multimodal form of access to knowledge, be it through devices or via premeditated processes of craft and play. Verbeek notes that when one designs mediation into products, it becomes "invasive" and "a contested thing to do" (Verbeek 2015, 31), although it has to be clarified that the intention of the probes and the proposed framework stemmed from a specific educational need and is inevitably paternalistic.

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[61] The term 'Tangible User Interfaces' (TUI), was proposed by Hiroshi Ishii and his group at the MIT Media Lab in 1997. They had put forth the idea that tangible objects can represent digital content and thus they can be physically manipulated with each other in a singular manifestation of representation and control. On screen digital representations are often used in close proximity to tangible objects, that function as physical controllers or even extensions of its virtual functions. (Ishii, Hiroshi, and Brygg Ullmer. 1997. "Tangible Bits: Towards Seamless Interfaces between People, Bits and Atoms." Paper presented at the Proceedings of the ACM SIGCHI Conference on Human factors in computing systems, Atlanta, Georgia, USA. http://dl.acm.org/citation.cfm?doid=258549.258715..) But Hornecker and Buur stated that the original definition of Tangible User Interfaces excludes many interesting notions from product design and the arts, thus suggesting that Tangible Interaction would be a more inclusive, less strictly defined term. (Hornecker, Eva , and Jacob Buur. 2006. "Getting a Grip on Tangible Interaction: A Framework on Physical Space and Social Interaction." Paper presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Montreal, Quebec, Canada. http://dl.acm.org/citation.cfm?doid=1124772.1124838.)

The probes described in this chapter are unlike the interactive displays exhibited in museums, galleries or shopping malls (refer to Image 27). They were designed with largely found resources at home, ranging from the smart devices that parents/carers own to the recycled cardboard boxes and newspaper. The probes did not require expensive setup like motion detectors and large format projectors to fulfil their interactivity, but rather relied on scaffolded facilitation by parents/carers and existing technology such as the built-in camera, mobile browser and audio playback available on their devices. The tangibility in the probes could be readily disassociated from the on-screen experience and function across different types of play for the child. Yet the child retained a mental note of the physical probed being linked to a separate set of activities, and they can make the conscious choice of returning to the content/activities on the devices at any point.

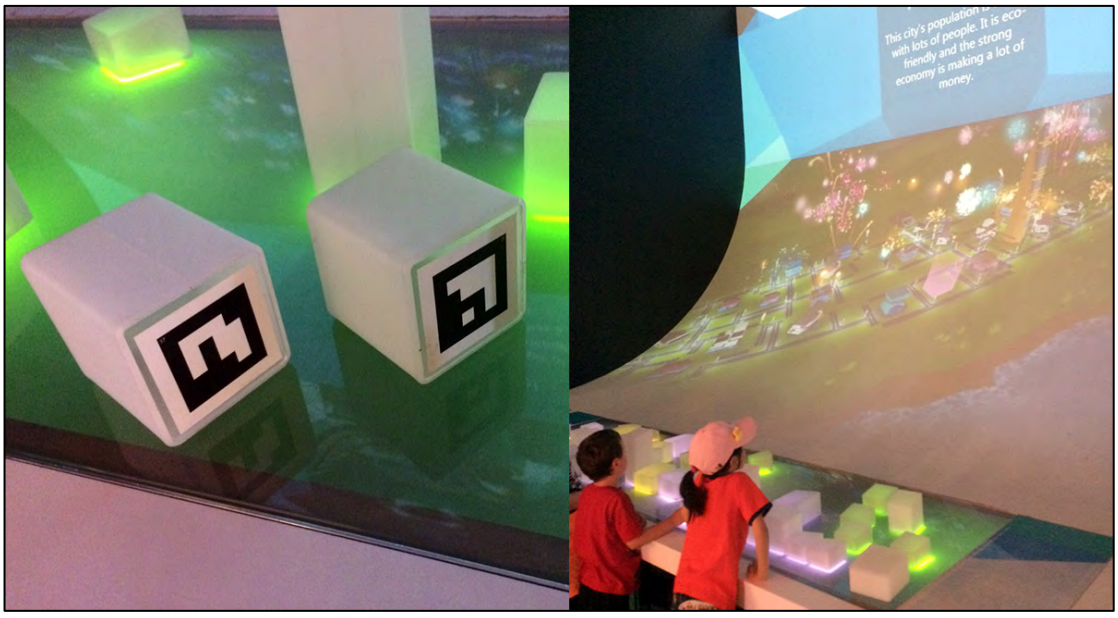

***Image 27*. Think Ahead Design Your Own City interactive exhibit, Scienceworks, Melbourne, Australia. Image by author.**

4.3 Early design probes – Craft-making & Mini phone case plushes

The early design probes were created during the early stages of this research project. The provenance is a personal as I was observing and interacting with my daughter (hereafter Yx) between her ages of 3 to 5. As mentioned before in Chapter 1, the anxiety of having to maintain usage of Mandarin at home with her, resulted in the quest for sourcing Mandarin Chinese learning material, such as DVDs, CD-ROMs, printed picture books and wall charts.

Like many of the parents from the first survey, I had introduced my iPhone to Yx by the time she was 3 and she was aware of the play value inherent in the device, and had expressed interest in accessing it when given the opportunity. The mini phone case plushes illustrated in

the second half of this section were created partially in response to my observation of my child's behaviour and the collated results from the initial survey (refer to Appendix E). The answers to Question 5 (What is the total amount of time per day your oldest child spend on all the devices he/she has access to?), Question 6 (What is your oldest child's level of interest in your/his/her portable digital devices?) and Question 10 (Do you regulate the duration your child/children spend/s on these portable digital devices/s?) indicated that 75% of the respondents' children spend up to 2 hours a day with their devices, about 70% of the children treats their devices like other toys or prefers them over other toys and about 73% of the respondents sometimes/always regulate the time their children spend on the devices. It was inferred that one of the issues uncovered is the association of the device with that of a toy. The probe sought to investigate the notion of ownership and if it was possible to decouple that association between device and toy object.

4.3.1 Methodology for craftwork

***Image 28*. Sample of craft activities conducted at home with Yx between ages 3 to 5. (1) Simple Play-doh "Writing", (2) Matching Numbers Flower Bed, (3) Pretend Play Hand-made Craft Dim Sum, (4) Pretend Play Eggcrate Laptop with "Internet Video Call".**

Much thought had gone into designing craft activities that were age and developmentally appropriate. Some of the work concerns basic numeracy and literacy, while others involved pretend play that drew from culturally specific experiences such as having dim sum at a

Chinese restaurant or making Internet video calls with extended family members who are living overseas (refer to Image 28).

The sessions for the construction of these craft toys were facilitated and their duration varied from 15 to 30 minutes, subject to the attention span and comfort level of Yx. More complicated craft were being completed over a few sessions. Yx was also an active participant throughout most of the sessions, attempting to follow my instructions and mimicking how to draw, cut, colour and assemble most of the craft items. Mandarin was the language of instruction and interaction, used throughout the sessions.

4.3.1.1 Post-craft-making interactions

A few of the post-craft interactions were video recorded and a transcription of one of these sessions will be discussed in this section. The video clip[62] for this session (recorded when she was 3.5 years old) captured her pretend play about eating and sharing the dim sums objects (refer to Image 29), with me asking Yx questions about what she had created, which object she liked and who does she share the objects with. The sentences within <> are the English translation accompanying the original speech articulated in Mandarin.

Me: 你最喜欢吃什么点心啊？ <Yx, which dim sum, do you like to eat?>

Yx: 饺子。<Dumplings.>

Me: 还有 leh？ <Anything else?>

Yx: 还有， 还有。。。。<And, and….>

Me: 这是什么？ <What is this?>

Yx: 还有猪肠粉。<and steamed rice flour roll.>

Me: 还有吗？你盘里面还有什么？这些黄黄色的是什么来的？<Anything else? What else is in your plate? What's that thing that's yellow?>

Yx: 你可以帮我讲吗？ <Can you help me say it?>

Me: 好啊，我可以帮你讲。这是。。。烧。。烧。<Yes, I can help you say it. It is Siew…Siew…>

Yx: 卖! <Mai (pork dumpling)>

Me: 对了，对了， 就是烧卖。那么这些又是什么？<Yes, yes, that's Siewmai. And what are these?>

Yx: 饺子。<Dumplings>

Me: 那么这盘点心是我的吗？<Is this plate of dim sum mine?>

Yx: 嗯。<Yes (nods)>

[62] The video clip and documentation of this craft activity, along with others conducted with Yx during her preschool years are archived at bigbrownmonster.com (BigBrownMonster. 2012. "Dimsumilicious." Accessed 08 May 2015, http://bigbrownmonster.com/?p=1890.)

Me: 爸爸喜欢吃什么？ <Papa likes to eat?>

Yx: 包吗？ <Bun?>

Me: 这是什么包？<What bun is this?>

Yx: 叉烧包! <Charsiew Bun!>

Me: 那么另一个也是叉烧包吗？ <And the other one is also a Charsiew Bun?>

Yx: 嗯。<Yes (nods)>

Me: 还有这是什么？<And what is this?>

Yx: hmmmm

Me: 里面软软香香的 leh <It's soft and fragrant inside.>

Yx: hmmmm

Me: 妈妈最喜欢吃的 leh <Mama loves this the most.>

Yx: 蛋挞！ <Egg tarts!>

Me: 哦，你有几个蛋挞啊？<Oh, how many egg tarts have you got?>

Yx: 两个。<Two>

Me: 那你要给谁？ 这是谁的蛋挞？<Who do you want to give them to? Who does this egg tart belong to?>

Yx: 你咯! <It's yours!>

Me: 我？两个都给我吗？ <Mine? Both are mine?>

Yx: 嗯。<Yes (nods)>

Me: 那你要不要？ <Do you want any?>

Yx: 嗯，要一个。<Yes I want one.>

Me: 那你最喜欢，最喜欢吃的是哪一个？<So what is your most, most favourite dim sum?>

Yx: 这个。<This one. (points to Charsiew Bun)>

Me: 你最喜欢吃叉烧包？<Your most favourite is the Charsiew Bun?>

Yx: 嗯。<Yes (nods)>

Me: 你最喜欢做哪一个？ <Which did you like making most?>

Yx: 这个。<This one.>

Me: 你最喜欢做叉烧包啊？<You like making Charsiew Bun?>

Yx: 嗯。<Yes (nods)>

Me: 为什么？<Why?>

Yx: 因为我喜欢做叉烧包。<Because I like making Charsiew Bun.>

Me: 是不是很容易做叉烧包？ <Is it because it is easy to make?>

Yx: 对。<Yes.>

Me: 那你刚才有帮爸爸搓呀搓吗？ <Did you help me roll the buns just now?>

Yx: 有啊。<Yes>

Me: 那我们要不要留些给妈妈吃？ <Should we leave some for Mama later?>

Yx: 要啊！<Of course!>

Me: 那我们该留什么呢？<What should we leave?>

Yx: 呃呃。这个一个。<(points to Siewmai) This one, one.>

Me: 这是什么？<What is this?>

Yx: Hmmmm

Me: 烧。。<Siew…>

Yx: 烧卖! <Siewmai!>

Me: 那我们把它放一边。还有 leh？<We will set these aside then. Anything else?>

Yx: 那。。。这是给爸爸妈妈吃的。<That…this (points to plate of dimsum we set aside) is for Papa and Mama.>

Me: 喔，爸爸妈妈只吃四个，你吃那么多个啊？<Wow, Papa and Mama only gets 4. You get to eat so many?>

Yx: 嗯。我留一些给你。<Yes. I'll save some for you.>

Then Yx started to "eat" her share of dim sum.

***Image 29*. Screen captures of video recording of post craft interaction and pretend play.**

This 2 minutes 47 seconds video clip showed a session of not only pretend play but also a structured form of interaction. While it was not exactly "teacher-pupil talk" (Burns and Radford 2008), where it would have entailed a greater degree of encouragement and acknowledgement, this interaction was supported with prompts and questions. It was still a means of social intercourse even though she had been pointing to the objects or provided delayed or incomplete answers (Vygotsky 1998). The conversation was about reinforcing the items we had prepared (at the beginning of the conversation) and also about a lesson in about sharing and setting aside things for others (sharing a pretend meal). The reimagining of the dim sum pieces and the shared meal at the table, entrenched the learning of craft processes (example: *Did you help me roll the buns just now?*) and life-long habits like sharing (example: *Yes. I'll save some for you*), and dining together as a family. As a HL learner, she has shown

that she was able to converse simply and effectively within short sentences but most importantly she was learning through an activity she enjoyed.

4.3.2 Methodology for mini phone case plushes

The mini phone case plushes (refer to Image 30) were created in a “collaborative” manner when Yx was 3.5 years old. Yx was starting to doodle and more coherent forms could be made out of her drawings. She would at times describe what they entail. The drawings were then recreated into mini plushes that could be attached to external iPhone cases with the use of Snap-On buttons or Velcro. The plushes were made of polyester/cotton fabric and stuffed with polyester wool so that they remained soft and light.

Yx was shown the process of making these plushes. While she was not as involved in the making of these plushes due to safety reasons, she was given opportunities to help choose the fabric print and stuff them. The plushes and customization of the iPhone cases will usually take a day to complete. After which, Yx was verbally told that these were made for her and she could use them to hold my iPhone whenever she was allowed access.

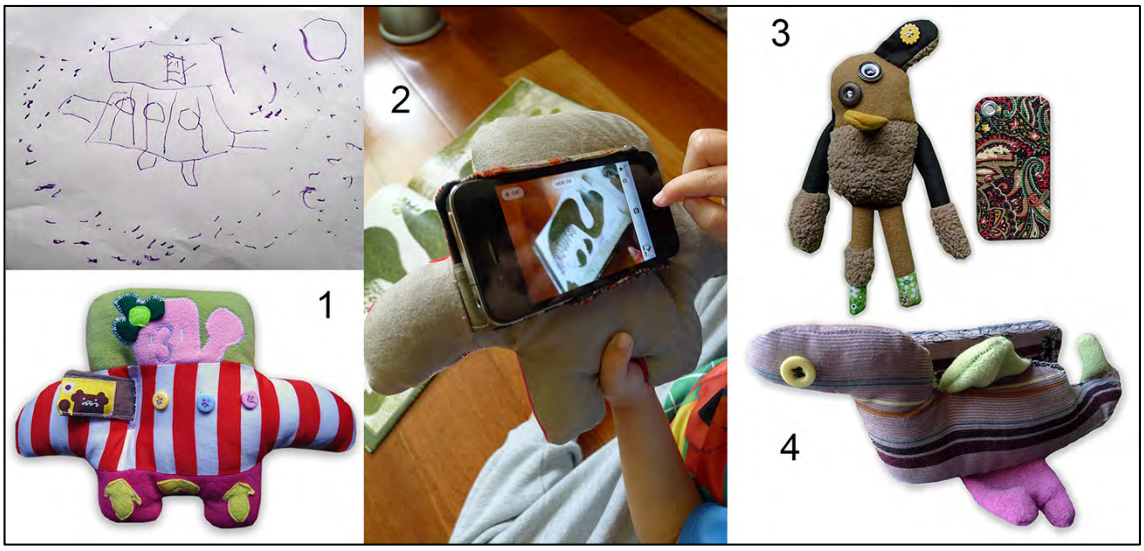

***Image 30*. Samples of “collaborative” phone case plushes. (1) Example of Yx’s drawing of a spaceship being made into a phone plush, (2) the design afforded better grip for Yx, (3) & (4) other plush iterations of her drawings, that can be detached/attached to a smartphone case.**

These were also used for gauging her responses to using QRcode scans and accessing of age-appropriate edutainment YouTube videos on the iPhone. QRcodes linked to specific clips of Mandarin and English children programmes on YouTube were printed and adhered onto the walls around our apartment, along with a small toy object that was thematically related to the YouTube video (whenever possible). Yx was also taught how to locate the scanning

application on the home screen of the phone, trigger the code capture and access the video. The locations of the codes and the codes themselves were changed regularly over a period of 2 weeks to ensure that she would find the experience refreshing, with new edutainment content lying around the apartment every now and then.

4.3.2.1 Interactions with mini phone case plushes

The interactions observed were either imaginative or task-oriented. As mentioned in Chapter 2, in the description of types of play by Kravtsov & Kravtsova (2010), she was observed to have engaged in Director's Play, Image Play and Plot-role Play, using these mini plushes along with her other plush toys. She would use more English than Mandarin when engaged in her imaginative play, especially when she was reenacting scenes from her favourite television programmes from ABCforKids. However she would codeswitch effectively (when spoken to in Mandarin by her parents) whenever they are involved in her play. Yx was able to play with the mini plushes independent of the phone. When given the opportunity to access certain games on the phone, the role of the mini plush receded to the background and it became the holder.

***Image 31*. (1) & (2) Yx's independent use of QRcode scanning application to access YouTube videos. (3) An unintended result in her use for the mini plush holder.**

The QRcode scanning activities were highly novel to her initially as she learnt that she could access her favourite animated/puppet characters (such as Elmo from Sesame Street) "on demand". That interest was kept up with regular surprises of finding out new clips during the first week. Her scanning and watching of the clips were supervised from a distance after she had learnt to access the content independently. She was allowed to replay the video clips but not accessing other clips from within the YouTube application's side menu. She would frequently enquire if there were "surprises" for her in the first week, however the interest subsided soon after, due to other distractions and possibly her limited access to the device (as she had to physically borrow it from me). This early probe exercise was developed for a

larger pool of participants in Project number CF15/3275 - 2015001389 (Learning with mobile devices by preschool children in bilingual families) (refer to Appendix F).

A surprise observation came in the form of Yx learning how to use the camera application to capture photo and video. She was very interested in photographing and video recording things around the apartment, including her toys, books and her parents. After being taught how to access the photos and video clips, she was eager to share with the parents (and her plush "friends") what she had captured. The addition of the plush to the phone's casings also provided a better grip for her, especially when holding up to capture a code or an image, or resting on a surface when viewing videos and accessing applications.

4.3.3 Moving on from early probes

The first-hand sense of designing things is particularly important. While it may be experimental and playful, the tactility and vibe from initial responses are crucial (Koskinen 2011). For the research project, it helped to gauge initially how future participants for subsequent design probes would experience and respond. These early probes provided the experience to develop and fine-tune a basic methodology for working and interacting with children. While some of the craft ideas here were intuitive to begin with, the observations from the extended interactions with Yx hinted of possibilities in using toys, craft and mobile technology in aiding migrant ethnic Chinese parents/carers like myself, to maintain and even teach HL to their children. Referencing the research surfaced in earlier chapters, these early probes exhibited alignment of using structured and frequent interaction with a content-based approach. They also helped to emphasize phonological awareness as priority (refer to Table 4) and the different loci described when identifying home as the ideal space for HL transmission (refer to Table 10).

By gifting the co-constructed toys to Yx, she was entrusted with a bond and sense of ownership. Not only did she pick up skills from a parent, her fine motor skills were honed through the handling of craft material. These child-centric and highly customised toys allowed her to associate abstract or stylized forms to her visual experiences in the real world, and shaped her sense of identity. By introducing a way to help her disassociate the toy from the device, it downplays the seductive influence of the technology/device and instead makes it implicative; allowing a different dimension to the play to be formed as it is now her crafted object, rather than the device, that is integrated as part of her existing "ecology" of playthings at home. It could also let parents/carers have better control over the amount of time and exposure she spends with technology. Parents/carers would also be able to allow her to engage in independent play and taking time to review and plan for future sessions (refer to Figure 11).

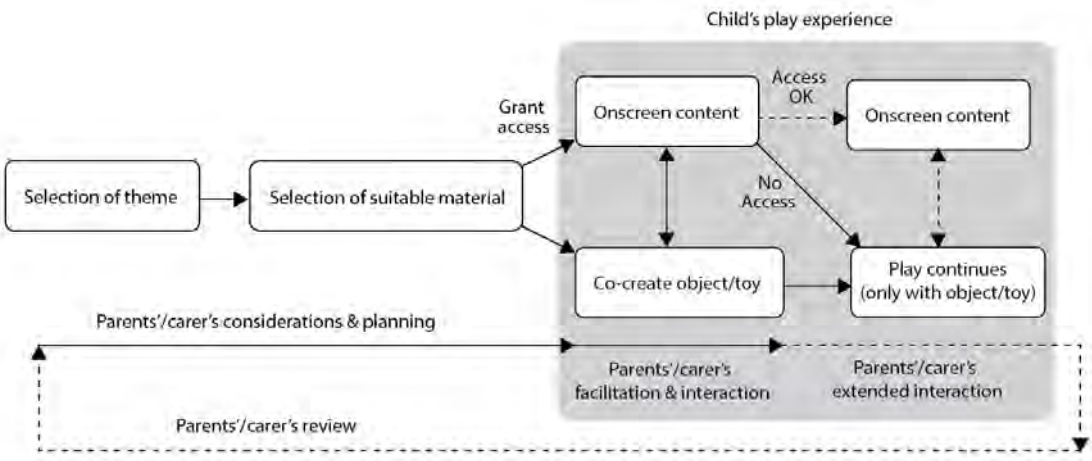

Figure 11. **Basic methodology for enhancing mobile device use with co-constructed toys**

4.4 Design probes 1 – Craft-making with Dudu eBooks

This series of design probes were designed to coincide with the development of literacy and interest in eLearning resources towards the later half of their preschool years. E-books have been a mainstay in the application stores any they have been popular as they are designed to attract the children's attention with colourful illustrations, animated feedback and audio effects. Some e-books also allow young readers to find out about difficult words and click hotspots on different pages for additional content such as mini games, hence they present a different and possibly richer reading experience to traditional books (Moyles 2012).

In this series of design probes, the research investigation sought to expand on the basic methodology that had been drafted from the early probes. The series of activities aimed to align the theoretical considerations Vygotsky's ZPD, Reggio Emilia approach, Active Learning, Internalization (refer to Table 10) with craft making and storytelling/shared reading as the key methods. Again, the home space is featured prominently as the context for affecting cognitive and motor development, visual perception and concentration in the children, even though the craft activities carried out are made in reference to a prescribed set of instructions specifically designed for the eBooks. The field activities are aimed at establishing a link between the craft sessions with the children's interest in reading, re-reading and retelling of stories with the craft objects that they had created. This will then be indicative of a degree of sustainability in such a model of resource delivery and consumption (refer to Table 20). It may also be possible to ascertain whether e-books, particularly enhanced e-book (those with interactive features), were more advantageous for engaging children and prompting physical interaction (Aerila and Rönkkö 2015), with the results from this set of design probes.

4.4.1 Methodology for Design probes 1

Collaboration was sought with Commontown, one of the biggest eLearning service provider based in Singapore, in early 2015. They had developed *Dudu Town (Commontown.com 2016)* as a subscriber-based portal which offer browser-based HTML5 enhanced Mandarin eBooks to a number of primary schools and preschools in Singapore. *Dudu Town* was designed for self-paced reading and incorporates an engine[63] to provide adaptive learning and the matching of the reader's ability, as he/she progresses in their reading and learning of Mandarin. When approached, Commontown expressed interest in finding new ways their target audience can better grasp the meaning in their stories, and maintain or improve their motivation to read and learn. Hence a proposal was made to integrate craft making as a means to extend the currency of their eBooks and interest younger readers. Commontown offered technical assistance in hosting the test site with the 4 craft-eBook packages. Subsequent activities and data collation were conducted without their further involvement, but they were briefed on the data collated at the end of the investigation.

Image 32: **Screenshots of the Dudu Town eBooks. The top 4 screenshots show the title pages with their designated tabs (bottom right of each title page) for downloading craft activities. First and third screenshot from the second row show mid-story prompts for craft activities.**

For the collaboration, 4 preschool-level titles were selected from *Dudu Town's* repository. Selection criteria for the titles include diversity in themes, illustration style and the story's potential for craft integration. A test site hosting the craft packages and these eBooks was specifically created for the participants, with the assistance of Commontown. The eBooks selected were, (1) *朋友和熊 <Friends and the Bear>,* a story about being true to your friends in the face of danger, (2) *金鱼睡觉了 <Goldfish is Asleep>,* a story about why fishes do not close

[63] Its Automated Reading Programme (ARP) sets out questions in passages within the eBooks to test the understanding of the learner and the programme monitors his/her progress over time, making suitable leveled changes to the readers' content.

their eyes when they sleep, (3) *小水滴 <The Rain Drop>,* a story about the water cycle, and (4) *小白兔和小蜗牛 <Rabbit & Snail>,* a story about the importance of keeping promises (refer to Image 32). These were chosen because they reflected similar themes that were surfaced from the previous survey of popular preschool television programmes. They also had appealing visual elements such as character designs and illustration styles, similar to those found in the programmes that the young readers were watching.

4.4.1.1 Design of craft activities for Dudu eBooks

The activities were designed with the main visual motif and theme of each story in mind so that the children can relate the craft making to the stories that they have read. They were also designed with ascending levels of technical difficulties. Sample craft designs were provided to the participants and the parents/adult carers were advised that they served only as guidelines as the craft objects should be created within the constraints of using any available material at home.

The craft object designed for the respective stories were, (1) a memory flip-card game with illustrations for colouring *<Friends and the Bear>* (Level 1), (2) a cardboard aquarium with mobile goldfish *<Goldfish is Asleep>* (Level 2), (3) a PVC bottle mini 'water cycle tank' with illustrations for colouring *<The Rain Drop>* (Level 4) and (4) a date-matching card game with illustrations for colouring *<Rabbit & Snail>* (Level 3). The craft instructions (refer to Image 33) were also packaged as downloadable PDF files and made accessible at the title page of every eBook. For details of the craft activities and other material issued to parent/carer volunteers, refer to Appendix F).

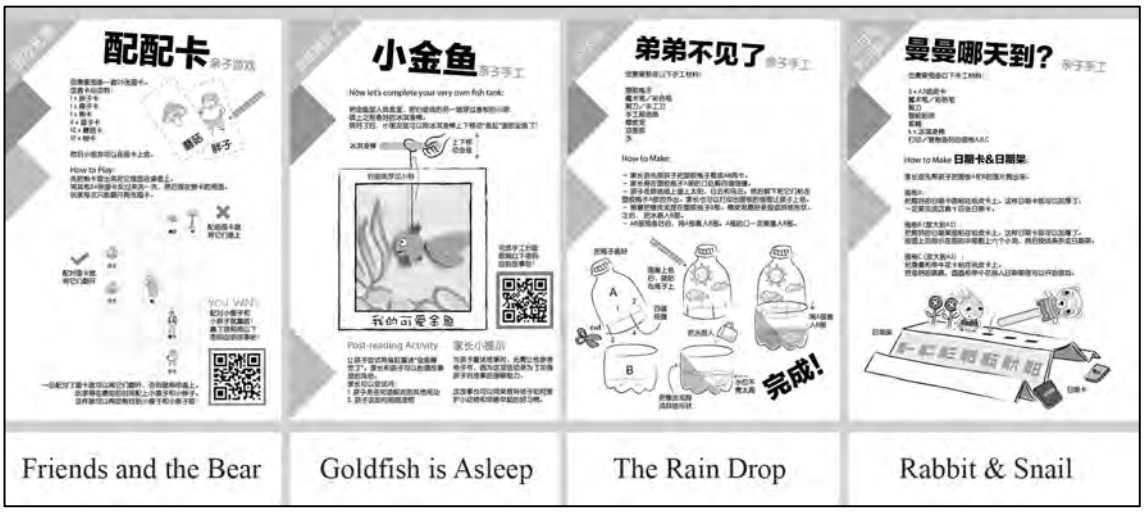

***Image 33*: Sample pages of Dudu Town Craft Instructions.**

Similar to the earlier methodology, the parents/carers were to prepare the material prior to the start of the shared reading. The children were to start on their craft activities midway through

the reading of the eBook when they were prompted by an audio-visual cue on a designated page. Upon completion of the craft object, the parents/carers could scan a QRcode printed on the instructions to return to rest of the story.

4.4.1.2 Parents/carers as facilitators and documenters

Parents/carers were sought as facilitators and collaborators in this investigation as it was not possible for preschoolers to understand fully what the investigation is about; hence reducing the possibility of them providing consent as informed participants. These parents/ adult carers, being 'gatekeepers' to the 'field' (Barley and Bath 2014) provided both familiarity to the children and also a degree of control and participation that an external researcher would take a long time to cultivate. It was also hoped that the children, when feeling safe, would express themselves more freely to the parents/carers they are familiar with.

In the adults' activity sheets, the parents/carers were required to provide some background information detailing their use of Mandarin at home. Their indication on the exposure and regularity in the use of Mandarin with their children and immediate family members will provide a picture of the environment the participants are growing up in. They were required to log down the time taken to complete the each activity, observations of the children and assist with photo or video documentation throughout the reading, craft making and post-reading activities. They were to also provide their own smartphone/tablet or cameras for the activities and respective documentation. This was to ensure that the participants were familiar with the handling of their devices to minimize troubleshooting of hardware issues by the researcher.

The shared reading of eBooks and all 4 craft activities were compulsory. Then they were encouraged to engage with post-reading activities, such as answering simple questions in the eBooks and retelling the stories, with the aid of the craft toys they had created. The adults were advised that the children's comfort take precedence and there was no rush to complete the activities in a single session. Most importantly, it was acceptable for the children to respond by code switching - alternating of Mandarin and English as long as they were comfortable responding in this manner. Even if a child may not fully remember the stories, an attempt at stringing fragments of a narrative through an artefact would be encouraging. A stylistically different retelling was a good indicator of whether the child, with limited vocabulary and language skills, can grasp what he/she has been reading/being read to. The parents/carers were briefed not to correct every error or inconsistencies they find during the post-reading activity, as long as the child participant displays confidence in their own retelling.

They were advised to set aside approximately an hour for each set of eBook-craft activity. The timing remained as a guideline and the adults should take into consideration whenever the child was comfortable and not near rest times. They were also reminded to supervise the activities at all times to minimize the chances of the children mishandling craft material and

smart devices. Upon completion, each child was to answer a simple questionnaire with a series of 5 simple Yes/No answers and was given a "Certificate of Completion" to encourage further reading and crafting (refer to Figure 12 for Methodology for Design probes 1).

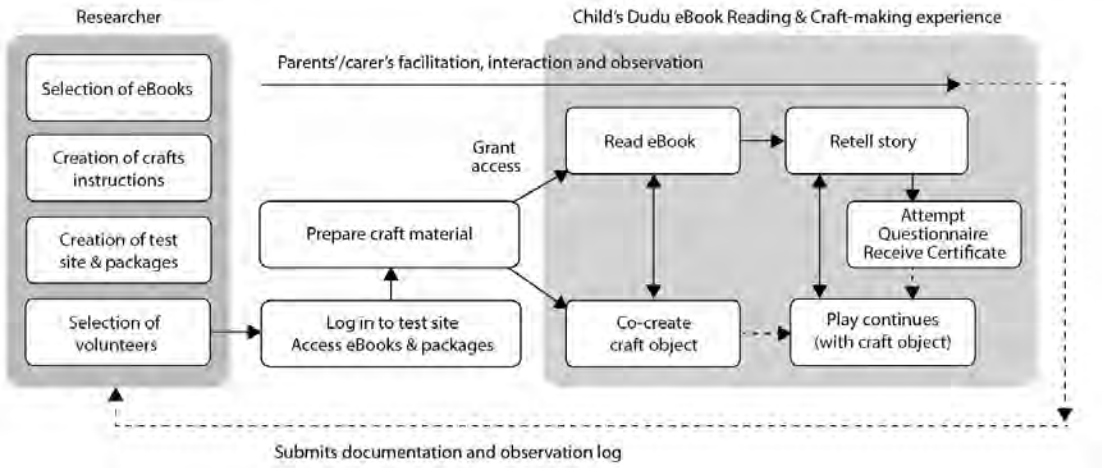

Figure 12: **Methodology for Design probes 1**

4.4.2 Results from field activities for Design probes 1

A total of 15 (10 girls and 5 boys) children aged 3 to 5 from bilingual (English & Mandarin-speaking) families based in Singapore and Melbourne participated in the activity. The first set of responses from the parents/carers showed how the participants took to craft as an activity and whether Mandarin was featured prominently in their day-to-day activities (refer to Figure 13). It also indicated the half the children needed encouragement to speak the language and all of the adults spent time on craft activities with their children, with DIY craft toys as part of the range of toys they play with. The parents'/carers' implied desire to have greater exposure to the language and a confidence of doing craft with children was important in the progression of the rest of the investigation.

When the respondents' answers from 2 key background questions: *The child responds in Mandarin when spoken to* and *The child needs me to encourage him/her to speak in Mandarin* were correlated, it showed that most adults still saw the need to encourage their children to speak in Mandarin even though they were already responding in Mandarin when spoken to (refer to Figure 14). This implies that the parents/carers in this sample group must have felt the same anxiety towards the maintenance of Mandarin.

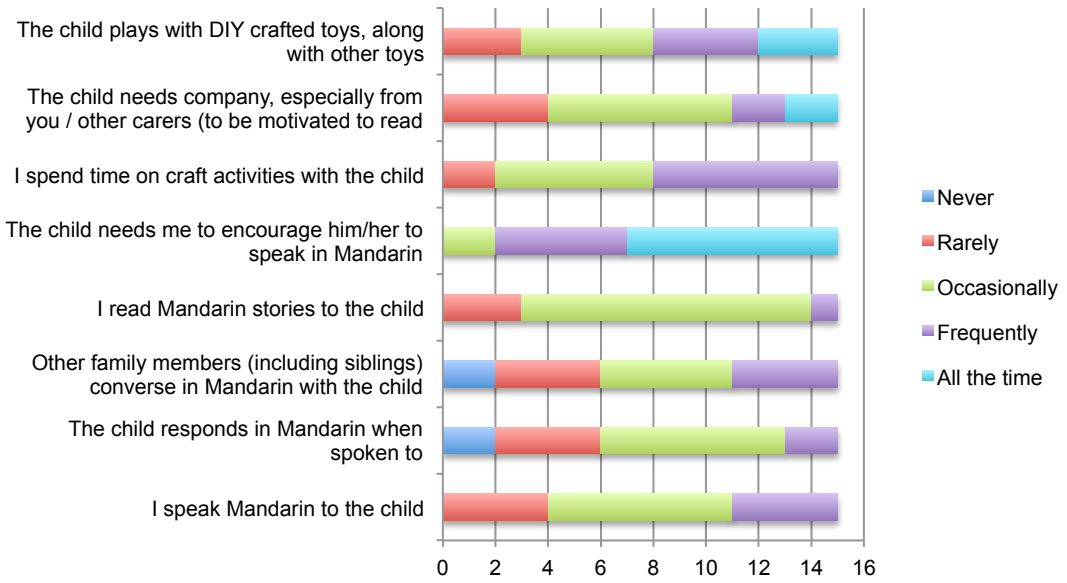

Figure 13: **Background survey of participants for Dudu eBooks (Section 1)**

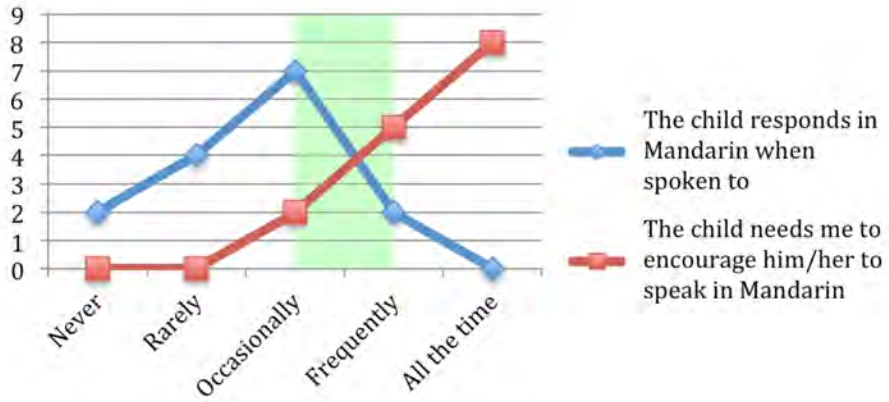

Figure 14: **Correlation between adults' encouragement and children's response in Mandarin**

The children who were noted to "never"/ "rarely" respond in Mandarin were compared to those who responded "occasionally" and "frequently" (no adults indicated "all the time"), in their interest to start reading the eBooks (refer to Figure 15). Almost all the children, regardless of their willingness to respond in Mandarin, were keen to start reading the Mandarin eBooks, possibly due to the visual appeal of the characters in the stories and/or the opportunity to access/ "play" with mobile devices.

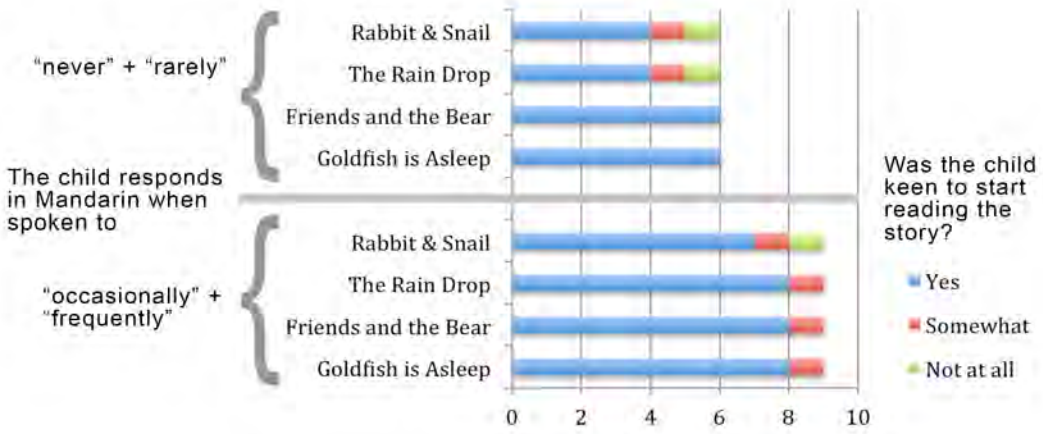

Figure 15: **Correlation between whether the children were keen to start reading the respective stories and their willingness to respond in Mandarin**

Next, the focus is on parents/carers who said they spent time on craft making with their children. Children with adults who indicated "rarely" and "frequently" to spending time on craft-making, are cross referenced to check if they related the craft object with the eBooks, and if they used the craft object to aid in their retelling of stories. There were 2 parents/carers who indicated "rarely" and 7 "frequently" about spending time on craft making with their children (the rest responded as "occasionally").

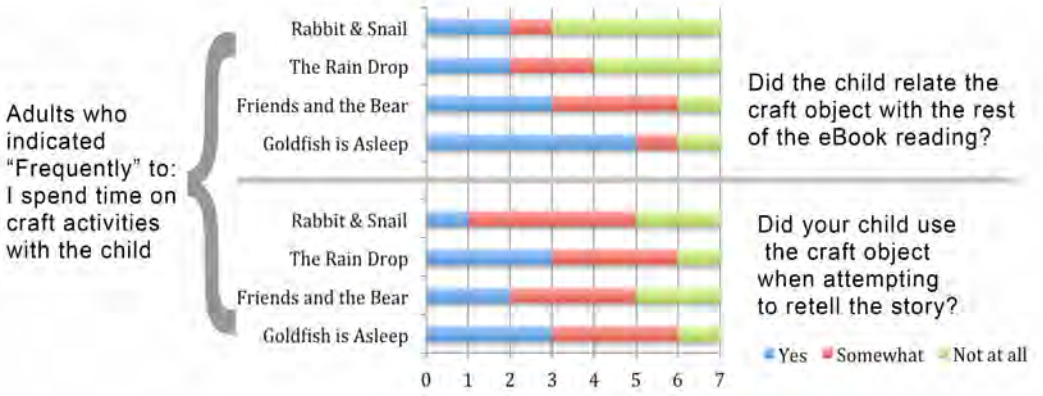

Figure 16. **Correlation between whether the children were keen to start reading the respective stories and their willingness to respond in Mandarin**

The correlated result of the children with the parents/carers who quoted "rarely" was too small to be read effectively. However, the 7 adults who cited "frequently" gave interesting results (refer to Figure 16) about their children's choice of craft. <*Goldfish is Asleep*> topped the list for being the most relatable craft object to the eBooks, followed by <*Friends and Bear*>, <*The Rain Drop*> and <*Rabbit & Snail*>. This matches the difficulty level of the activities designed. <*Goldfish is Asleep*>, despite being slightly more difficult, could have topped due to its whimsical factor. The children with this group were also using the craft object when attempting to retell the stories, as most indicated "yes" and "somewhat" to using what they made. Thus prior experience may have a role in affecting their actions.

It was initially thought that the differences in maturity, language abilities, fine motor skills and cognitive development in the children would determine how well the reading and craft activities were received. However the parents/carers observed that most children exhibited interests in doing the craft activity and had little or no problem following through them (refer to Figure 17). The photo documentation (refer to Image 34) from the parents/carers demonstrated that the children were able to manipulate the material, and with adult guidance, completed the craft activities. The most significant result from this section presented crafting as being well received and an average of 13 children continued to play with their craft objects after the activities.

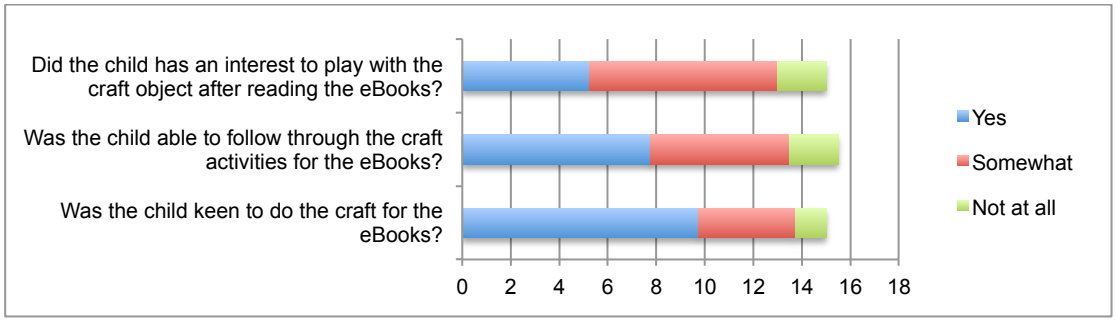

Figure 17: **Gauge of the children's interests in the craftwork when related to the eBooks**

Image 34: **Sample documentation of participants accessing the eBooks and playing with their completed craft objects**

At the end, 4 out of 6 of the children who "never"/ "rarely" respond in Mandarin at home were noted to be "somewhat" able to engage in the retelling of the story in Mandarin. All other

children who “occasionally”/ “frequently” respond in Mandarin at home, expectedly were able to (“yes” and “somewhat”) engage in Mandarin retelling. While it was not conclusive that the children warmed up to the use Mandarin after going through the activities, it was helpful to know that the children were not adverse to the experience. These sentiments were also captured in the final children questionnaire, with 13-15 of them noted that they liked reading and retelling the stories (with the craft objects), playing the toys they made and liked making them with the parents/carers (refer to Figure 18). For the full results of this set of field activities, refer to Part (x) in Appendix F.

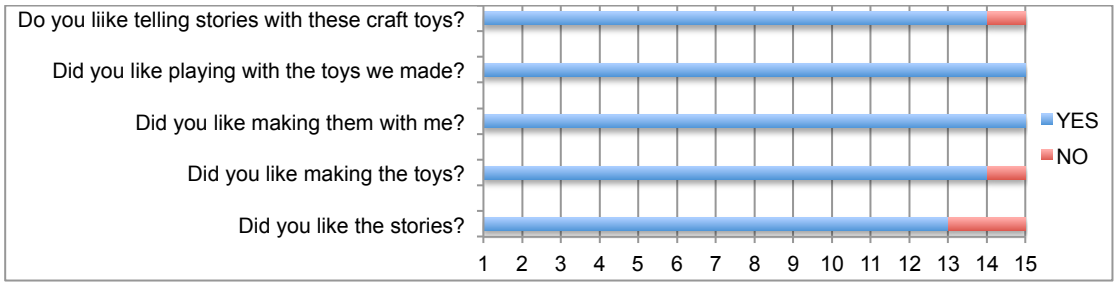

Figure 18: **Summary of responses from children after the activities**

4.4.3 Transcripts of selected story retelling by the child participants

The post craft and shared reading activity required of the child participants was the retelling of their favourite stories from the 4 eBooks. The following transcripts were chosen from the video recordings of 4 different participants, each attempting his/her retelling of one of the 4 stories. The video clips showed the children attempting their retelling with the craft objects that they had created and also captured verbal prompts by the parents/carers in helping the children progress through their retelling. Where applicable, the sentences within <> are the English translation accompanying the original speech articulated in Mandarin.

Child 1 – Female (4 years old) retelling <*Friends and Bear*>

Child: 有一天有两个小朋友，一个是胖子，一个瘦子。。。。<One day there are 2 friends, a Fat boy and a Thin Boy>

Parent/carer: Then 他们做什么呢？<Then what did they do?>

Child: 他们去篮子。。。。<They went basket.>

Parent/carer: 森林里 <Into the forest.>

Child: 森林里找蘑菇。有一天，有一只熊。他们不知道那个熊在那边。<Into the forest to find mushrooms. One day, there is a bear. They didn't know the bear was there.>

Parent/carer: 那他们做什么呢？<So what were they doing?>

Child: (mumbles and moves cards around to indicate the movement of the characters in the story) Then 熊很靠近了 （moves Bear card around Thin Boy card) <Then the bear gets nearer.>

Parent/carer: 哦，那熊绕一绕是吗？那熊走掉 （child moves the Bear card away and brings over the Fat Boy card) <So, the bear circles around Thin Boys and walks away?>, 那胖子来了，(child takes Thin Boy card and Fat Boy card in each hand and actions with them) 他们讲话是吗？ <So comes Fat Boy. Are they talking?>

Child: 他说你为什么，告诉我你为什么他的朋友，不管我了，他说不要管 他的那个朋友。。。。<Fat Boy ask what, Thin Boy tells him why as his friend, he did not care about him. He says he does not want to care. He does not want to care about Fat Boy.>

Parent/carer: 不要跟他做朋友是吗？<Thin Boy doesn't want to be friends with Fat Boy right?>

Child: 不要跟他做朋友，是。<Thin Boy doesn't want to be friends with Fat Boy. Yes.>

Child 2 – Female (4 years old) retelling < *Goldfish is Asleep* >

Child: Cos I don't know Chinese what's "Once upon a time"

Parent/carer: Ok 你 try <Ok, you try>.

Child: Once upon a time…

Parent/carer: Then?

Child:金 I don't know….

Parent/carer: 金鱼。 <Goldfish.>

Child:金鱼在睡觉了。我不要睡觉。<Goldfish is sleeping. I don't want to sleep.>

Parent/carer: 然后呢？<Then?>

Child:妈妈说金鱼在睡觉。 好，金鱼睡觉了，我也是要睡觉。<Mama says goldfish is sleeping. Good, goldfish is asleep, I want to sleep to.>

Parent/carer: 还有吗？没有啦？ 讲完了？<Anything else? Is that it? Finished telling the story? >

Child: 讲完了。<Finished>.

Child 3 – Female (5 years old) retelling <*Rabbit & Snail*>

Child: 有两个小朋友。 <There are 2 friends.>

Parent/carer: 叫什么呢？<They are called?>

Child: 叫跳跳跟慢慢。 它们是好朋友。<Called Hoppy and Slowy. They are good friends.>

Parent/carer: 然后呢？跳跳跟慢慢说什么？<Then? What did Hoppy tell Slowy?>

Child: 牵牛花开的时候，我们在森林玩。<We will play in the forest when the morning glory blooms,>

Parent/carer: 是跳跳跟慢慢讲还是慢慢跟跳跳讲？<Is this what Hoppy told Slowy? Or Slowy told Hoppy?>

Child: 跳跳讲。。。。<Hoppy did.>

Parent/carer: 跳跳说啊？你肯定？<Hoppy said so? Are you sure?>

Child: （nods）肯定。。。。慢慢说好的。牵牛花开的时候，慢慢还没有来。<Yes. Slowy agreed but when the morning glory bloomed, Slowy has yet arrived.>

Parent/carer: 后来怎么样？还有一个朋友是吗？<What happened next? Is there another friend?>

Child: （nods）熊宝宝圆圆跟跳跳说慢慢不会来了。<Bear Yuanyuan told Hoppy that Slowy would not be coming.>

Parent/carer: 然后它怎么说呢？<What did Hoppy say next?>

Child: 跳跳说跳跳答应慢慢 < Hoppy said Hoppy promised Slowy.>

Parent/carer: 跳跳答应慢慢什么？<What did Hoppy promise Slowy?>

Child: 跳跳答应慢慢我会在门口等它。<Hoppy promised Slowy that he will wait for him at the door.>

Parent/carer: 所以呢？它又跟圆圆玩吗？<Did Hoppy play with Yuanyuan instead?>

Child: 它没有跟圆圆玩。<No, he didn't play with Yuanyuan.>

Parent/carer: 为什么呢？<Why?>

Child: 因为它答应了慢慢它会等它。<Because Hoppy promised Slowy he will wait for him.>

Parent/carer: 后来呢？<What happened next? >

Child: 后来就一个星期过了，慢慢还没有来。<1 week has passed but Slowy is not here yet.>

Parent/carer: 那跳跳怎么说？<What did Hoppy say?>

Child: 为什么慢慢还没有来呢？<Why is Slowy not here yet?>

Parent/carer: 跳跳还要等它吗？<Is Hoppy still going to wait for Slowy?>

Child: (nods)一个星期过了，慢慢还没有来。跳跳还在那边。<1 more week has passed, Slowy has not arrived. Hoppy is still there.>

Parent/carer: 那跳跳还要等吗？它有等到慢慢吗？后来慢慢有来吗？<Is Hoppy going to continue waiting? Did Slowy arrive later?>

Child: 后来它有。<Yes Slowy did.>

Parent/carer: 那慢慢来了，它说什么？<What did Slowy say when he arrived?>

Child: 圆圆说慢慢肯定是不要来了。<Yuanyuan said Slowy is definitely not coming> (the child is repeating a previous part of the story).

Parent/carer: 后来慢慢有来吗？<Did Slowy come?>

Child:跳跳说我答应了慢慢，我会等它。<Hoppy said I made a promise and so I will wait for Slowy.>

Parent/carer: 那后来呢？<What happened next?>

Child: 牵牛花忘了，慢慢还没有来。跳跳说我不要跟慢慢做好朋友了。<The morning glory has forgotten(?) Slowy is still not here. Hoppy says he doesn't want to be friends with Slowy anymore.>

Parent/carer: 后来呢？<What happened next? >

Child:跳跳要回家的时，慢慢来了。<As Hoppy is going home, Slowy appeared.>

Parent/carer: 慢慢来了。哦。那慢慢怎么说呢？<Slowy is here. What did Slowy say?>

Child:跳跳说为什么你来的更久。因为慢慢说因为。。。。因为蜗牛爬得很慢。<Hoppy asked what took you so long? Slowy said because…. because snails crawl very slowly.>

Parent/carer: 蜗牛爬得很慢，所以花了很多时间才到是吗？<Snails take a long time to crawl. That's why it took so long right?>

Child: （nods） 是。<Yes.>

Parent/carer: 哦，那你看了这故事，你学到了什么？<Ok, so what did you learn from the story after reading it?>

Child:你答应了朋友，你要做。<You must do what you promised your friends.>

Parent/carer: 很好。<Very good.>

Child 4 – Male (5 years old) retelling <*The Water Droplet*>

Child:小水滴的故事. 大海里的水经过太阳的热气变成了云。(Child fiddles with the cloud cut-out, line was prompted by parent/carer) <The story of the water droplet. The water from the sea turns into the cloud, as the sun was very hot.>

Parent/carer: 你可以把它粘在太阳的下面吗？<Can you stick that under the sun?>

Child: (child sticks on the cloud to the PVC bottle) 因为云会下，下雨。。。。。。<Because the clouds will rain, rain….>

Parent/carer: 小雨滴？<The water droplet?>

Child: (child sticks on cut-out of water droplet) 小雨滴。<The water droplet.>

Parent/carer: 又回到了？<And it returns to?>

Child: 小雨滴又回到了大海。<The little droplet returns to the sea.>

Parent/carer: 这就是？(Parent/carer prompts the rest of the sentence).

Child: 这就是小雨滴的故事。<This is the story of the water droplet.>

4.4.4 Limitations and strengths of Design probes 1

The results are not definitive that a structured parents'/carers' involvement in shared reading and craft making, can help foster the children's interest in the learning and use of Mandarin. There are factors like biasedness and the intimacy between the adult facilitator and the child participant that might have influenced the logging of observations for this investigation. The differences or limitations of individual parent's/carer's approach when facilitating the activities

might have affected how the children responded or went about their activities. Neither was there a consistent use of Mandarin in the communication between the adults and children from some of the video documentation submitted. However, this may be seen as adults using code switching to engage rather than to negate the efforts of the children.

The reading of the eBooks, facilitated as the provenance for subsequent craft activities and the documentation showed that the children were able to inject certain degree of their own individuality to the objects created. As seen from the previous section detailing the transcription of the video footage of the children's retelling, most of them demonstrated they understood what they read and a retelling clearly helped them to learn how to verbalize their experiences of reading (Cohen 1993). From the video documentation submitted, most were retelling with their craft object in hand and at some point of the recordings, there were evidence of them referring to or playing with the objects. Some of the children were also seen code-switching between English and Mandarin during parts of their retelling while others who were hardly proficient relied mostly on their parent/carer to structure their retelling and they could only plug in certain short Mandarin phrases (e.g. names of characters) during these parent/carer-led sessions.

Future in-depth investigations, with a larger pool of participants, different family demographics, more varied stories and a control group exercising without craft-making activities, would provide a better picture on how the role of adults, adult-child interaction and craft-making's materiality and tangibility, can help retain interest and knowledge. The documentation from this investigation did however shed light on how the children were injecting their own individuality into the craft objects, and that they were at ease when reading and crafting within their homes. It is possible to infer that hands-on activities such as craft-making, can be further tailored to provide a more enriching reading experience, as they meet the needs and interest of the preschool children and their parents/carers. It was clear that parents/carers involvement in structuring and facilitating part of the experience was helpful. Regardless of their exposure to mobile technology, the children were still keen to spend time with their parents/carers.

From the perspective of design research, this indicates that the development of screen-based edutainment preschool resources requires more than just better narratives and audio-visual content. The understanding of child development, play, the recognition of their creativity, the engagement of adults and even site specificity should be key considerations for any designer/educator/manufacturer, instead of piling on enhancements that do not relate to the stories or enrich the reading experience.

4.5 Design probe 2 - Monsters on the Move application

This set of design probe is part model kit and part browser-based learning journey. It is targeted at preschoolers who are more proficient in English and whose parents/carers are interested in introducing Mandarin characters for sight-reading. It builds on the previous idea of a craft-object as a toy that children can disassociate from the mobile application, but when coupled with the content on the device, contextualizes the learning with a physical play experience. It was also designed to coincide with the child's development of oral literacy and serve as an introduction to basic Mandarin characters in simplified form. The craft component is made easier for the parents/carers and their children by the provision of pre-cut cardboard model kits, but the children were still allowed some degree individualization. The probe also served to investigate how parents/carers would choose to prepare and engage their children.

4.5.1 Methodology for Design probe 2

Image 35: **Co-creating cardboard bus/smart phone holder with parent/carer**

The parents/carers facilitated the craft making with the child prior to accessing the mobile application. The craft vehicle could easily be pieced together by slotting together pieces of pre-cut cardboard model kit. After the vehicle was constructed, the child would decorate and personalize it (refer to Image 35). The cardboard vehicle would also serve as a carrier for the parents'/carers' mobile phone. The craft object designed for this probe was that of a cardboard bus. Once assembled, the cardboard bus could be pulled or pushed along and hold

a smartphone. The parent/carer would help the child slot on the mobile device into the craft vehicle they had just worked on.

The design probe's interactive component was developed on a wordpress blog (Momx.bigbrownmonster.com 2016) and intentionally built as a browser experience, so that it could be field tested across different makes of smartphones. It was modelled after the previous 2 probes by incorporating a brief narrative and audio-visual elements in the blog with an element of an "Easter Egg Hunt", where the player has to collect and scan a series of 12 QRcodes via a third party free-to-install code reading application, such as QR Code Reader by Scan, Inc. (Scan 2016). The probe used the inherent camera capture function to scan in the QRcodes. The capturing of the correct code triggers the appropriate page and audio playback to load on the browser.

For this probe, the on-screen visuals were designed to simulate a bus interior. The premise was for the child to role-play as a passenger travelling with other little monsters on the bus. The narrative then introduced the child to a series of simple questions/riddles in English, requiring the child to relate to one of the 12 picture cut-outs he/she had prepared with the parent/carer prior to the game (refer to Image 36). When the child answered correctly to the parent/carer, they would see the object being introduced onscreen as part of the scenery outside the bus window. The child would hear a short audio clip of a sentence about the object in Mandarin (refer to Part (v) of Appendix G). These sentences helped parents/carers contextualize how the objects relate to what they might see when they travel on the road.

The visuals on the website were intentionally designed to be simple, two-dimensional and in bright cheerful colours. The character designs in the application were a small group of anthropomorphic "monsters" passengers, which were being ferried about by an adult "monster" narrator (refer to Image 37). The player would then be prompted to locate the cut-out of the same object as displayed on screen. These physical cut-outs were strategically left around the play area by the parent/carer before the game. Upon locating the cut-outs, they were to scan in the corresponding QRcode next to the cutout. When the code is scanned, the player would be directed to a "flashcard" page that introduced the word (in Simplified Chinese, Pinyin and English) and played back an audio clip of the word in Mandarin and English (refer to Image 38). The scanned item would be tallied and displayed as part of the child's achievement page (refer to Image 39). The child would then move on to answer the next question and locate the next cut-out.

Image 36: **Physical cut-outs prepared by the parents/carers and children**

The probe involved a greater degree of physical interaction and movement on the part of the children, as they had to locate the items placed in the play space within their homes. Like the previous probe, the child participants had to answer a questionnaire (refer Part (vi) of Appendix G) after the activity and were also awarded a certificate to encourage them to craft and learn Mandarin in the future.

Image 37: **(1) Introduction bus stop scene, (2) player is prompted to scan his/her travel card code, (3) & (4) simple questions to guide children to locate the correct cut-outs and QRcodes.**

Image 38: **12 "flash cards" from Monsters on the Move game**

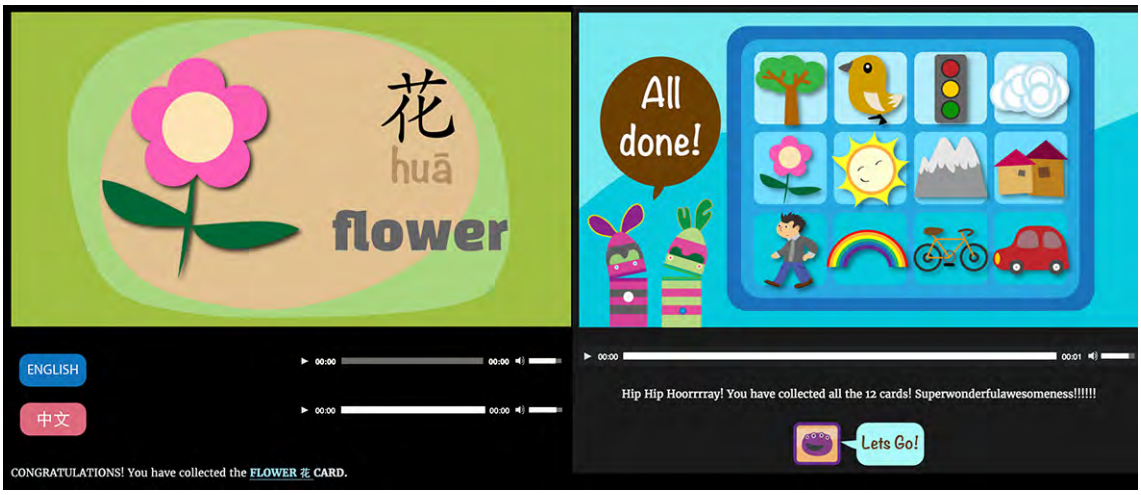

Image 39: **"Flash card" page with English and Mandarin audio clips and album page tracking the child's progress of the hunt.**

4.5.1.1 Parents/carers as facilitators and documenters

Unlike the earlier probes, there was no shared reading component in this set of activities. Instead the parents'/carers' role involved strategically deploying the home space as a space for learning. Parents/carers, in this activity, served as phonological guides, helping to scaffold emergent oral literacy, with print knowledge.

Parents/carers would facilitate a joint-craft session with their child, where they co-created a series of cut-outs of the objects, each with its corresponding QRcodes, and placed them, ideally around the children's play area within their homes (refer to Part (iv) of Appendix G). In the craft activity, the parents/carers were encouraged to go through the 12 words with the children and reinforced their memory of the words when preparing the object cut-outs. They were also advised that they could substitute the templates provided, with cut-outs from magazines or newspapers or even allow their children to draw their own representations of

the 12 objects. These approaches were in line with the advocacy of the use of the child's awareness of environmental print within their surroundings, in deriving meaning and helping with their emergent literacy, as such ubiquitous prints can provide many opportunities for spontaneous learning experiences and situated literacy practice (Kuby, et al. 1999).

Like in the previous probe, the parents/carers were reminded of the comfort level of their children and they should not be pushing to complete either the craft making or the game, over a single session, if the children expressed discomfort or tiredness at any point during the activities. The parents/carers were also involved in logging their children's behaviour and document the use of the craft objects and mobile application. In contrast to the previous field activity, they were also asked to reflect on the activities conducted based on the following questions: (1) if there was too much preparation work on their part, (2) if the suggested instructions helpful in their planning, (3) if they found the craft activity with their child engaging and (4) if the craft work was helpful in providing a more meaningful context to the subsequent play experience.

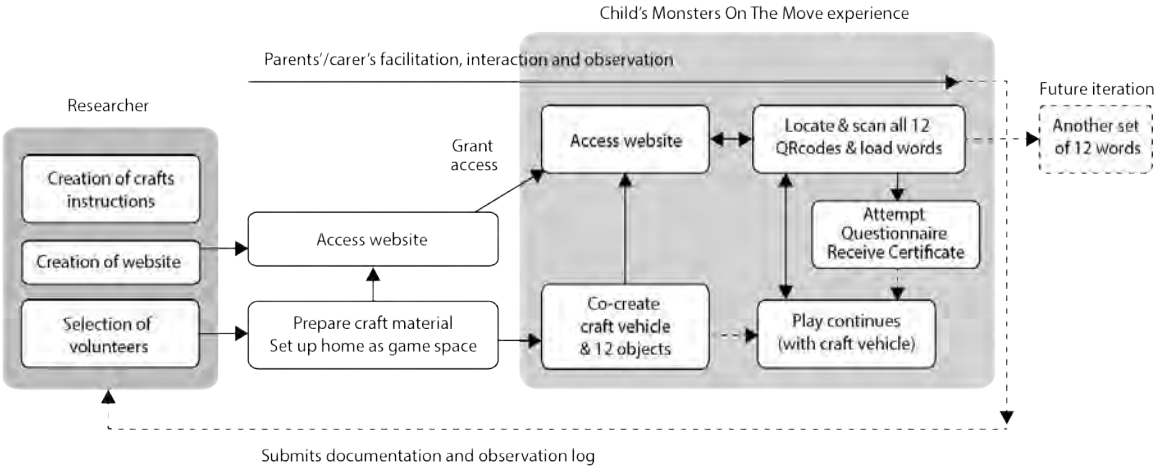

Figure 19: **Methodology for Design probe 2**

4.5.2 Results from field activities for Design probes 2

The collated results can be referred to at Part (viii) of Appendix G. A total of 3 children participated in the activities. 2 of them were 4-year-old twins and the 3rd child was 3.5 years old when the activities were carried out. They were selected because their family backgrounds (bilingual ethnic Chinese Singaporean migrant families in Melbourne) were ideal for the field activities. They had noted that maintaining their HL was a priority in their families. The 2 families were also similar in their bilingual background, with parents/carers being effective bilinguals but since their migration, their children have either lost the use of the HL or have difficulty maintaining it in the face of acculturation, when they began preschool in Australia.

Like the parents/carers who were surveyed in Appendix E, the participating parents/carers pointed out that they did control the duration on which their children can access their smart

devices though the frequency of access was varied across families. All of them noted that their children required constant encouragement to engage in the use of Mandarin, and they would also occasionally spend time doing craft activities with their children.

The children took between 1 to 3 sessions to complete the craft activities. Neither of the parents/carers chose to substitute the templates provided, with cut-outs from magazines or newspapers. Their children also did not choose to draw their own representations of the 12 objects. They then spent 30-60 minutes going through the website's questions and collecting all the 12 related "flashcards" via their scanning application on their smartphones, within their designated play areas at home. The children's interest in the craft activities and the access of content on the devices saw them through the exercise and all the children were observed to have played with the completed craft object (without pairing with the phone), before and after the field activity (refer to Image 40).

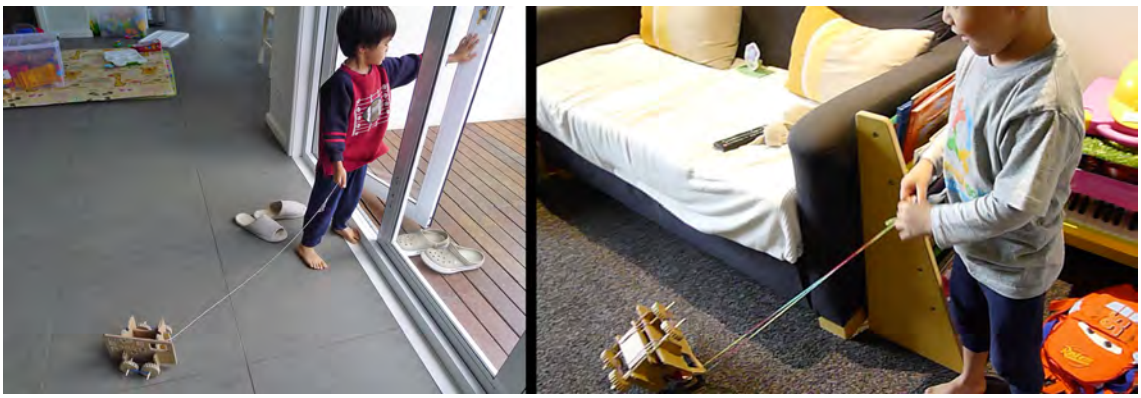

Image 40: **Children playing with their craft vehicle, without pairing with their parent's/carer's mobile phones.**

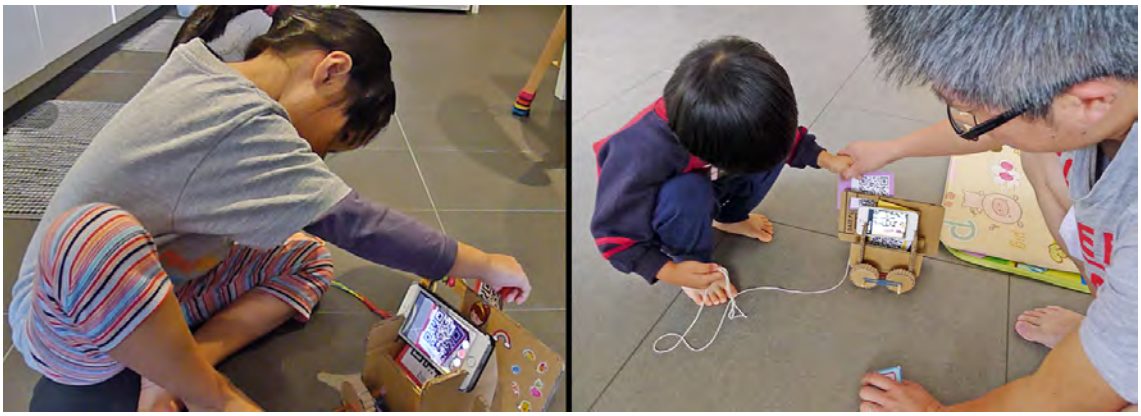

Image 41: **Children scanning in QRcodes either independently or with assistance from their parents/carers.**

These children, like those surveyed earlier and the participants in the previous field activities, expressed enthusiasm when told that they would be accessing content on their parents/carers smart device (refer to Figure 20). The responses were mixed in terms of how long it took for

the children to learn to navigate through the content and scan the objects. From the photo and video documentation, the children got better at toggling between the scanning application and content on the browser as the activity progressed, hence the parents/carers gave a "somewhat" response, when asked whether their children could complete the tasks independently (refer to Image 41). The children were interested in the task and all 3 were able to complete the tasks within a single session.

The parents/carers did not mind the amount of work that went into the preparation of the craft activities and play sessions. All of them felt that the experience was generally a positive one. They found the instructions provided helpful and the shared time with their children on the craft activities, engaging. They also noted that it gave a more meaningful context to both themselves and their children, when they started playing with the content on the browser. Comments were gathered and they included a suggestion for the on-screen content to be experienced on a tablet, as the media playback button on the phone were too small to be tapped effectively by the children. One of the parent/carer noted that his child picked up the Chinese word easily during the session and the activities might have made it easier and more interesting for him to do so.

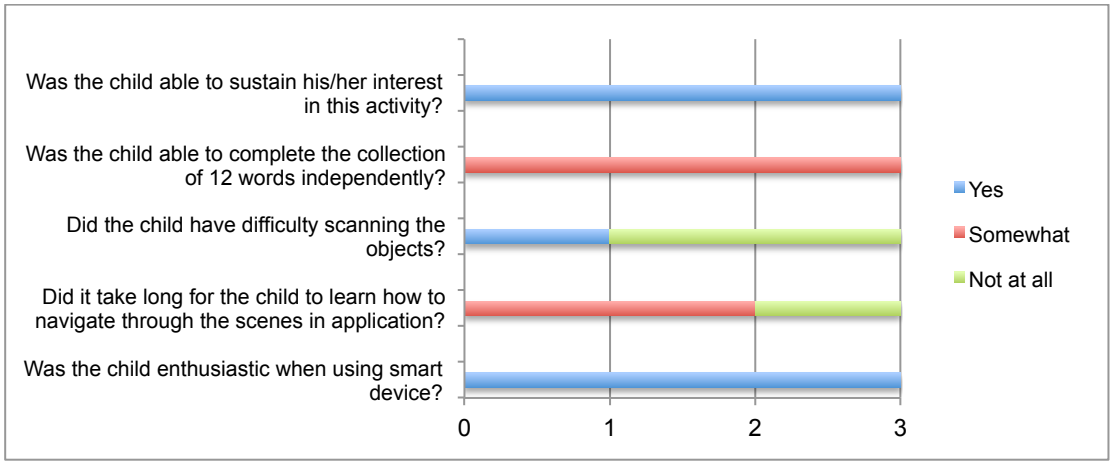

Figure 20: **Observations of the children using the probe**

With reference to the children's questionnaire, the children answered most of the questions positively except for the 4 technical questions, which required them to remember and recognize the 12 Chinese words that were introduced to them during the game. As they had no prior exposure to these characters or words, they were only able to answer these questions after the parents/carers prompted and helped to translate them into English. After this, the children were awarded a "Certificate of Completion" to encourage further reading and crafting (refer to Part (vii) of Appendix G).

4.5.2.1 Transcripts of selected interactions

The interactions between parents/carers and their children during the hunt were video recorded and a transcription of a few of these sessions will be discussed in this section. The video clips captured the facilitation involved by the parents/carers in helping the children progress through the hunt. Where applicable, the sentences within <> are the English translation accompanying the original speech articulated in Mandarin.

Child 1 – Female (4 years old)

(Upon finding out the next object is the Sun)
Parent/carer: What's this?
Child: 太阳 <Sun>…(Pronunciation is off)
Parent/carer: 太阳<Sun> (Correctly pronounced). Now wait, listen to the story (sentence) first.
Website playback: 中午的太阳高高地挂在天空上。<The afternoon sun is hanging high up in the sky>
Parent/carer: 中午 is afternoon. The afternoon sun is hanging high up in the…?
Child: Sky!

(Upon successfully scanning a QRcode for traffic lights)
Parent/carer: What's this? Traffic…
Child: Traffic lights!
Parent/carer: 红绿灯。红色 <red> is which one? Is it red, yellow or green? 红色 <red>…
Child: (Points to red)
Parent/carer: Yah red. Then which one is 绿色 <Green>?
Child: (Points to yellow then changes to green)
Parent/carer: Yes, that's green. This is 黄色 <Yellow>.
Child: 黄色 <Yellow>.

Child 2 – Male (4 years old)

(Upon scanning in the flower card)
Parent/carer: What's this?
Child: I don't know (says cheekily)
Parent/carer: Flower, 花 <Flower>
Child: 花! <Flower!>
Parent/carer & child, after listening to playback again: 花!
Parent/carer: There…how many more cards do you have left?
Child: Eight!

(Upon scanning in the bicycle card)

Parent/carer: So what's this?

Child: Bicycle!

Parent/carer: 自行车！<Bicycle!>

Child: 自行车 <Bicycle> (Pronunciation is off)

Website playback: 自行车 <Bicycle>.

Child: I said it 自行车<Bicycle>.

Parent/carer: Yah you said it, I know.

Child 3 – Male (3 years old)

(Looking for the Bird cut-out)

Parent/carer: (Guiding the child) 那是不是鸟？<Is that a bird?>.

Child: 不 <No>.

Parent/carer: 不是哦。 那我们再去找。<That's not it. Let's try to find it again.> 那么鸟在哪里？<Where is the bird?>.

Child: 鸟在。。。。(searches around the play area, pulling along the cardboard bus with smartphone) 鸟在哪里? 鸟在哪里？<Where is the bird….where is the bird?>.

Child: Yeah! This one is here!

Parent/carer: Yeah! 找到了 <Found it>！

Child: 找到了<Found it>！

(Upon finding the Cloud cut-out)

Parent/carer: 白云在蓝天上飘着。Shall we scan the QRcode?

Child: Yes!

Parent/carer: Ok, 我们来 scan.爸爸帮你。Scan the QRcode (points to the capture window on screen).

Child:（scans correctly on his own).

Parent/carer: Oh！对了！ Good scanning. There…what is this?

Child: Cloud.

Parent/carer: (Taps on audio playback in Mandarin) 云 <Cloud>.

Child: 云 <Cloud>.

Parent/carer: (repeats in Mandarin) 云 <Cloud>.

Child: (repeats in Mandarin)云 <Cloud>.

Parent/carer: 对了！ 云 <Cloud>. Wow, you got another stamp!

Child: Another one！

(Looking for Bicycle cut-out)
Parent/carer: What's that?
Child: Bike.
Parent/carer: A bicycle. 那我们听听华文叫什么 <Let's listen to what it is in Mandarin>.。
Website playback: 在路上骑自行车时要小心 <You have to be careful when cycling on the road>.
Parent/carer: 自行车, 自行车 <Bicycle, bicycle>.
Child: 要小。。。<Have to….>.
Parent/carer: 要小心, 对了...会不会讲自行车？<Have to be careful, that's right. Can you say bicycle?>.
Child: 自行车，要小心。<Bicycle, be careful>.
Parent/carer: 对啊，在路上骑自行车时要小心。那我们去找 bicycle…where is it? <That's right, we have to be careful when cycling on the road. Now let's go find the bicycle…where is it?>.
Child: (Runs away to find the cut-out)

The above transcriptions clearly described the limited HL proficiency across the 3 children participants (Child 3 being slightly more frequent in his use of HL), and the willingness of the parents/carers to code-switch between English and Mandarin when engaging with their children. All 3 children were repeating after their parents/carers, whenever the adults reiterated what is played or displayed on the device. The children did not repeat immediately what they heard from the audio playback, thus showing the relevance of the parent/carer in getting the children to enunciate the words or part of the sample sentences, as seen in Child 3's final transcript. The constant feature in the photo and video documentation was their play with cardboard toy buses and their interest in scanning and completing the task. This relates back to previous chapters about how technology on mobile devices and physical toys remain a draw to the children and it should be leveraged to help with exposing them to HL usage.

4.5.3 Limitations and strengths of Design probe 2

The main limitation for this probe was the small sample size. Only 2 sets of parents/carers and their children had the opportunity to test this set of activities. Due to the small number of participants, the intended impact of content on the children's interest in using Mandarin in their future speech was not conclusive. Like the previous probe, the lack of a control group meant that this was an initial investigation. Limitations of using a browser-based content are the lack of auto-play support for audio clips on mobile devices, the lag in loading media files and appearance of browser address bar and buttons upon the loading of media. These are minor inconveniences that the children did not seem to mind but had to be rectified by the parents/carers. The presence of the child's existing toys in his/her familiar play area at home may be distracting and would require parents/carers to keep them on task. Future research

would benefit with a longitudinal investigation with sustained user-testing, more developed suite of content, across wider demographics of family background.

However there were some results and aspects from the documentation that pointed to the potential of such a blended approach. There was a correlation between the children who needed constant encouragement to converse in Mandarin, and their subsequent level of enthusiasm in the crafting and play activities, as well as willingness to engage with a more technical questionnaire (refer to Part (vi) of Appendix G). But there was prompting and translation from their parents/carers when attempting to answer the questionnaire. The choice of using English text to drive the narrative differed from the sole use of HL text in the Dudu eBooks in previous probe. The English text probably made the children, who were not proficient in HL, more comfortable and willing to engage with the narrative. Thus a better narrative, with richer plot and character development could be deployed in this probe, to capture greater interest in the children. The parents/carers, being bilingual, also code-switched frequently to engage the children and they tried their best pronouncing of the words/characters, referencing to the Pinyin on the webpages.

Nonetheless, by having children to create their own craft toys and playing in a familiar space allowed them to relate to the space better during the hunt. They were also able to exercise their routine of taking and packing away craft material as it was situated in their homes. With reference to the toys surveyed in recent years (refer to Appendix B), the trend in crafting, personalization and exploration of creativity could be something worth exploring in future research.

In terms of content development, using the tried and tested gameplay of an “Easter Egg Hunt” had been effective. There were no complicated rules and the simple instructions transmitted by the parents/carers on how to put together the vehicle and scanning the objects during the hunt, meant that parents/carers could scaffold themselves readily into their children’s learning, rather than spending time reiterating and clarifying the gameplay. It was also intentionally created on a simple blog to illustrate to the parents/carers that preschoolers do not need fancy applications to be kept occupied or interested, and that it was something that they could consider creating themselves. Material-wise, by incorporating designs that use readily found material such as paper and cardboard, helped to boost confidence in parents/carers who might otherwise be uncomfortable with spending additional resources in such activities. In future iterations of this probe, other vehicle cardboard carrier with new set of words may be introduced, while the development of a HTML5 or native application for related devices may be better for greater interactivity or more enriching personalization for end users.

4.6 Design probe 3 - juBloks

While the previous 2 design probes were designed for preschoolers who were beginner learners and not necessarily conversant with HL use, juBloks is designed for children and parents/carers who are more conversant in Mandarin, had learnt some basic Pinyin or older children who have had consistent exposure to their HL. juBloks would also require the learning of a new schema of a basic set of 320 Chinese characters. These characters had been categorized into 15 major groups. These would have to be learnt by the parent/carer, before teaching it to their child. The idea is for children who have yet been able to recognize print, but whom are phonologically more aware, to use associated visual tools to learn about constructing simple Chinese sentence. As the methodology has a steeper learning curve for both adults and children, this probe was not field-tested on other children except for Yx. However it served as a potential extension to the investigation on how HL can be maintained with the use of mobile devices and tangible interactivity.

4.6.1 Methodology for juBloks

In Chinese, knowledge of the 1,500 most frequently used characters[64] constitutes the threshold of literacy, and it is considered important for students to recognize characters, combine them into words, and then understand the words' meanings (Jing 2009). It is too many for preschoolers to learn and a shortened list of Chinese characters or phrases would be more suitable.

***Image 42*: Sample of characters and phrases from New HSK level 1 Vocabulary (HSK 2016). Screen capture from hsk.academy/en/hsk_1**

[64] Ministry of Education of the People's Republic of China lists 8105 Chinese characters. (China, Ministry of Education of the People's Republic of. 2013. *Table of General Standard Chinese Characters*. China: Ministry of Education of the People's Republic of China.)

However there is no such official list for this age group and the next most relevant list of 150 characters/words targeted for beginners' level was sourced from various international HSK[65] (Hanyu Shuiping Kaoshi) websites (refer to Image 42). It was felt that the HSK list did not adequately reflect some of the words and phrases Yx had been using as a pre-schooler, and as mentioned in previous chapter, some phrases used were also more relevant for use in China, and are hardly used by ethnic Chinese migrants from other parts of the world.

Thus a survey of 25 Mandarin storybooks (refer to Part (i) of Appendix D) from the Junior Readers Section at Monash City Library, Glen Waverley branch was conducted from May to June 2014. A list from the reading of 25 books was cross-referenced with the pre-2015 HSK list[66] and tallied to 320 characters. The words were grouped into 15 broad categories. Characters were associated with a maximum of 3 categories as anything more was deemed confusing for young learners. The 15 categories are: (1) objects, (2) common words, (3) food, (4) colours, (5) fire/heat, (6) feelings/emotions, (7) directions/positions, (8) sounds/voices, (9) quantifiers/ comparisons, (10) body parts/pronouns, (11) animals, (12) water, (13) actions, (14) time, (15) place/locations. These categories were assigned their respective icons and they were introduced to Yx as how commonly used words can be grouped (refer to Image 43).

Image 43: **15 character/word categories for juBloks**

[65] China's official test of Chinese language proficiency for non-native speakers. It is open to foreign students, overseas Chinese, and members of ethnic minority groups in China, and aims to provide a global standard for Chinese language proficiency. The tests are administered from beginner to advanced level. The test is administered by Hanban, a non-government organization affiliated with the Ministry of Education of the Chinese government. As of October 2011, The Confucius Institute at the University of Manchester is an official HSK Test Centre for the HSK Department of the National Office for Teaching Chinese as a Foreign Language of the People's Republic of China (Hanban).

[66] The New HSK Levels were introduced in 2015, hence it was the old list that was being referred to when the survey was conducted in 2014.

The categories are not exhaustive but it sufficed for Yx to engage in her visual thinking by cognitively relating what she wanted to express with a prescribed image. Hence Yx learnt to recognize and associate characters and phrases in a broader context of these icons rather than just the isolated memorizing of individual characters or with their respective Pinyin.

4.6.1.1 Initial version of juBloks

The initial version of juBloks involved the creation of a set of character cards (refer to Image 44) with the related category icons and Pinyin printed on them. The cards were labelled with the alphabets describing the initial sounds (consonants) of Pinyin[67] and the categories that the characters have been grouped under. The cards were then placed in a deck, while the labels of 15 category icons were printed and adhered to Yx's toy construction blocks. She was roped in to assist with the preparation of the labelling and that was used as the opportunity to explain to her what each icon signified and what kind of common words are associated with it.

Image 44: **Sample word cards**

The basic rule of the "sentence construction game 造句游戏" was simple. She had to construct a short full sentence mentally, then associate those words with the corresponding physical construction blocks and "construct" it in a serial manner. Yx was not told specifically that her basic Mandarin sentences had to be constructed in subject-verb-object structure since the emphasis is to keep the exercise fun and not too structured. Then she would attempt to draw out the associated cards from the deck and place them alongside her "constructed sentence". As Yx was not able to recognize most of the printed characters, she would rely on the icons and initials as guides to choosing the characters. As the deck had only limited numbers of characters, there were gaps in the cards that are selected and the role of

[67] Pinyin syllables used in standard Mandarin are made up of a system of initials (consonants) and finals (vowels). There are 4 tone variations that are often used with the vowels, though not all 4 tones exist for each syllable (Archchinese.com. 2016. "Mandarin Chinese Pinyin Table." Accessed 26 January 2016, http://www.archchinese.com/chinese_pinyin.html.)

the adult/carer is to then go through the cards and verify her logic for choosing the cards. If the cards were incorrect or missing, then they will be replaced or written in by the adult/carer (refer to Image 45).

Image 45: **Initial version of juBloks**

4.6.1.2 Prototype juBloks application

A tangible interaction approach was adopted to develop this design probe. The application was developed collaboratively with CYSquare.com, a local iOS developer, as a proof of concept. The application uses existing open source 2D barcode (code 128) reader API (application program interface) and inherent camera capture and audio playback capabilities on iPhones. The application would be comprised of 2 components for the child and parent/carer respectively. The child component allows access to the game and has an in-application album where the child can capture his/her construction. The parent/carer component to be developed for future iteration of the probe, would allow the parent/carer to author and record a set of sentences associated with preloaded or in-album pictures/photographs. The author could match category icons with the words/characters that he has inputted and assign up to 4 self-authored sentences to each picture. The parent/carer would also be able to allocate the number of sentences for the child. However in this probe, only the child's component had been developed as a proof of concept for HL learning.

For the pre-game activities, the parent/carer printed out the sticker icon-2D barcode labels of these categories. Like the earlier trial, the child would be enlisted to help select his/her toy objects for "upcycling" into controllers for this game and parents/carers would also use this opportunity to talk about what the categories meant.

For this probe, the application is preloaded with a set of 4 pictures and each had been assigned 4 different sentences (refer to Image 46). After launching the application, the child selected the picture to begin the game with. The application allowed the child to construct the sentences in 2 ways, either by allowing category icons hints to be displayed or to be played

without the hint, by relying on his/her understanding of the spoken words and their related categories (refer to Image 47). Unlike the earlier card version, there will be no Pinyin displayed on screen as this application is created to assess the child's ability to recognize the words/characters alone without the reliance on Pinyin.

Image 46: **4 pictures with their corresponding groups of 4 sentences**

Image 47: **(1) Child's component interface. It allows access to the game and in-application photo album. (2) When the game component is tapped, the child is allowed to choose which photo/picture he/she would like to start with. (3) When Photo A is selected, he/she will be given a choice as to how he would like to play – by choosing to display the category icons as hint (show juBloks) or by starting to scan in the object without visual hints. (4) The child selects to display hints, he taps on the yellow play button to play back the audio recording of the sentence and then finds the corresponding category item to scan. (5) If the child did not opt to display hints, the icon will appear when he/she scans in the correct category. He/she then proceeds to turn the object to scroll through the options onscreen before choosing the correct words/characters.**

Category-specific 2D barcodes were generated with the icons into labels that were then printed and adhered to existing toys. Each category label had 5 unique 2D barcodes, of which 4 denoted the different word options and 1 for confirmation of the child's choices. The child simply turned the object on its sides to scan the different codes and to scroll through the options available on screen. Once he/she made the choice, he/she would have to tilt the object to scan a top facing code to select the option.

Image 48: **(1) Category labels with 2D barcodes adhered onto child's upcycled toys. (2) Child turns object on its 4 sides to scroll for onscreen options. (3) Child tilts the object to use the 5th code to select her option. (4) Child's "constructed sentence".**

All scanning is done via the phone's front-facing camera. These toys, with the category labels and codes attached to them, became tangible controllers for the child. The child no longer needed to sieve through the physical cards. Instead, he/she matched the audio recording to the onscreen character/word and parents/carers did not have to correct the choices (refer to Image 48). Once all the icons were correctly matched with the characters/words, they moved on to the next picture for the next set of sentences. If the child chose an incorrect category object to scan, the application would not register the choice, but if the child made a wrong choice of words/characters, he/she would be prompted to reselect a choice. When the sentences for each picture/photo were complete, the child was prompted to visually document his/her physical "constructed sentence" and the photograph stored in the in-application album.

4.6.2 Discussion of juBloks

The methodology applied for this application-based design probe differs from probes 1 and 2, but is similar to the early probes (refer to Figure 21). The role of parents/carers was reduced during the child's time spent with the device. The cursory involvement was for troubleshooting the inconsistency in code capturing by the front-facing camera, due to either poor lighting or camera angle. When craftwork was substituted with the upcycling of preloved or existing toys, it changed the parents'/carers' role from a collaborator-facilitator to that of a tutor-facilitator.

The type of toys used played a part in whether the physical play continued after the completion of the application. As this probe was utilizing construction blocks, Yx was observed to have tried to construct her own sentences through various builds. Currently as the adult module had not been developed nor was it field-tested with other children, it was not possible to review the child's progress over time and provide conclusive results.

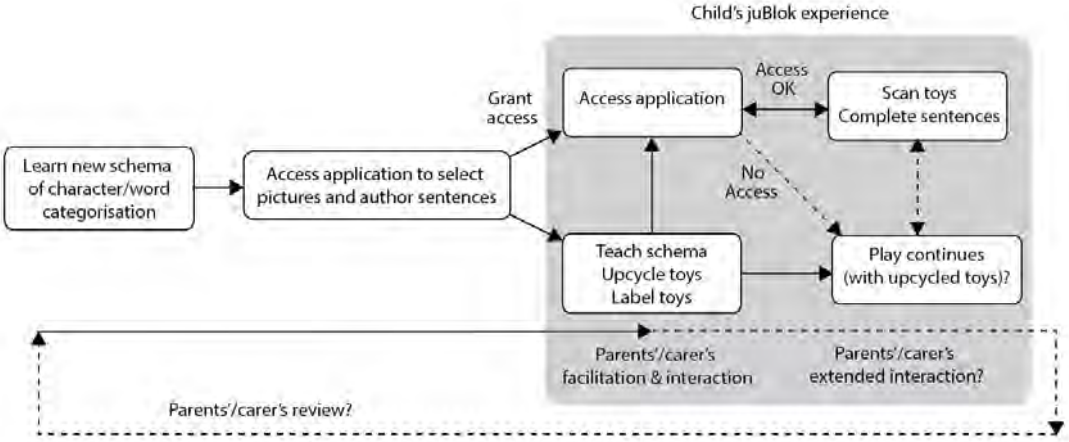

Figure 21: **Methodology for Design probe 3**

Nonetheless this probe allowed HL learners to cognitively associate words they might already been using on a daily basis into broader categories, giving them another layer of context in which they would use Mandarin. Unlike traditional rote learning methods of Mandarin characters and sentence construction, when words/characters and their related categories were accessed non-sequentially, these parts of memory were recalled as if they were next to each other (Chiong, et al. 2012), therefore potentially allowing greater association between the characters and their wider context of use.

This probe also relied on the child form his/her own relationship with the transformation of his upcycled toys into tools and controllers for on-screen changes. The physical construction of sentences by arranging/rearranging a series of toys/craft objects may help the child gain confidence in his/her use of HL speech. In future iterations of this probe, it may even be useful to include speech recognition capabilities with physical and interactive features for deployment in speech therapy (Kanopy 2014; Hamidi 2010).

For now, the zero-to-low cost adaptation of upcycled and preloved toys might be attractive to parents/carers as they could explore the materiality and tangibility of objects when interacting with the mobile device. Similar ideas of modular play have also been explored in recent interactive computational construction kit like Cubelets (Modrobotics.com 2016) and Littlebits (Littlebits.cc 2016), which encouraged children to experiment with a collection of modular tools such as sensors, power source, mini processors and motors to create simple programmable robots or working circuitry. They utilized a parallel distributed computing model and a multimodal interface (actual objects and programming or controls that were

accessed via mobile devices) so users could explore patterns and engage in simple programming. Future iterations of juBloks could potentially explore similar technological approach, using sensors and mechanical manipulations to remove the reliance on device-based feedback.

As a preliminary exploration, there were several limitations to this probe. It would need to involve greater input terms of linguistic expertise for content development, if it is to serve as a language eLearning tool for promoting print literacy. The idea of involving the same set of physical toys in more creative play in its post-application experience should also be looked into. A more thorough investigation with a larger sample pool of subjects, a control group using the initial juBlok design rather than an application-based design, differing demographics in parent's/carer's proficiency in Mandarin and involvement of preschoolers with differing HL abilities, would paint a clearer picture of its overall effectiveness.

4.7 Chapter summary

The design probes used for the research has given an overview of how different degree of parent/carer involvement, the use of external conduits such as craftwork and existing toy objects and screen-based application might affect the level of engagement with preschoolers. Each probe had attempted to fulfil most of the research premises as highlighted in the previous chapters, and as a whole body of work, they represent possibilities into methods that reference back to the framework. As noted in previous sections in this chapter, there were limitations within their designs and how they were tested in the field, but the documentation of the probes had also surfaced interesting correlated results and observations.

One of the areas that the probes tried to do was to integrate the exposure to Mandarin print into their activities, like shared reading and basic character/word recognition. Situated literacy practice such as the use of environmental print (product labels, road signs and advertisements), can communicate meaning and provide many opportunities for spontaneous learning experiences/ situated literacy practice (Commonsensemedia.org 2015). Existing research on English-speaking children has found that knowledge of print during preschool may be correlated to their later performance in word recognition, spelling, and reading comprehension (Dickinson, et al. 2003; Neumann, Hood, and Neumann 2009). In studies conducted on 42 pairs of mothers and children in Taiwan, the results indicated that Taiwanese/Chinese parents placed an emphasis on print in their interaction with their children. It also suggested that explicit use of print referencing interaction strategies during shared reading as being helpful in the development of print concepts skills in children (Chang, Luo, and Wu 2016).

The results from the probes did indicate that there was some degree of sustained interests in the language resources after the initial run of the activities, especially in instances when

parent/carer were involved in frequent and structured interaction. The children were observed to refer back to the devices and the resources installed on them more so than their finished craft items, but the collaborative endeavour between parent/carer and child was not lost. In Vygotskian view, the artefacts in the social and cultural environments would have played an important role in assisting the development of the child and helped to shape his/her developmental skills, though it would be difficult to pin down the transfer of specific skills during the course of collaborative craft-making within the home space.

As elaborated earlier in the chapter, the probes were not meant as completed works or solutions to the problem. They were embodiments of the research processes and tools for addressing the research question, with intentions to deliver results focused on the parents/carers and the children who have participated in the field activities. The probes were also not meant to be aestheticized and to be regarded as unique creations. Neither were they commercial prototypes to be gauged for technical testing, sturdiness, and safety of mass production. Instead, they had to come across to parents/carers volunteers as something safe, useful and worth their time for participation as research collaborators. Lastly, there is a concern of these probes being labelled as art and treated as political or social statements (Koskinen 2011, 98) once they are situated within a conventional gallery space (as in the case of the impending exhibition examination). The presentation of the probes and other design research evidences would have to circumvent any of such possible readings within a gallery.

The following table (Table 20) summarizes the key points and findings for the design probes that were developed for this research.

Design Probes				
Objectives		**Approaches**		**Methods**
Conduits for HL transmission & learning Not to create "finished" prototypes		Tangible interaction Play Customisation		Mediated Action-centric Cognitive association Flexible/sharable use
Probe	**Early probes**	**1: Dudu Craftwork**	**2: Monsters on the Move**	**3: juBloks**
Association with emergent literacy	Phonological awareness Associate craft with oral HL transmission	Phonological awareness Associate craft with print on eBook (shared	Phonological awareness Associate craft with environmental	Print and phonological awareness Associate toys and simple

		reading)	print (with audio prompt)	visuals to word groups (with audio prompt)
Method	Parent/carer-child interaction within home space HL specific Content-based approach Craft-making	Parent/carer-child interaction within home space HL specific Content-based approach Craft-making Shared reading	Parent/carer-child interaction within designated home space HL specific Content-based approach Craft-making Word/character recognition	Parent/carer-child interaction within home space HL specific Limited hands-on activity Word/character recognition Basic sentence construction
Effectiveness	Highly customized Culturally specific too Disassociation of play object and device	Interest in Mandarin resource and engagement in HL Craft object retained interest post activities	Limited interest in Mandarin resource and engagement in HL Craft object retained interest post activities	Upcycling of toys Word recognition
Limitations	Not field tested No craft-specific content on device	Need larger pool of subjects, different demographics, control group and longer duration in future tests Subject to language proficiency of the children		Not field tested No craft-specific content on device

***Table 20*. Overview of chapter on Design Probes**

Chapter 5
Discussion and conclusion

5.1 Overview of research

This thesis looked at how migrant bilingual ethnic Chinese parents/carers could better use mobile devices to help their children maintain the use of HL at home. Chapter 1 had covered the background in HL maintenance by migrant Chinese families abroad and how my personal narrative not only paralleled it but also provided the impetus for this research. The thesis then surfaced recent researches in HL maintenance, its various push factors and proposed approaches in helping parents/carers who are concerned with it. The focus was to reduce acculturation's impact on language shift and the approaches would be for a young HL learner, by building linguistic skills that complement realities of how the HL is used within his/her ethnic community and the immediate family, and also bolstering one's cultural identity.

With this as the provenance, the research in Chapter 2 mapped socio-constructivist theoretical considerations onto the choice of the preschoolers' home as the learning space. The potential of mobile technology as an enabler for HL learning and the deployment of play and parent/carer-child interaction as the method for HL transmission and maintenance, were also discussed. The migrant's home space is recognized as the space where it has the opportunity for intergeneration transmission and support, access to multimodal channels of transmission and the physical material for active learning. The attitudes towards the transference of technology was also investigated with a survey directed at parents/carers and a field activity was conducted to gauge children's ability to navigate non-linearly and access content on mobile devices. These provided not only an understanding of the driving factors for both parent/carer and the child in using mobile technology, but also how such technology is now truly ubiquitous. Results from a survey of commercially available Mandarin language learning resources also indicated that there are issues that needed to be dealt with; hence a rethink of the design approach is timely. Play was also highlighted as the key methodology for its socio-constructivist relevance to learning in children. For a framework to be applied, the attitudes of ethic Chinese parents/carers towards play were explored and matched with the realities in recent toy consumption and design, especially in the understanding of how design affordances make a toy object work for the child.

With the field mapped, a theoretical framework modelled after Vygotsky's ZPD, Mediated Action Triangle, and using Play as methodology, was proposed in Chapter 3. The actualization of the theoretical framework relied on considerations made when designing for, and working with, children over a series of actual probes. As the focus is on young children, a survey of popular preschool television programmes highlighted what would be constituted as viable visual appeal to them. Considerations on what are viable factors to parents'/carers'

were also made when they were involved in the field activities for this research. Considerations, such as safety and sustainability, for parents/carers were also mentioned and integrated into the design of the probes, used for supporting the proposed framework.

In this final chapter, the proposed theoretical framework will be gauged across the different methodologies, related with results gathered from the design probes and the role physical interaction design played in the design probes. The thesis will then conclude by looking at the potential and limitations to the methodologies used, foreseeable issues with mobile technology and the plausible integration of other innovations into the design of probes for young children. A projection of its real world application into the design and consumption of such products will also be discussed. As such, the thesis seeks to offer not only a design-based theoretical contribution to HL learning for the children of migrant ethnic Chinese families, but also extrapolate its use in the development of resources for other communities who are looking into the maintenance of their own HL.

5.2 Relating the probes to the proposed theoretical design framework

The motivation factor within parents/carers is very important in the use of the design probes and the research was lucky to have identified parents/carers volunteers who were keen to explore the use of craft with the prescribed activities. This section will illustrate how the framework was adapted by the 4 different methodologies embodied by the probes.

5.2.1 Development of framework from work on early probes

The early probes encapsulated how the proposed framework would work (refer to Figure 22). The parent/carer was close to the subject and was with her throughout the activity, beginning from providing verbal instructions when co-creating the craft objects, to playing along and interacting in a structured manner. The example of the Dim Sum craft session shows the child was able to co-create the craft by engaging with the instructions throughout her play activity. She had reinforced these craft objects with her experience/memory of the family eating together and sharing food between family members. The parent/carer was more involved as he was the point of instruction, mediation and association for this activity. The dialogue documented in the previous chapter indicated that the child orchestrating her own play after the crafting session.

The early probes also introduced the possibility of pairing the mobile phone with a tangible plush object made from the child's drawings. The ownership between the mobile phone and the plushes was segregated from the beginning, as she knew that unlike the plush object, the phone did not belong to her. The phone could also become a tool since she was using it to access content scanned from the QRcodes. Her interaction with the plushes showed at least 3 types of recognized play and she would sometimes involve or relate to the parent/carer.

While she made no relation between the plushes and the content accessed on the phone (since they had not been intentionally constructed as such), she did use both the phone and the plushes in director's and plot role play, with the phone becoming a mini television (a household fixture that she readily recognized within the home space) or photo album to the plushes. Her use of HL to communicate was highly dependent on the proximity the parent/carer places himself/herself within her scope of play. As observed, she would also code-switch to the use of Mandarin when spoken to in Mandarin by the parent/carer.

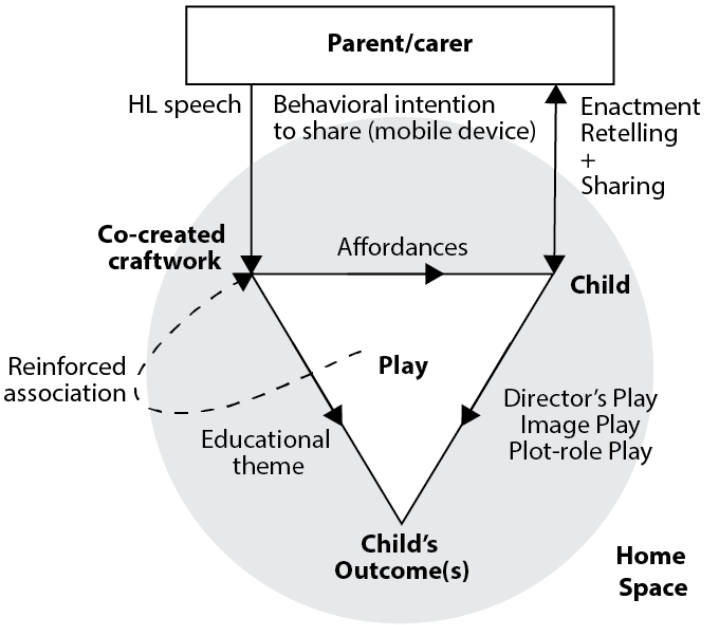

Figure 22: **Adaptation of framework for early probes**

5.2.2 Adaptation of framework for Design Probes 1: Dudu eBooks & Craft making

The children were also familiarized with the visual elements of the stories as they had read half of the stories before co-creating the craftwork with their parents/carers. The craftwork, designed to complement the visual themes and moral lessons of the stories, helped the children to consolidate what they read. The subsequent active participation of the child helped to ingrain what were learnt from the stories, and enabled their retelling towards the end of the activities. There were positive responses from the children about the craft they created. As mentioned in the previous chapter, the majority of the children did show an interest in playing with the objects after the activities. Its correlated results from parents/carers who reported they "frequently" spend time on craft-making, showed their children mostly responded positively to using the craft object to retell the stories. It can be assumed that parents/carers who had previously engaged their children within their ZPD, helped retain certain degree of interest in craftwork on the part of the children, and also possibly affected their interest in the use of Mandarin in this field test.

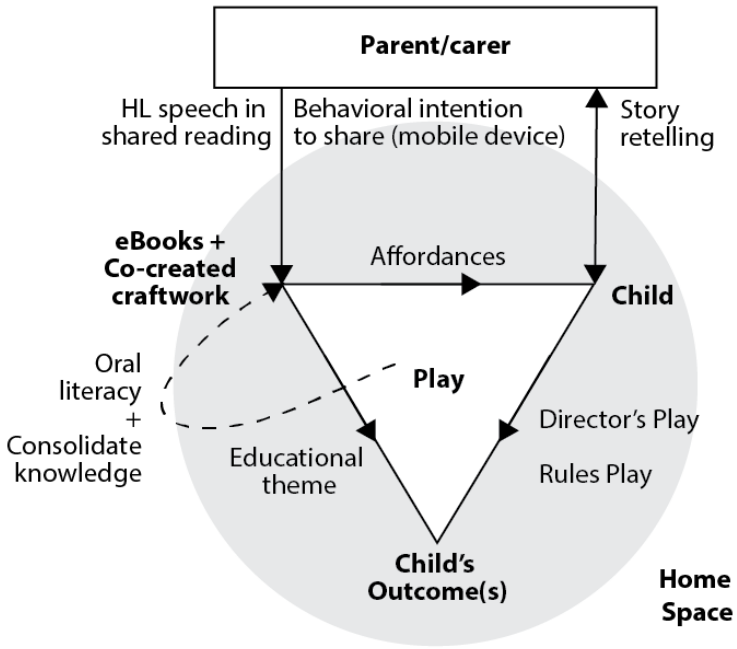

Figure 23: **Adaptation of framework for Design Probes 1**

5.2.3 Adaptation of framework for Design Probe 2: Monsters On The Move

The 2nd probe takes after the adaptation in Design Probe 1 (refer to Figure 24). The differentiations are in the size of space used within the home, the types and themes in play and how much takeaway in HL the child had. The parent/carer had to prepare a wider home space to accommodate the play area for hiding the 12 cut-outs used in the hunt. The activity, simulating a mini treasure hunt, was more physical than shared reading. The parents'/carers' facilitation of both the craftwork and the game, were observed to have been conducted in both English and Mandarin, with the predominant use of the latter (sentences and Mandarin words) on the website.

The parents/carers and children went through the 12 words associated with the items as part of their pre-game preparation. The pre-cut model kit, constructed with everyday objects like disposable chopsticks and elastic bands, were intentionally designed as retro craft toys that the parents/carers might have created when they were younger. The children were also observed to have associated the craft as a toy object on its own right, personalizing it with stickers (refer to Image 49) and were happy to play with it, without attaching the mobile device (refer to Image 40). They primarily saw the constructed object (Image Play) as a vehicle and it was subsequently contextualized as a school bus by the onscreen content. The process of reading the onscreen narrative, understanding the steps required capture the QRcodes, and collecting the 12 objects, manifested as rules to the game that they would play with their parents/carers. As mentioned earlier, simplicity in procedure was important for these preschoolers to effectively engage in Rules Play.

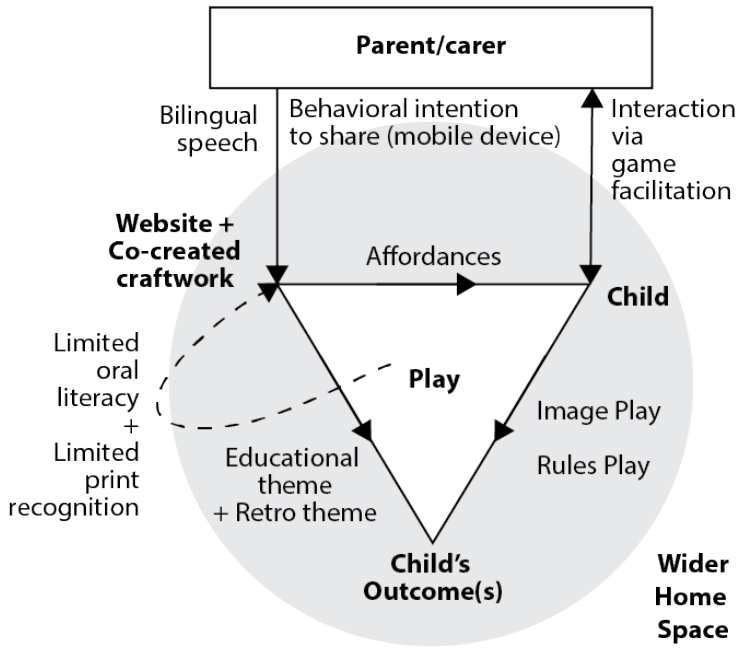

Figure 24: **Adaptation of framework for Design Probe 2**

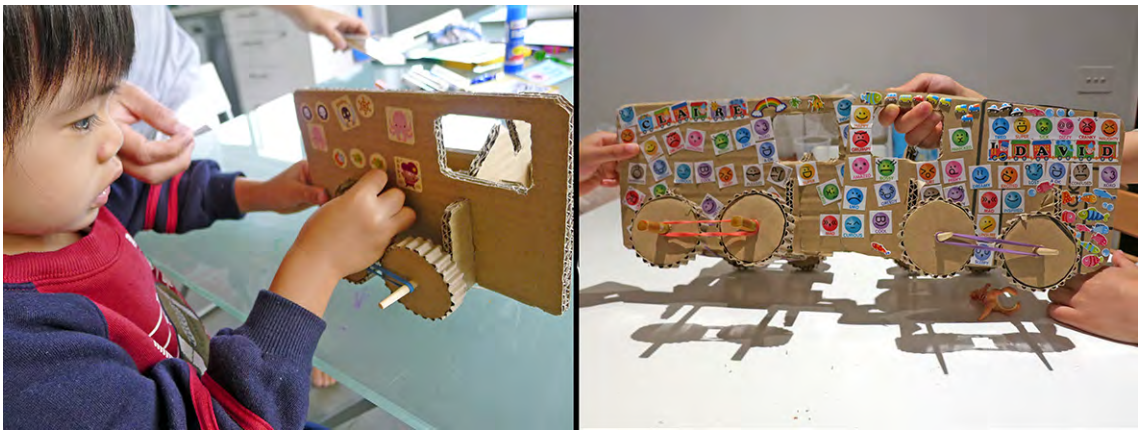

Image 49: **The children personalized their craft vehicles.**

One of the parents/carers had expressed appreciation for the educational value of the field activity in using mobile devices as a tool for transmission of simple HL content. As their children were not proficient in HL speech, the parents/carers were using mainly English to interact. They were glad their children attempted in reiterating the Chinese words as they moved around collecting the set of 12 objects "flashcards".

The parents/carers were also observed to be spending extended duration of time interacting with their children, facilitating both the hunt, scanning of QRcodes and also reading of the collected "flashcards". The participants were comfortable engaging in the activities within their familiar surroundings. While time had to be set aside for the compulsory shared reading and craft-making in Design Probe 1, the parents/carers in this set of activities did so on their own accord, and eliciting limited responses in oral HL and print recognition.

5.2.4 Adaptation of framework for Design Probe 3

Design Probe 3 has a slightly different parent's/carer's "orbit" of the child's ZPD (refer to Figure 25), due to their differing level of involvement. The children in Design Probe 3 were regarded to have used the toys, for Director's and Rules play, since they relied more on the children's understanding of instructions and rules to accomplish the games. The parents/carers saw the upcycled toys as being educational and possibly retro since the construction bricks were similar to what the adults played with when they were children. The final probe saw lesser interaction time structured during gameplay, since the child who is more proficient in the language is being tasked to independently identify words/characters. The only times that the parent/carer would be interacting with the child, were when the child had to be taught the word categorization schema, and helping with the labelling of his/her upcycled toys for the application. Another window of interaction took place when the child requested for help with the scanning of the codes and when there were characters he/she needed help identifying.

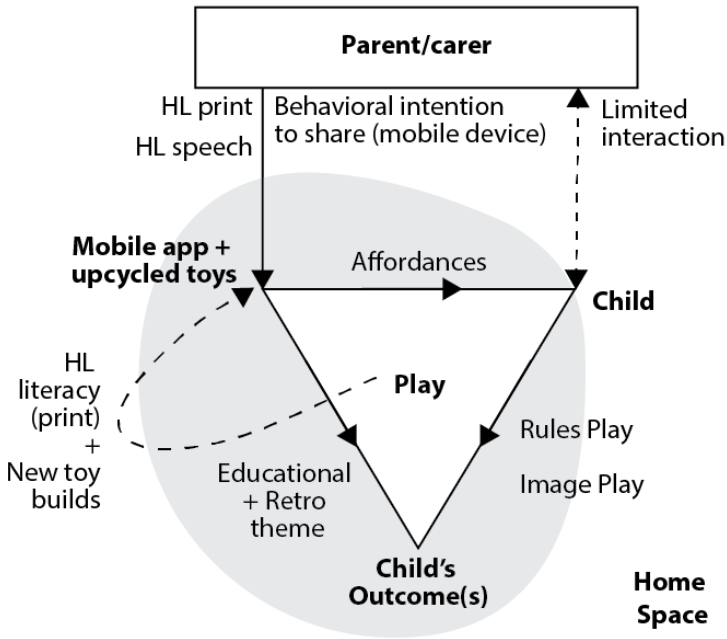

Figure 25: **Adaptation of framework for Design Probe 3**

The adaptations of the proposed framework described above over the series of probes provided preliminary evidence that the use of mobile technology, when structured through mediated action over a complementary activity like craft-making, is possible to generate some degree of interest in the use of the HL. However they are not necessarily perfect language tools as the emphasis is largely on improving phonological awareness in children learning HL without the frequent and structured interaction with the parents/carers.

5.3 Reviewing of design probes and considerations for future development

From the field activities' results gathered, the association of oral transmission with interactional activities like craft had been effective only to a certain degree. While the eBooks' stories were short, the shared reading and craft making with parents/carers provided a personal experience for the individuals involved. Such interactions were also important as they allowed the child to ask questions from time to time, and that helped the child clarify his/her readings and extended the material in the stories (Rogers and Price 2009). For most, the allowance to code-switch between English and Mandarin provided a degree of encouragement to their use of HL. The children, who initially expressed a lack of confidence in their use of HL, had also been generally positive towards the activities and they were deemed fun enough to be completed.

The probes could certainly benefit from longer termed, more extensive and rigorous field tests, such as the provision of a larger pool of subjects with diverse family demographics, setting up of a control group, capping and standardizing activities to children's attention span of approximately 15-minute periods (Gikow and Loredo 2009). The research acknowledges that the assessment of preschoolers' knowledge of print and phonological awareness of Mandarin would also require more in depth expertise in the field of emergent literacy, as well as possibly a comparative study between different migrant communities and heritage languages.

5.3.1 Assessing the significance of mediated physical interaction within the design probes

The research culminated in the deployment of the theoretical framework over a series of probes in Chapter 4, but not before grounding the probes with the theoretical considerations by Verbeek and Ihde, on mediated interaction through relationships with technology. The probes aimed to allow technology to play only a neutral role, and as Hornecker had argued, what transpired as "design experiences", required more than simply a technologically-based approach to interaction. As the early probes had shown, structured and frequent deployment of content-focused home-space HL transmission, allowed mediated physical interaction to gain traction with the participants. These were seeded from the initial observations of craft activities done with the early probes that coincided with Yx's period of emergent literacy, and that she used the smartphone as a tool rather than a toy, to access virtual content off physical QRcodes.

Probe 1 and 2, which were field-tested with different groups of ethnic Singaporean Chinese children and their bilingual parents/carers based in Singapore and Melbourne, illustrated materiality and interaction with the use of craftwork as a conduit for oral transmission and

phonological awareness. There was also a degree of print association in the shared reading of eBooks and Easter-egg hunt within the participants' home space. The correlation of documented results between the participants' construction of craft objects and interest in reading or post-activity retelling, pointed to the importance of sustained and structured interaction within the framework. With regards to technology, what might have been solely an alterity relation between the child and the technology/device, was positively affected by the presence of the tangibility and materiality of craft activities. The created craft object became the subsequent provenance for retelling of stories by the children, and to an extent, the springboard for HL transmission from both the parents/carers and eLearning content on their devices.

As described in Chapter 4, the individual probes' had a degree of simplicity in their construction and use, and they allowed preschoolers to effectively engage in play. The sequential and nested affordances within their designed physical components and onscreen content, also helped to shape the children's behaviour. For example, the embedding of clear affordances in the craft designs in Design Probe 1 and 2 (such as the use of a cut-out window to assist with capturing the codes and the form of a movable toy vehicle to contextualize the search for the cut-out within their familiar play space) helped associate materiality and technology in their play. The relationship with technology was not only one of alterity, but also at times one of embodiment, since the child reimagined the device as part of bus and used it as an "eyepiece" to the "changing landscapes outside the bus window". The craft object created a contextual delivery of the technology and exerted a persuasive influence on the child in completing the activities.

Design Probe 3, on the other hand, was designed for a more competent HL child user. The user was in a hermeneutic relation with the mobile device. The child could match Mandarin characters and words, with visual cues printed on upcycled toys, and construct physical builds of sentences with on-screen prompts (although the parent/carer retained a degree of interaction for the transmission of instructions). It was also observed that the assigning of control "functions" to the upcycled toys, instead of requiring physical contact and interaction with the screen, gave them a certain degree of 'gizmo' (Baudrillard 1996) and brought back a sense of imagination in the child's attitudes towards these upcycled toys. The use of technology here may also be considered as having an implicative influence on the child, as by drawing upon the existing sentiments and memory the child may have of these old toys, they are perhaps more likely to explore their new "uses" as controllers and "building blocks" to their mentally constructed sentences. However this may differ from child to child.

The results from the field studies conducted with the probes indicated that not only were the children able to relate the craft-objects or upcycled toys to the complementary on-screen content and hence associated learning experience, they were also able to disassociate the two readily. This was, in part, aided by parents/carers instilling a sense of ownership of these

artifacts to their children, allowing them to be viewed both as a toy on its own right, and as the children's own tools when accessing virtual content and when they were used to retell the stories. Thus play could continue independently without needing access to the mobile devices and thus ensuring a degree of longevity to the craft-objects or upcycled toys.

5.3.2 Other potential techniques for aiding literacy

Along with the emphasis on phonological awareness, the research also recognized that reading on screen or print is fundamental for HL transmission. Most of the probes described in the previous chapter required a narrative to be built and told by the parent/carer to the child, and later internalized and retold or re-enacted by the child during his/her imaginative play.

In future iterations of the design probes, especially for more Mandarin proficient HL learners, there could be a focus on the use of other techniques such as parent/carer-child joint writing, where parents/carers teach via writing tasks. Parents/carers who seek to improve on the children's emerging skills in phonological awareness, print knowledge, character/word writing, and orthographic understanding, would have to move beyond storybook reading in facilitating literacy development (Aram and Biron 2004). Some researchers see the use of radicals in Mandarin character recognition and the understanding of orthographic representation, as more important to a Mandarin-language learner before he/she could make out phonological and meaning information when in reading in Chinese (Taft, Zhu, and Peng 1999). While in another study, it was noted when bilingual children are learning Chinese characters and Pinyin concurrently. The Pinyin and English reading skills seemed to cross facilitate, but the reading of Chinese characters and English words did not (Wang, Perfetti, and Liu 2005), due to the marked difference in the 2 writing systems. As mentioned earlier in Chapter 1, it is a priority for young HL learners to pick up phonological awareness as it has more immediate use within their family context of maintaining intergenerational conversations. Writing should only be introduced to children and parents/carers who are already comfortable with the use of the spoken language.

A multisensory approach may also have the potential for bringing fun into the learning of HL. Technological integration into toys like Leapfrog's LeapTV (2015) offered opportunities for the children to engage immediately with their physical environment via remote and movement sensors. Other enhanced play experiences, may also incorporate the air-tracing of characters/words, singing and dancing to HL content, to better attract and encourage preschoolers' learning (Neumann, Hood, and Neumann 2009) of their HL. Tangible surfaces, crafted from environmental print, such as those on readily found items around the house like Chinese newspapers, magazines and grocery packages, could possibly be integrated into such enhanced multisensory system. However further research on the relevance of movement detection technology to learning on game consoles, is still needed to substantiate the manufacturers' claims of aiding a child's emergent literacy skills, amongst other areas like

motor skills development, hand-eye co-ordination and social and emotional development.

Perhaps children would find their literacy/gaming experiences meaningful and validating (being approved and shared by their parents/carers) when parents/carers join in their play. A shared gaming experience, like any other joint activity, becomes a common reference point in which a child and the parent/carer would use to communicate successfully, leading it to become a social activity on its own right (Rogoff 1991). Navigating through virtual spaces on a bigger screen is no different from that of a mobile device in a child's familiar multimodal environment, and it is simply another space that he/she has to learn to navigate by observing their parents/carers or elder siblings. Nonetheless, the game design would be a challenge to developers, as the gaming experience would have to enable parents/carers and their children to work as equal partners (Siyahhan 2011) before the play experience can become meaningful. The parents/carers would also then be able to facilitate post game discussions and relate to other conversations around real-world experiences. However, parents/carers should also be mindful of the potential costs involved, when developers of such games leverage on their wider product spectrum that target children as consumers. Outdoor play and learning activities might also adopt the Reggio Emilia approach of using environment as the 'third teacher' for relevant future research and trials.

5.3.3 Issues with mobile technology

As the evidence from Chapter 2 has shown, the technology available for mobile learning are no doubt engaging. Children could possibly grasp difficult concepts better and make connections between observations and ideas, and relating physical experiences to abstract knowledge (Bernstein 2013). But the current use of mobile technology is not without issues.

For the research, the technical issue of platform specificity arose during the development of the design probes. For example, HTML5 were used by Commontown to develop their suite of Dudu eBooks while juBlok was coded natively for iOS. HTML5 content is essentially "device agnostic" (Mombrea 2015), allowing all the participants to access the eBooks, irrespective of operating systems since it is browser-based. However there were technical quirks that made some participants on iOS devices suffer an inferior user experience. There were also lengthy loading times of HTML5 content and ceasing of related activities once the devices (running either iOS or Android) became offline, intentionally or otherwise.

Native applications tended to offer a smoother experience and there were no layout glitches and delays, which may affect the children's engagement with the content. Consequently, it is crucial for future content development to understand what options are available and weigh out the pros and cons, since it will determine on the onset which group of mobile device users the product will be catered to. Other restrictions, such as storage limits and battery life remain the

same issue for mobile device users, just as they did, about a decade ago[68]. Issues of constant recharging and non-replaceable batteries in mobile devices meant restricted access time for users and these issues still ring true today as devices become more processor-intensive, have bigger screens and drive up battery usage (Sadun 2008). Regardless, it is a systemic problem caused by the symbiotic relationship between manufacturers and users. End users being intrinsically part of the "multi-player ecosystem[69]", have been constantly driving the demand for innovation behind these devices (O'Sullivan 2004), while technical improvements in storage and energy efficiency take a few iterations of device design to catch up.

One of the consequences from such a rapid uptake in mobile technology is the large and fragmented base of phones, tablets, computers and digital gaming consoles, each with its inherent operating systems, screen real estate and processing prowess. Though this caters to different market demographics, it affects brand loyalty for consumers who may be left out in the shifting technological divide, and manufacturers who have to continuously cater to a widening spectrum of technical considerations between different generations of devices. As more families are able to afford devices and Internet connectivity, it is also most likely that the average household's requirement for the bandwidth will increase in tandem with more devices being owned and connected at home. This meant that there would be a greater consumption of content via the Internet and Internet Service Providers have to offer higher bandwidth connections. Designers and developers thus will have to be more aware of how their content are being designed, packaged and delivered online, and how potentially growing sizes in applications affect future users' consumption patterns.

The increase in use of mobile devices for gaming and edutainment in recent years has changed the way such devices were used traditionally. Smartphones and tablets are now considered as a best selling toy and edutainment content are also readily found on social network platforms. The convergence of the social and play has begun to shape a very different kind of technological need in this generation of children, as they growing up to be more interactive, independent yet collaborative (Shaffer 2006). Hence learning content, even if it was for HL maintenance and transmission, could ideally just be a facet of these migrant children's childhood experience, and every effort should be made to make it a positive one.

On the issue of sustainability, there is also a growing consciousness of the market potential of

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[68] The first generation iPhone was released on June 29, 2007.

[69] Berkeley media studies group and the Centre for Digital Democracy identified this "ecosystem" as one that encompasses cell phones, mobile devices, broadband video, instant messaging, video games, virtual 3D world; all of which provide the knowledge and information that young people use to navigate their place in families, schools and communities (Chester, Jeff, and Kathryn Montgomery. 2007. *Interactive Food & Beverage Marketing: Targeting Children and Youth in the Digital Age*. Berkeley Media Studies Group: Center for Digital Democracy, American University.)

second hand mobile devices and this bodes well for parents/carers who are considering the purchase of a secondary device for their young children. In Deliotte's report on trend forecasts, they projected the second hand used smartphone market to be worth $17 billion in 2016, and with 50 per cent year-on-year growth in units. These used devices will represent an approximate 7 per cent of the total smartphone sales by units in 2016 as they predict the average lifespan would likely to be more than 4 years (Deliotte 2016). This is a significant trend as the availability of cheaper second-hand devices could appeal to buyers with smaller budgets. As the chapter on probes has illustrated, since they had used only basic on-board technology such as camera capture, audio playback and internet connectivity, these second hand sets represent sustainability which some parents/carers would consider as relevant when procuring resources for their children.

Perhaps one of the most pressing issues that had been largely ignored until recently is the case of cyber security in mobile technology used by young children. This issue had taken a back seat because most technology-embedded toys did not offer connectivity until children began to use of mobile devices or products like all-in-one learning devices from Leapfrog and VTech. Most of these child-centric devices held photographs of child users, personal and possibly bank details of parents/carers, which were used for logging in and purchasing content from on-line stores. Though the bank details were not readily accessible to the young children, they were not impervious to hackers. This was exemplified by a hack attack in 2015 on VTech's electronic toys, which caused more than 6.3 million children's accounts to be affected, allowing the perpetrator access to their photos and chat logs (Kelion 2016). Manufacturers and system developers would have to acknowledge and address the risks involved, as more children are likely to be users of mobile devices in the near future.

5.3.4 Innovations in designing for young children

The probes have indicated a possible alternative in bringing back craftwork as toys for young children, in a market dominated by petroleum-based products. The research recognized that craftwork would not, and should not, replace the diverse repertoire of toys that an average family would purchase for their children over the course of their preschool years. However, the push for innovative use of material and interaction for enriching play is important for the future of toys, especially if they were to be designed for education.

The craft activities used in the probes were kept manageable for both parents/carers and children. It was deliberately designed with clear visual guides/instructions so as to encourage parents/carers, who may have otherwise considered themselves to be un-craft-savvy, to facilitate the sessions with their children. Likewise for children, the craft objects had to project a sense of intuitiveness when they start making and playing with it. On the other hand, conceptualizations of tangible interactivity should continue to be mediated and focused on instilling creativity and social interaction. For the parents/carers, they may deploy the use of

epistemic games (Jenkins 2009), where the play simulates the authentic social context of a vocation and the children are to work through simulated real-life problems. The children are to learn how to interpret and communicate across the essential information and skills necessary for playing in these games, which can potentially be rich learning environments for meaning making and interaction.

Innovation in designing for prechoolers is also mandated by the changing demographics of the research's target group of 3-5 year-old preschoolers, as it continues to demand for better products. About a decade ago, a "KGOY" (Kids Getting Older Younger) or age compression phenomenon (Foster 2004) was noted by the toy industry. Older kids between the ages of 8 to 12 have lost interest in traditional toys and were now more interested in fashion and electronics. Foster (2004) also noted that children nowadays are "over-scheduled" with less hours dedicated for play and relaxation, and whatever free time they have tended to be multifaceted, from screen-time to sports. In the results from 1999 LiveWire research on 1,600 American families, it had foreshadowed the trends discussed in Chapter 2, with the sample returns suggesting preschoolers in the late 90s, were starting to demonstrate brand knowledge and influence over their parents/carers (Kurnit 1999). The children were documented as being influenced by familiar imageries from the television programmes that they were exposed to. The researchers concluded while preschoolers were once considered a single group of under 5 year-olds; it is now divided into two groups of 1-3 and 4-5 year-olds. Thus special attention and innovation are needed on identifying effective visuals and branding targeted at young children.

Future iterations of the probes may have some of the other characteristics that were highlighted in Chapter 2's survey of popular toys. Some of the popular toys from the survey in Chapter 2 have compact, portable form factor that fit into the busy and scheduled lives of preschoolers, derived from their parents'/carers' work patterns. Portability in the design of toy objects, would allow children to play during their 'on the go' time. They may be comfort aids for younger preschoolers, like companion plushes that children can relate to readily. These forms can elevate certain tensions that may be associated from their daily insecurities in learning or from going to school/day-care. As parents/carers become more aware of what are possible with the integration of technology and electronics, some have even come to expect interactive enhancements from a simple plush toy. This is a double-edged sword with questionable impact on the child's play. As cached audio and visual responses are sometimes automatically triggered from the device embedded in the toy, the child is no longer required to stage his/her own imaginative interactions with it.

As education aids, the probes had allowed the parents/carers and the children some degree of customisation. Future design iterations of toy objects may cover the different stages of the child's cognitive and physical development, perhaps with components that encourage more intricate craftwork and fine-tuning of the child's motor skills or spatial perception. Multi-lingual

text and speech, content that deals with social responsibility and teaches appropriate cultural etiquettes, may be popular with ethnic migrant Asian families across the globe. These may also be tailored as topical bite-size content for mobile devices. Whatever innovations are integrated, the new probes should still retain the key function as a bonding tool for the parents/carers and their children.

In the last few years, 3D printing technology is maturing to become a promising tool for not just creation of trinkets but actual prototyping at home. There are now many affordable 3D printers available in the market today and many of the bundled 3D modelling software can now be found on both iOS and Android. It is technically possible for elevating the idea of crafting and tinkering onto the next level with such technology, while retaining an intuitive interface for use by even young children. The design innovation is as much about how they create and what they create. The children can engage in collaborative virtual creations that are saved and shared on cloud storage with other parents/carers and children. The idea extends beyond printing just one-off objects but rather parts that can be then assembled to form larger creations, like dolls, robots, dinosaurs and vehicles. These could in turn be used with their mobile devices, similar to the ideas explored in the design probes.

5.3.5 Communities of Practice

A mentioned in the previous section, today's edutainment media are changing the children's tastes and type of play. Children's literature is now increasingly linked to popular and material culture and it is the perennial parental concerns for their children's education, in relation to providing access to quality learning resources, which drives global consumption trends. Toy companies struggle with children aging out faster than they used to and this makes marketing to children challenging. A combination of factors, such as the children's multimodal screen experiences, an increase in variety of edutainment content and a spike in participation within the social media sphere by younger audience, that are feeding the "KGOY" phenomenon.

Developers, publishers and manufacturers understand that standalone applications, books and toys lack scale and versatility, hence they are tailoring their messages to their consumers via different social networks. Their franchises are also created to span multiple platforms (Wooldridge 2013) from cartoons to video games to films to physical toys, while shaping market consumption through multi-platform social media campaigns targeting parents/carers (Burgess 2014). For example, Hasbro purchased of a 70% stake in the mobile gaming company, Backflip Studios for $112 million (Hasbro 2013b) and announced a partnership with Ubisoft (Hasbro 2013a), a video game developer, to bring board games to the console platform. The Little Tikes Company had also partnered its parent company MGA Entertainment and Concrete Media to create videos for online and digital broadcast (Dickson 2013). Social media has now become the default space for consumer's attention. With increasing concerns about how young children should be exposed or inducted to the world of

consumerism, the role parents/carers play in this exposure is more important than ever before.

The proposed framework in this thesis has the potential to be transferrable to parents/carers, designers & developers, as it allows the anchoring of learning in authentic contexts that make it meaningful and purposeful for young children and parents/carers alike. One possible way is for the proposed framework to be applied is to involve wider expertise and larger uptake through the creation of Communities of Practice. In the previous chapters, it has been repeatedly emphasized that parents/carers are vital in creating learning environments and they play a role in mediating learning and play. There is a range of techniques for them to do so (such as modelling, scaffolding, questioning, task structuring, task management and providing relevant feedback), so that the children can explore, reflect, and express themselves. Collaborative tools for pursuing HL maintenance and transmission exist on social media, and parents/carers can readily use these to seek out advice and help others to shape authentic engagement, forming their own Communities of Practice.

Communities of Practice can be either craft or HL driven, and may be seeded from existing interest-sharing platforms like Facebook Community Pages or Pinterest topic groups. They can be comprised of groups of individuals who contribute to different activities, while sharing diverse viewpoints and engaging in participation through varied levels. However it may not necessarily be well-defined or identifiable as a social group (Lave 1991). Like any social media platform, it may not even be permanent (Bazan 2012), but by having a platform, parents/carers can find greater support for the push outwards to other enterprises and communities. More importantly, diverse members within the Community of Practice, bring along their unique epistemic frames, covering different domains of knowledge and practices (Shaffer 2006). When these frames are subsequently applied across other contexts and support is drawn from members, the community itself may afford creative solutions for what is essentially a “wicked” problem, where the subjects of migration, dislocation and culture have changing social-cultural dimensions, with its likely solutions “potentially universal in scope” (Buchanan 1992, 16).

5.4 Chapter summary

This thesis has set out to investigate how HL can be maintained with the use of mobile devices. Over the course of the investigation, it has shown the potential use of an external conduit in the form of a co-created craft object or an upcycled toy. More importantly, the active participation and interaction of the parents/carers within joint activities, rather than relying on just language applications found in mobile devices or similar toy objects, will greatly enhance the chances in motivating young migrant children in their HL learning.

As discussed earlier, the push for HL transmission is usually centred within the family and the recommendation is for the parents/carers to embrace the technology only as a tool to assist in their endeavour. At the same time, they have to be mindful of not being overly reliant on the tool. As the proposed theoretical framework has shown, it requires the rooting of the learning experience through phonological and print awareness, and also through the association with thematically related tangible objects. These objects are manifestations of the socio-cultural climate that the families are in and their mediated use shows the relevance of design as a force in the bridging of needs.

While the probes do not exult signature aesthetics and may not be suitable for immediate commercial exploitation, this chapter has pointed out the various potential and limitations of utilizing the framework for producing related probes. It had also concluded by highlighting possible areas of innovations that could be tapped on when designing for young children, and further emphasized that adaptations of the framework would require further fine-tuning and research. It would be interesting for future related research to investigate the effectiveness of Communities of Practice of designers, developers, manufacturers and parents/carers, on how they can draw upon each other's relevant expertise, to create better methodologies in helping migrant communities maintain and transmit their HL in future generations.

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Appendix A: Sample of toys from China Toy Expo (Shanghai) 2012 and HKTDC Hong Kong Toys & Games Fair 2014

1. **Tablet toys**

Form adapted from popular tablets, often offering a silicon/plastic protective case for degree of individualisation. Runs of Android OS 4.2.2 or newer, has 7 inch capacitive multi-touch screen, Wi-Fi-enabled. Most contain proprietary applications but also allow for application downloads from Google Play. Enriched content utilises audio, camera and video recording functions built into the tablets. Features bilingual content, often with English as second language learning. Most offer parental controls and online/offline content update via Wi-Fi/USB.	 Reference: B.B.Paw. Gardex Electronics Co. Ltd. www.bbpaw.com	 Reference: Vitek Electronics Co. Ltd. www.vitektabletpc.com

2. Mobile device-inspired toys

Mock laptop and tablets, relying on present buttons to provide audio feedback when children touch them. Often relying on an small LCD display or LED lighting to provide visual feedback, and built in audio feedback. Not possible to update content on most of these products. Features bilingual content, often with English as second language learning.	 Reference: Pekhai Trading Co Ltd - Hong Kong	 Reference: Pekhai Trading Co Ltd – Hong Kong

3. Text and touch pen-reader clones

Text and touch pen-reader clones, usually packaged with storybooks and learning charts. Features bilingual content, often with English as second language learning. Most offer online/ offline content update via Wi-Fi/USB.	 Reference: Technonia. www.technonia.com (South Korea)	 Reference : KidLand Electronics (H.K.) Ltd

4. Other technology-enabled toys

Using devices' inherent functions e.g. Bluetooth to control toy's movements, using mobile devices as controller to manipulate a flying helicopter/ insect. Using device's capacitive touch screen as game's changing backdrop, e.g. racetrack, moving sky, while manipulating an external object on screen. Applications are free to download and install by user upon purchase of the toy.	 Reference: iPawn. Jumbo Diset International. www.jumbodiset.com	 Reference: Hong Kong KeNa Toys Trading Company Ltd. Kenatoys.en.alibaba.com

5. Other learning & experiential play toys

Wide range of pretend play toys made of inexpensive craft paper/cardboard. Such genre of toys include: scale reproductions of vehicles, monuments, pretend play toy houses/kitchens, scaled environments such as cities, castles, farms, zoo, safari. Toy package includes several simple experiments or games that teaches certain mathematical/scientific concepts. Encourages children to like such subjects and inspire future vocation in the sciences.	 Reference: iPawn. Artistic Craft Group Ltd. www.artistic-craft.com	 Reference: Japan Artec Inc. www.artec-educational.com

Appendix B: Most popular Preschool Toys sold from 2009-2015

Most information on these top-selling toys is mined from sites originating from Australia, USA and European markets. Only toys suitable for children under 5 years old are selected for reference.

Year/toy	1	2	3	4	5	6	7	8	9	10
2009 **Reference:** http://www.parents.com/fun/toys/kid-toys/best-toys-for-preschooler-2009/#page=2	**Mouse Match**	**Handy Manny's Construction Laptop (with small LCD screen)**	**My First Mosaic**	**ChickyBoom**	**Burger Builder (playdoh)**	**All Around Art Tower**	**Kitchen Playset**	**Shake 'n Go! Crash-Ups Speedway**	**Rocky the Robot Truck (interactive toy)**	**Penguin Peek-A-Boo Plush**
	fundexgames.com	vtechkids.com	alextoys.com	blueorangegames.com	hasbro.com	step2.com	maximenterprise.com	fisher-price.com	mattel.com	fiestatoy.com
Age Range	4+	3 to 6	3+	4+	3+	3+	3+	3-7	3+	3+
Price	$15	$30	$10	$25	$20	$80	$50	$60	$60	$20

Year/toy	1	2	3	4	5	6	7	8	9	10
2010 **Reference:** http://www.parentdish.com/2010/11/26/parentdishs-20-top-educational-toys-for-preschoolers **Reference:**	**Classic Etch A Sketch Magic Screen**	**LEGO Ultimate Building Set - 405 Pieces (6166)**	**Leap Frog Leapster2 Learning Game System**	**Smart e-Bear**	**The Magic School Bus: Going Green**	**Zhu Zhu Pets**	**Work Bench 'N Box**	**Dalmatian Vet Kit**	**Melissa & Doug Deluxe Wooden 27-Piece Lacing Beads in a Box**	**Singamajig**
	http://www.world-of-toys.com/category_s/10.h	http://shop.lego.com/en-US/LEGO-Large-Brick-	http://www.amazon.com/LeapFrog%C2%AE-	http://www.amazon.com/Kids-Prefered-	http://www.theyoungscientistsclub.com/themagicsc	http://www.zhuniverse.com/	http://www.wonderworldtoy.com/product_roleplay.p	http://www.battatco.com/products/battat/battat_pg/	http://www.amazon.com/Melissa-Doug-	fisher-price.com

http://abcnews.go.com/Business/top-rated-toys-seasons-revealed/story?id=21080580#4	tm	Box-6166	Leapster%C2%AELearning-Game-System/dp/B00134TC10/	90647-Smart-e-Bear/dp/B0016LTRMY/ (discontinued)	hoolbus/		hp?id_get=131&type_get=Role%20Play	products_battat.html#!prettyPhoto/31/	Deluxe-Wooden-27-Piece/dp/B000GIJ4Y4/	
Age Range	3+	3+	4-9	2-6	5-12	3+	3+	2+	3+	2-6
Price	$20	$30	$33	$30	$10	$5	$30	$25	$10	$15

Year/toy	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
2011 **Reference:** http://www.parents.com/fun/toys/best-preschool-toys-2011/#page=12	**Wacky Water Park**	**Hot Wheels Wall Tracks**	**Ybike Kicker Scooter**	**Wonderworld Vacuum**	**Where is Sock Monkey?**	**Disney Appmates (ipad dependent)**	**Photo Safari (interactive, image capturing)**	**Snack Attack**	**Healthy Gourmet Salad for Green Eaters**	**Twirl 'n' Top Pizza Shop**
	http://catalog.manhattantoy.com/MTE_catalogue/index.html#/124/	http://www.hotwheels.com/en-us/walltracks.html	http://www.ybikeworld.com/site/	http://www.toysrus.com/buy/housekeeping/wonderworld-vacuum-ww-4548-13360979	http://www.timetoplayma g.com/toys/3227/cardinal-games/where-is-sock-monkey-game/	http://www.appmatestoys.com/	http://www.redballoontoystore.com/index.php/toys/by-category/games/children-s-games/photo-safari.html	http://www.thinkfun.com/snackattack	http://www.boomerangtoys.com/saforgreabye.html	http://www.hasbro.com/shop/details.cfm?R=65136B80-5056-900B-10F6-869B1BEE3E5F:en_US
Age Range	3+	4+	3-5+	3 +	3+	3+	3+	4 +	3+	3+
Price	$30	$35	$90	$40	$30	$15	$20	$20	$25	$15

Year/toy	1	2	3	4	5	6	7	8	9	10
2012 **Reference:** http://preschoolers.about.com/od/toys/ss/Hot-Holiday-Toys-2012-Best-Toys-For-Kids.htm	**LeapFrog LeapPad 2 (mobile learning device)**	**Disney's Jake and The Neverland Pirates - Jake's Musical Pirate Ship Bucky (interactive)**	**Servin' Surprises Cook 'n Serve Kitchen & Table (interactive)**	**Playtime Together Dora & Me Dollhouse (interactive)**	**Winx Club Dolls**	**Vtech Switch & Go Dinos (interactive with LCD screen)**	**Team Umizoomi Come & Get Us! Counting UmiCar (remote control interactive)**	**Disney Doc McStuffins Time For Your Check Up Doll (interactive)**	**Disney Princess Songs Palace by Little People (interactive)**	**Vtech InnoTab 2 Learning App Tablet**
	http://shop.leapfrog.com/leapfrog/jump/LeapPad2/category/cat1020006	http://www.fisher-price.com/en_US/brands/jakepirates/products/65872	http://www.fisher-price.com/fp.aspx?st=900004&e=storeproduct&pid=66847	http://www.toysrus.com/product/index.jsp?productId=13312192&prodFindSrc=search&cp	http://www.winxclub.com/en/toys	http://www.vtechkids.com/brands/brand_view/switchandgodinos	http://www.fisher-price.com/en_US/brands/teamumizoomi/products/67532	http://www.disneystore.com/dolls-toys-doc-mcstuffins-doll-set/mp/1319951/1000259/	http://www.fisher-price.com/en_US/brands/littlepeople/products/67282	http://www.vtechkids.com/product/detail/12367/InnoTab_2_Learning_App_Tablet
Age Range	3-9	3+	3+	3+	4+	3+	3+	3+	1.5-5	3-9
Price	$40	$35	$55	50	$15	$70	$35	$40	$40	$50

Year/toy	1	2	3	4	5	6	7	8	9	10
2013 **Reference:** http://www.parenting.com/gallery/toy-fair-2013 (selection	**Green Toys Tractor**	**BeginAgain Animal Parade Puzzle**	**Furreal Friends Cuddles My Giggle Monkey (interactive animatronics)**	**FirstBIKE Street Bike (balance bike)**	**Play-Doh Perfect Twist Ice Cream Parlor**	**Fisher-Price Create 'n Learn iPad case (interactive app with code reading)**	**Imaginext Apptivity Fort (interactive app and toy)**	**Aha! Concepts The Un-Block**	**Kid Constructions, Inc. Dragon (cardboard wearables)**	**Fat Brain Toys Squigs**

from The 110th American International Toy Fair)										
	http://www.greentoys.com/green-toys-tractor.html	http://www.beginagaintoys.com	http://www.hasbro.com/furreal/en_US/	http://www.firstbike.com/	http://www.hasbro.com/playdoh/en_US/shop/details.cfm?R=991AC489-5056-9047-F5D2-7947586059D2:en_US	http://www.fisher-price.com/en_US/products/71905	http://www.fisher-price.com/en_US/brands/imaginext/products/71903	http://theun-block.com/	http://www.kidconstructions.com/	http://www.fatbraintoys.com/toy_companies/fat_brain_toy_co/squigz.cfm?display=main
Age Range	1+	3+	4+	2-5	3+	3+	3-7	5+	4+	3+
Price	$20	$40	$80	$160	$25	$40	$50	$70	$25	$25

Year/toy	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
2013 (other tech toys for preschoolers) **Reference:** http://www.edutainingkids.com/articles/childrensgiftguidepreschooler.html **Reference:** http://www.gizmag.com/top-ten-high-	**LeapFrog Scribble and Write**	**Fisher Price iXL 6-in-1 Learning System**	**Ubooly**							
	http://shop.leapfrog.com/leapfrog/jump/Scribble-%26-Write/productDetail/Preschool-	http://www.amazon.com/gp/product/B00388IS1E?ie=UTF8&tag=edutainingkid-20&linkCode	http://www.ubooly.com/							

tech-toys-for-kids/30173/	Fundamentals-Toys/lfprod19139/cat800012	=as2&camp=1789&creative=390957&creativeASIN=B00388IS1E								
Age Range	3+	3+	3+							
Price	$20	$20	Small $30 Big $60							

Year/toy	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
2014 **Reference:** http://www.usatoday.com/story/tech/columnist/gudmundsen/2014/03/02/toy-fair-top-tech-toys/5806049/ **Reference:** http://www.parenting.com/gallery/best-toys-2014	**Tiggly Shapes**	**Wikibear (by Commonwealth)**	**TheO™ SmartBall**	**Learning Resources Super Sorting Pie**	**Fisher-Price Imaginext DC Super Friends Batcave Playset**	**Melissa and Doug Shape Sorting Clock**	**Magna-Tiles Clear Colours 32 Piece Set**	**Spot It! Junior Animals**	**GoldieBlox and the Spinning Machine**	**Monster High Create-A-Monster Design Lab**
	http://tiggly.com/	https://www.facebook.com/wikibearofficial	http://physicalapps.com/	https://www.learningresources.com/product/super+sorting+pie.do	http://www.fisher-price.com/en_AU/Products/Imaginext-DC-Super-Friends-IBatcaveI	http://www.melissaanddoug.com/wooden-shape-sorting-learning-clock	http://www.magnatiles.com/products/magna-tiles-clear-colors-32-piece-set/	http://www.blueorangegames.com/index.php/games/spotit-junior-animals	http://www.goldieblox.com/products/goldieblox-and-the-spinning-machine	http://service.mattel.com/us/productDetail.aspx?prodno=X3732&siteid=27
Age Range	2-4	3+	2-6	3+	3+	3+	3+	4+	4-9	3+
Price	$30	$70	$35	$20	$35	$15	$50	$10	$30	$30

Year/toy	1	2	3	4	5	6	7	8	9	10
2015 **Reference:** http://www.toyassociation.org/TIA/Events/TOTY/Past_TOTY_Winners/Events2/TOTY_Awards/2015_TOTY_Winners.aspx#.VuwLMhJ94UE **Reference:** http://www.parenting.com/gallery/best-toys-2014	**Tiggly Shapes**	**Camp Site by PLAYMOBIL®**	**The Doc McStuffins Get Better Talking Mobile**	**The VTech® Kidizoom® Smartwatch D**	**The Paw Patrol Look-Out**	**Razor Jr. Monster Kix Scooter**	**Disney Frozen Snow Glow Elsa Doll**	**LeapTV**	**Disney Eye Found It Game by Wonder Forge**	**Osmo**
	http://www.lego.com/en-us/juniors	www.playmobil.us/camp-site/5432.html	http://justplayproducts.com/products/doc-mcstuffins-get-better-talking-mobile/	https://www.vtechkids.com/brands/brand_view/smartwatch	https://www.spinmaster.com/product_detail.php?pid=p10730&bid=cat_pawpatrol	https://shop.razor.com/Razor-Jr-Monster-Kix-20059630/	http://www.toysrus.com/buy/interactive-dolls/disney-frozen-snow-glow-elsa-31058-41389446	http://www.leapfrog.com/en-au/products/leaptv	http://www.wonderforge.com/products/disney/eye-found-it/	https://www.playosmo.com/en/
Age Range	4-7	3+	3-6	4+	3+	3+	3+	4+	5+	3+
Price	$15	$60	$45	$60	$40	$30	$30	$115	$20	$120

All prices quoted in USD and have been rounded to the nearest dollar.

Appendix C: Survey of 45 popular preschool programs (on television and internet) from Australia, China, Taiwan, Singapore & Hong Kong (2011-2015)

	Program / Average duration per episode	Country of origin / production company	Genre: Animation /Live action/ Variety	Type of characters & their composition	Theme / Siting of characters	Feedback about series
1	Teletubbies 1997-2001 24 minutes http://www.teletubbies.co.uk/	UK Ragdoll Productions	Live action with animated clips	Anthropomorphic characters (performers in body suits) & toddler's face as the sun Group of 4 characters and a machine. Of mixed characteristics and ethnicity Narrator off screen	Tubbytronic Superdome[70]	Initial concerns about the Tubbies' baby talk affecting the development of children's language skills. Having video screens on the Tubbies' tummies was also seen to endorse TV strongly.[71] America's religious right had denounced it as one of the characters, Tinky Winky, is deemed gay[72]. It might also be confusing to very young viewers as it does not seem to be in any order. On the other hand, the show is non-violent and characters are multicultural, curious. It embraces love and play while its pace is repetitive and slow, tailored for very young children.[73]
2	In the Night Garden 2007- 2011	UK Ragdoll Productions	Live action with animated clips	Anthropomorphic characters (performers in body suits) & puppets Group of large and small characters and a machine. Of mixed	Night Garden	There were concerns about the misrepresentation of certain characters' 'skin colours' in selected merchandise attributing to racial biasness. Although said the character was "not intended to represent a specific race

[70] http://en.wikipedia.org/wiki/Teletubbies. Accessed March 2014
[71] http://current.org/1998/02/eh-oh/. Accessed August 2014
[72] http://news.bbc.co.uk/2/hi/276677.stm. Accessed August 2014
[73] https://www.commonsensemedia.org/tv-reviews/teletubbies. Accessed August 2014

	26.5 minutes http://www.inthenightgarden.co.uk/			characteristics Narrator off screen		or culture." [74] The show emphasizes friendly, loving relationships (e.g. characters trying to learn a new skill or helping a friend solve a problem). Its soothing tone also eases prechoolers into bedtime.[75]
3	Waybuloo 2009 – present 19 minutes www.waybuloo.com	UK Canada Gallus Entertainment	Live action with computer animated clips	Anthropomorphic characters (computer animated) & children Group of 4 characters, respective bug-pets and 6 children. Of mixed characteristics and ethnicity Narrator off screen	Land of Nara[76]	Pipling characters practising "yogo", a form of yoga designed specially for children and their parents to get involved with what's on the screen. However some Christians attack what they perceived to be the overt promotion of aspects of Buddhism and Hinduism, such as meditation and levitation.[77] Concerns with the use of improper English also surfaced in some online parent forums.[78]
4	Sesame Street 1970 – present 55 minutes	United States Children's Television Workshop,	Variety Live action with animated clips and	Muppets / anthropomorphic monster puppets (performers in body suits) & adult & children performers. Animation clips are included	Sesame Street	The series is topical and also introduces simple words, alphabets and numbers. Sometimes it deals with strong emotions but the messages for the children are always positive and self-affirming.[80] Also the series is constantly

[74] http://www.telegraph.co.uk/news/uknews/4108465/BBC-forced-to-recall-In-The-Night-Garden-doll-over-skin-colour.html. Accessed March 2014
[75] https://www.commonsensemedia.org/tv-reviews/in-the-night-garden. Accessed August 2014
[76] http://en.wikipedia.org/wiki/Waybuloo. Accessed March 2014
[77] http://www.telegraph.co.uk/culture/tvandradio/bbc/8030043/Waybuloo-a-TV-show-of-delight-and-wonder.html. Accessed March 2014
[78] http://www.netmums.com/coffeehouse/general-coffeehouse-chat-514/tv-music-sport-entertainment-13/748287-waybaloo-grrr-all.html. Accessed March 2014
[80] https://www.commonsensemedia.org/tv-reviews/sesame-street. Accessed May 2014

	shorter made-for-net productions available via iTunes[79] www.sesamestreet.org	Sesame Workshop	puppets	Mixed characters and ethnicity		updated with current themes and that ensures its currency with growing children. The sexual orientation of Bert and Ernie[81], HIV-positive Kami, dietary concerns for Cookie Monster, Oscar the Grouch's mood swings, Elmo's questionable grammar[82] and recent parodies of other networks' programmes are some controversies that have risen over its long run.
5	Yo Gabba Gabba! 2007-present 22.5 minutes www.yogabbagabba.com	United States The Magic Store Productions Wildbrain Entertainment Nickelodeon Productions	Variety Live action with animated clips	Anthropomorphic characters (performers in body suits) & human performers. Animation clips are included Group of 4 characters (each representing a season 'realm'), a robot and human narrator.	Gabbaland[83]	It highlights life lessons young viewers can relate to, like sharing, being a good friend, trying your best, and being polite. The energetic puppet characters encourage kids to sing and dance along, though some parents were less convinced of the loud colours, beat-driven music in the shows. [84] It had been labelled as over-stimulating by some parents.[85]
6	Barney & Friends 1992-2010 47 minutes	United States Connecticut Public Television	Variety, Live action with animated clips	Anthropomorphic dinosaurs (performers in body suits), adult and children actors Core group of 4 dinosaurs, puppets,	Barney appears only when children are imagining[86]	An initial controversy over the rights to the popular character's "I Love You" song in 1994.[87] Other negative opinions that surfaced concerns the racial profile of the actor and how the dinosaur was deemed

[79] https://itunes.apple.com/au/podcast/sesame-street-podcast/id264537349?mt=2. Accessed May 2014
[81] http://abcnews.go.com/Entertainment/WolfFiles/story?id=91748&page=2. Accessed Jan 2014
[82] http://theweek.com/articles/499871/katy-perry-10-other-sesame-street-controversies. Accessed Jan 2014
[83] http://en.wikipedia.org/wiki/Yo_Gabba_Gabba! Accessed May 2014
[84] https://www.commonsensemedia.org/tv-reviews/yo-gabba-gabba. Accessed Jan 2014
[85] https://www.commonsensemedia.org/tv-reviews/yo-gabba-gabba/user-reviews. Accessed Jan 2014
[86] http://en.wikipedia.org/wiki/Barney_%26_Friends. Accessed 23 May 2014
[87] http://community.seattletimes.nwsource.com/archive/?date=19940608&slug=1914582. Accessed 20 April 2013

	www.barney.com			children and adult narrators		The episodes show creative problem solving, respect, participation, group cooperation, and active play.[88] Music encourages preschoolers to sing and dance along.
7	Play School 1966 – present 25 minutes http://www.abc.net.au/abcforkids/sites/playschool/	Australia Australia Broadcasting Corporation	Variety Live action with songs and animated clips & puppets	Adult performers using toys as props, puppets 2 adult narrators/singers and pianist	Simulated preschool play area	Detractors may penalize the show for its relative rawness and simplicity but it is precisely this simplicity in theme and format of presentation make this series a popular choice with parents. Its pace is slow and easy with music reassuring, not dramatic[89], compared to some of what preschoolers may be exposed to on other programmes.
8	The Wiggles 1991 – present 22 minutes www.thewiggles.com	Australia ABC For Kids[90]	Variety Live action with songs and animated clips	Anthropomorphic characters (performers in body suits and costumes) & adult actors 4 core adult narrators/singers, other personalities include a dog, dinosaur, octopus	Simulated preschool play area	Internal disputes between the members, removals and renewals in the team makeup have tainted the Wiggles branding to a certain degree[91]. The show may also appear to be lacking in educational content when compared to some other offerings on television. Like Play School, the Wiggles' simplicity in format, catchy song, silly skits and acting continues to make it very popular with preschoolers.[92]

[88] https://www.commonsensemedia.org/tv-reviews/barney-friends. Accessed 20 April 2013
[89] http://www.imdb.com/title/tt0143055/reviews. Accessed 20 April 2013
[90] http://en.wikipedia.org/wiki/The_Wiggles. Accessed 23 May 2014
[91] http://www.brw.com.au/p/sections/features/have_the_wiggles_killed_their_brand_BFDqd9BWTC6pUcFMKmVyDP. Accessed 16 June 2013
[92] https://www.commonsensemedia.org/tv-reviews/the-wiggles. Accessed 16 June 2013.

9	Lah-Lah's Big Live Band 2.5 minutes www.lah-lah.com	Australia-Canada Stella Projects (Australia) Bardel Entertainment (Canada)	Variety Live action with songs and animated clips	Adult performers singing, playing musical instruments in front of props and computer animation 4 musicians and 1 singer, children Narrator on screen	NA – band performances	In a similar model to the Wiggles, the programmes usually show preschoolers how to negotiate their way through situations they face while introducing them to music, musical performances and range of styles.[93] However the show may also appear to be lacking in educational content when compared to some other offerings on television.
10	LazyTown 2004 – present 24 minutes www.lazytown.com	Iceland, UK, US LazyTown Entertainment [94]	Variety Live action with animated clips and puppets	Actors in costumes and puppets 3 main characters and other puppet characters	LazyTown	The running theme of the show is about healthy lifestyle and young viewers are motivated to do simple acrobatic movements and dance along part of every show. However the story can sometimes be too fast paced for the children and the theme of the stories lost in all the activities. Some of the character designs are deemed scary for young audience by some parents[95].
11	Banana in Pyjamas 1992-2013 24 minutes	Australia Southern Star Group (2011-13)	Variety Live action with animated clips. Computer 3D	Anthropomorphic characters (performers in body suits and costumes) 6 main characters, 1 narrator and	Magical world of Cuddlestown [96]	Very parent and child-friendly as the issues put up in the show are mild and targets preschoolers or younger children. Occasionally there are some slight mischief but everyone learns their lesson, apologises and goes on being friends. [97]

[93] http://www.cbeebies.com/australia/lahlah. Accessed 20 September 2014.
[94] http://en.wikipedia.org/wiki/LazyTown. Accessed 20 April 2013
[95] https://www.commonsensemedia.org/tv-reviews/lazytown. Accessed 20 April 2013
[96] http://www.abc.net.au/abcforkids/shows/s2948119.htm. Accessed 20 Sept 2014.
[97] https://www.commonsensemedia.org/tv-reviews/bananas-in-pyjamas. Accessed 20 Sept 2014.

	http://www.cartoonito.co.uk/tv-show/bananas-in-pyjamas/games		animation after 2011	other 'animal' recurring characters		The change of format in 2011 to one that is animated has garnered mixed reviews from parents.[98] Other opinions include what some parents thought to be negative stereotyping and role modelling of the characters.
12	The Wotwots 2009-2011 10 minutes www.wotwots.com	New Zealand. Pukeko Pictures Weta Workshop	Mainly computer 3D animation characters with some live action elements	Anthropomorphic computer generated characters with live action background 2 alien twin siblings, 1 narrator	Steam-powered spaceship on Earth	Children relate to the aliens as they look at the world through very inquisitive eyes[99]. The characters are cute and gadgets plentiful to capture interests from both boys and girls. The use of live action and real scenes makes it relatable to young audience. The use of language is limited to that of an off-screen narrator hence there is less focus on vocabulary for the young audience. Hence some parents are less drawn to it than other programmes.
13	Peppa Pig 2004 - present 5 minutes www.peppapig.com	UK Astley Baker Davies Ltd	Computer aided 2D animation	Anthropomorphic computer generated characters (pigs and animals) Family unit of 4 pigs and extended family of pigs with other animal friends	House on a hill	A family-themed animation thus common domestic issues and relationship dynamics are often dealt with in the series. The relationships portrayed are realistic with the occasional teasing and comeuppance[100]. Some negative reviews about the show centred on how Peppa Pig, being bossy and abrupt,

[98] http://www.essentialbaby.com.au/forums/index.php?/topic/902911-when-did-bananas-in-pyjamas-go-animated/. Accessed 20 Sept 2014.
[99] https://www.commonsensemedia.org/tv-reviews/the-wotwots. Accessed July 2013.
[100] https://www.commonsensemedia.org/tv-reviews/peppa-pig. Accessed December 2013.

						may be a bad role model for young children[101]. Children picking up pig's snortings in their speech is also a concern.
14	Olivia 2009-2011 10.5 minutes	UK-US Chorion	Computer 3D animation	Anthropomorphic computer generated characters (pigs and animals) Family unit of 4 pigs and extended family of pigs with other animals as pets.	Suburbia. A world where all people are pigs.	Animation is adapted from the successful children literature of the same title. Unlike Peppa pig, the series is very much centred on a confident young girl (pig) Olivia and her imagination. The dialogue in Olivia can be a bit 'more sophisticated'[102]. Some parents have also found Olivia's world to be lacking in diversity and the character being too self-centred.[103].
15	Gaspard and Lisa 2001-2013 21 minutes	UK Chorion Impossible TV[104]	Computer 3D animation	Anthropomorphic computer illustrated characters (dogs in a human world) 2 families of dogs (Gaspard's and Lisa's) and their human friends (classmates and neighbours)	Paris	An animated series that is adapted from children books by Anne Gutman and from the onset it challenges assumptions about identities[105] and relationships. Though some find the premise of Gaspard and Lisa being the only anthropomorphic characters in an otherwise all-human environment unsettling[106].

[101] http://www.smh.com.au/entertainment/about-town/not-everyone-loves-peppa-pig-when-tv-shows-make-kids-naughty-20130822-2sdi9.html. Accessed December 2014.
[102] http://blogcritics.org/age-old-question-olivia-or-peppa/. Accessed March 2014.
[103] https://www.commonsensemedia.org/tv-reviews/olivia/user-reviews. Accessed March 2014.
[104] http://en.wikipedia.org/wiki/Gaspard_and_Lisa_(TV_series). Accessed March 2014.
[105] http://www.mdarlings.com/2012/04/tv-shows-we-love-gaspard-and-lisa-on.html. Accessed March 2014.
[106] https://sportsjim81.wordpress.com/2012/12/04/an-over-analyzed-grown-up-review-of-gaspard-and-lisa/. Accessed March 2014.

16	Penelope 2006 - 2008[107] 5 minutes	Japan Nippon Animation, NHK Enterprises and Shirogumi, Inc.	Computer aided 2D animation	Anthropomorphic 'painted' characters (colourful koalas and animals) Family unit of koalas with other animal friends	Preschool and home	An animated series that is adapted from children books by Anne Gutman. The character's curiosity, sense of humour and interaction with friends and family, make it very popular, especially in Japan. The artworks, guided by series background designer Yuta Sukegawa, retain the hand-painted look and feel of the original children's books.[108]
17	Peter Rabbit 2012 – present 12 minutes[109] http://www.peterrabbit.com/au	US, UK Silvergate Media Brown Bag Films Nickelodeon Animation Studios	Computer 3D animation	Anthropomorphic computer generated characters Family unit of 5 rabbits and other animal friends. Unlike other animations, there are 'villains' (e.g. a farmer and fox) that the characters have to be up against.	Lake District of northern England	An animated series that is adapted from characters created by Beatrix Potter. The central theme is about having a positive attitude and developing problem-solving skills as exemplified by the characters. But Peter's disregard of advice from family and friends and impulsiveness is something parents have an issue with[110].
18	Raa Raa! The Noisy Lion 2011 – present[111] 10 minutes http://www.raaraathenoisylio	UK Chapman Entertainment	Computer 3D animation	Anthropomorphic computer generated animal characters. Group of 6 animal friends, led by RaaRaa the male lion.	Jingly Jangly Jungle	The animated creatures are scripted to teach preschoolers communication skills with sounds and basic words. It focuses on the use of repetition, rhythm, rhyme and retelling as preferred teaching methods. The stories also deal with the importance of co-operation, problem solving and appropriate behaviour.[112] Like Peppa Pig's snorts, the 'noise' from the characters is not accepted by some parents.

[107] http://www.nipponanimation.com/program/. Accessed December 2013.
[108] http://mondemerda.blogspot.com.au/2010/05/4kids-entertainment-presenting-penelope.html. Accessed December 2013.
[109] http://en.wikipedia.org/wiki/Peter_Rabbit_(TV_series). Accessed January 2014.
[110] https://www.commonsensemedia.org/tv-reviews/peter-rabbit. Accessed January 2014.
[111] http://en.wikipedia.org/wiki/Raa_Raa_the_Noisy_Lion. Accessed March 2014.
[112] http://www.raaraathenoisylion.com/about. Accessed March 2014.

	n.com					
19	Arthur 1996 – present 25 minutes http://pbskids.org/arthur	Canada, USA Cookie Jar Entertainment 9 Story Entertainment [113]	2D animation	Anthropomorphic traditional 2D animated characters Main protagonist is a brown aardvark named Arthur. The stories revolved around his relationship between him and his sisters and other animal friends.	Elwood City (Fictional suburban town)	The characters are sited in a real world setting where the parents are working and friends come from multi ethnic and socioeconomic backgrounds. It covers more complex and original issues than other children programmes[114]. Its longevity has also allowed its writers to match real world development such as technology and pop culture. Its take on sibling struggles are often very real and some parents may have issues with highlighting character flaws in a children programme[115].
20	Franklin and Friends 2011-2012 22 minutes http://franklin.treehousetv.com	Canada Nelvana	Computer 3D animation	Anthropomorphic computer generated animal characters. Main protagonist is a turtle named Franklin. The stories revolved around his relationship between him and his family and other animal friends.	Village of Woodland	The series is an adaptation of the classic characters from the *Franklin the Turtle* series of children's books written by Paulette Bourgeois and illustrated by Brenda Clark[116]. The show aims to portray positive role modelling, navigate through issues with relationships and highlight social skills to young audience.[117] Like Arthur, it gets criticized for portraying character flaws[118], which are triggers for lessons to be delivered on the show.
21	Rastamouse	UK	Stop motion	Anthropomorphic crime busting	Mouseland	The stories aims to teach mutual

[113] http://en.wikipedia.org/wiki/Arthur_%28TV_series%29. Accessed December 2013.
[114] https://www.commonsensemedia.org/tv-reviews/arthur. Accessed December 2013.
[115] https://www.commonsensemedia.org/tv-reviews/arthur/user-reviews/adult. Accessed December 2013.
[116] http://en.wikipedia.org/wiki/Franklin_and_Friends. Accessed December 2013.
[117] https://www.commonsensemedia.org/tv-reviews/franklin-and-friends. Accessed December 2013.
[118] http://www.tv.com/shows/franklin/reviews/. Accessed December 2013.

	2011- present 11 minutes http://rastamouse.com/wp/	Three Stones Media The Rastamouse Company	animation	reggae mouse band called Da Easy Crew. Main protagonist is a mouse named Rastamouse. His band also doubles up as sleuths, solving mysteries for Mouseland.		understanding, love and respect without resorting to punishment. The idea is to have children learn that they can help wrongdoers to redeem themselves from their mistakes. It is also popular for its catchy songs and reggae music. Some criticizes the characters' West Indian accent and use of slang[119]. There were allegations and complaints of racist overtones[120] but its producers and broadcasters have always stated otherwise.
22	Octonauts 2010- present 11 minutes http://www.theoctonauts.com	UK Brown Bag Films	Computer 3D animation	Anthropomorphic computer generated animal characters. A crew of 7 animals working aboard the Octopod. The series also features half-animal, half-vegetables called Vegimals.	Undersea base, the Octopod	The series is based on American-Canadian children's books written by Vicki Wong and Michael C. Murphy[121]. It has fun facts about the ocean and sea creatures on top of the usual themes of friendship, cooperation and teamwork[122] in a sci-fi underwater world exploration setting.
23	Pororo the Little Penguin 2003 – present 5 &11 minutes	South Korea. created by Iconix Entertainment, SK Broadband,	Computer 3D animation	Anthropomorphic computer generated animal characters. A group of animal friends consisting of Penguin, Polar Bear, Fox, Beaver, Bird and Dinosaur	Snowy village of Porong Porong Forest[123]	The animated series explores the friendship and trials faced by this group of animal children. The characters grow with the series. Its global appeal can almost be narrowed down to the cute character designs, catchy tunes and unique personalities of the different

[119] http://en.wikipedia.org/wiki/Rastamouse. Accessed March 2014.
[120] http://www.dailymail.co.uk/news/article-2087221/Rastamouse-complained-childrens-TV-sparking-racism-row.html. Accessed March 2014.
[121] http://en.wikipedia.org/wiki/The_Octonauts. Accessed December 2013.
[122] https://www.commonsensemedia.org/tv-reviews/octonauts. Accessed December 2013.
[123] http://en.wikipedia.org/wiki/Pororo_the_Little_Penguin. Accessed March 2014.

		Ocon and EBS with the North Korean compa ny Samchŏlli in Kaesŏng				characters[124]. There are also some concerns about portraying the mischief and antics of some of the characters and its potential influence on young children[125].
24	PoCoYo 2005-2010 7 minutes http://www.pocoyo.com/en	Spain Zinkia Entertainment Cosgrove-Hall Films Granada International[126]	Computer 3D animation	Computer generated human and anthropomorphic animal characters. Main protagonists are Pocoyo (boy) and his animal friends. An offscreen narrator helps to guide the characters and viewer along.	White 3D space	Young viewers are encouraged by the narrator to recognise situations the characters are in hence imagination is core to the series. The minimal set and short story allows the parents to limit the time their children spend in front of the screen. Pocoyo also exhibits negative traits that are common for this age group[127], but eventually he identifies and fixes the problem, sometimes with the help of his friends. Its simplicity makes it more suitable for children under 4.
25	Postman Pat 1981-2013 15 minutes http://www.postmanpat.co.uk/	UK Woodland Animations (1981–1996) Cosgrove Hall Films (2003–2008) Mackinnon & Saunders	Stop motion animation	Stop motion animated human and animal characters. Main protagonists are Pat the postman and Jess the cat.	Village of Greendale and the nearby town of Pencaster	Viewers are shown how Pat goes about delivering their mail and also can be relied upon to solve the problems of the townsfolk, hence they learn about emotional development, problem solving, safety and community involvement[129]. The stories are often light hearted and focused on the friendship of the multi-ethnic characters living within the village and town.

[124] http://english.ohmynews.com/ArticleView/article_view.asp?no=383379&rel_no=1. Accessed March 2014.
[125] http://raabad.blogspot.com.au/2011/12/reviewing-pororo-little-penguin.html. Accessed March 2014.
[126] http://en.wikipedia.org/wiki/Pocoyo. Accessed May 2014.
[127] https://www.commonsensemedia.org/tv-reviews/pocoyo. Accessed May 2014.
[129] https://www.commonsensemedia.org/tv-reviews/postman-pat. Accessed May 2014.

		(2013–present) Classic Media (2010–2012) DreamWorks Classics (2012–present)[128]				
26	Bob the Builder 1998-2012 2015 – present 10 minutes http://www.bobthebuilder.com/index.html	UK Hot Animation Chapman Entertainment Hit Entertainment [130]	Stop motion animation	Stop motion animated human and anthropomorphic construction vehicle characters. Main protagonists are Bob the general contractor (with his own construction yard), with Scoop and the rest of the machine vehicles.	Bobsville , Sunflower Valley, Fixham Harbour	Most of the episodes convey a gung-ho, can-do attitude of its characters to young viewers. This inspires confidence but some of the backend reasons for being hung-ho, like raising money to build certain projects, may not connect with younger children[131]. Younger children may also not take to the structured way of problem solving that the show sometimes dwell on.
27	Fireman Sam 1987 – present 10 minutes http://www.firemansam.com/	UK (Wales) Bumper Films Hit Entertainment [132]	Stop motion animation Computer 3D animation (from 2002-present)	Stop motion then CGI animated human characters.	Village of Pontypandy	The central theme of the series is about teaching fire safety to young children. The storyline is similar to Postman Pat and Bob the Builder, which stresses on the importance of community involvement and problem solving. Some may take issue with stories that show young children starting or playing with fire and

[128] http://en.wikipedia.org/wiki/Postman_Pat. Accessed May 2014.
[130] http://en.wikipedia.org/wiki/Bob_the_Builder. Accessed May 2014.
[131] https://www.commonsensemedia.org/tv-reviews/bob-the-builder. Accessed May 2014.
[132] http://en.wikipedia.org/wiki/Fireman_Sam. Accessed March 2014.

						getting into troubles. Non-UK parents may also have some problems understanding the Welsh accents and expressions[133]. Other adults also felt they preferred the stop-motion series to the newer CGI iteration.
28	Shaun the Sheep / Timmy Time 2007- present 8 minutes 10 minutes (Timmy Time) http://www.timmytime.tv/	UK Aardman Animation	Stop motion animation	Stop motion animation of anthropomorphic sheeps. Shaun and his flock come up with antics to brighten their day while avoiding discovery by the Farmer with the help of sheepdog Bitzer[134] Timmy attends preschool with his anthropomorphic animal friends and likewise turns out to be a mischievous but reliable friend[135].	Shaun and his flock lives on Mossy Bottom Farm, a traditional small northern British farm	Shaun the sheep is a spinoff from Aardman's popular Wallace and Gromit series while Timmy Time is a spin off from Shaun the Sheep. Their popularity partly stems from the fact that both do not feature any dialogue and is readily accessible. Timmy Time is structured more like other children programmes, with emphasis on being responsible, learning empathy and fostering friendship with others[136]. Shaun the Sheep is more of clever (& typical Aardman) humour and does not offer any obvious positive message for children, though its leadership qualities can be discussed with them[137].
29	Pingu 1986 – 2006	UK, Switzerland	Stop motion animation	Stop motion animation of a family of 5 anthropomorphic penguins and	Antarctica	According to Carlo Bonomi, its original creator, he created Penguinese[139] with inspiration from

[133] https://www.commonsensemedia.org/tv-reviews/fireman-sam. Accessed March 2014.
[134] http://en.wikipedia.org/wiki/Shaun_the_Sheep. Accessed May 2014.
[135] http://en.wikipedia.org/wiki/Timmy_Time. Accessed May 2014.
[136] https://www.commonsensemedia.org/tv-reviews/timmy-time. Accessed May 2014.
[137] https://www.commonsensemedia.org/tv-reviews/shaun-the-sheep. Accessed May 2014.
[139] http://web.archive.org/web/20101207023135/http://www.kcl.ac.uk/content/1/c6/03/08/18/Pingu%27s%20Lingo%2C%20or%20How%20to%20Get%20By%20in%20Penguinese.doc. Accessed December 2013.

	5-6 minutes http://www.pingu.net/	Trickfstudio, The Pyros Group, Hit Entertainment, Hot Animation[138]		their friends.		*Gramelot*, an old French word for muttering or murmuring used by travelling performers. This is partly what makes this series and its characters endearing and entertaining for a larger age group. The set is minimal and young audience gets to focus on the physical comedy and pick up on how to control one's emotion and being responsible in overcoming bad behaviour[140] in front of loved ones. Some parents did feel Penguinese to be a bad influence and some scenes to be mildly violent and socially irresponsible.
30	Charlie and Lola 2005-2008 10-11 minutes http://www.charlieandlola.com/	UK Tiger Aspect Productions	Computer aided 2D animation	Animation centres on a 7 year old Charlie and his younger preschool sister, Lola. Their friends, including an imaginary friend of Lola's, often appear during playtime.	A residential apartment block	Based on the stories and illustrations by Lauren Child. The illustration style of the books is retained in the animated series. The series uses 2D cell animation, paper cut-out, fabric design, real textures, photomontage, and archive footage in a software application called CelAction2D[141] The stories are simple anecdotes in the lives of the protagonists. Positive thinking, role modelling (usually in the form of the older brother), relationships, responsibility and empathy are themes that the series touched on. Lola's antics are realistically childlike and relatable to all children and parents[142].

[138] http://en.wikipedia.org/wiki/Pingu. Accessed December 2013.
[140] https://www.commonsensemedia.org/tv-reviews/pingu. Accessed December 2013.
[141] http://en.wikipedia.org/wiki/Charlie_and_Lola. Accessed December 2013.
[142] https://www.commonsensemedia.org/tv-reviews/charlie-and-lola. Accessed December 2013.

31	Caillou 1997-2010 25 minutes http://www.caillou.com/indexEN.shtml	Canada Elastic Rights Clockwork Zoo Cookie Jar Entertainment DHX Media[143]	2D animation, Computer aided 2D animation	The animation is about the life of a 4-year-old boy named Caillou, his immediate and extended family, neighbours and friends.	17 Pine Street	The series is based on the books by author Christine L'Heureux and illustrator Hélène Desputeaux. Similar to Charlie and Lola, the protagonist is imaginative and sometimes serves as a role model to his younger toddler sister. It also portrays and deals with emotions that a preschooler may feel, such as anger, fear, loneliness, anxiety and empathy. They are told in a straightforward manner and is realistic[144], hence some parents may not think it's beneficial for their children.
32	Little Princess 2006 – 2009[145] 11 minutes http://www.littleprincesskingdom.com/	UK The Illuminated Film Company.	Computer aided 2D animation	2D animation showcasing a 4-year-old princess, her immediate family and courtiers. A narrator strings the story along.	A castle	The series is based on the books by author Tony Ross. The animated adaptation is faithful to its source material and any changes or additions compliment the original books beautifully[146]. The princess's character is not unlike Peppa Pig and Caillou as her share of temper, mischief making are known to everyone around her. Yet acceptance and reconciliation are key elements of the running series. Again, some parents do not like their children viewing negative behaviour being portrayed on screen.

[143] http://en.wikipedia.org/wiki/Caillou. Accessed February 2014.
[144] https://www.commonsensemedia.org/tv-reviews/caillou. Accessed February 2014.
[145] http://www.imdb.com/title/tt0934676/?ref_=ttrel_rel_tt. Accessed February 2014.
[146] http://www.toonhound.com/princess.htm. Accessed February 2014.

33	StoryTrain 2010 – present 11 minutes http://www.driverdansstorytrain.com/	UK, UAE Twofour54 3linemedia	Computer 3D animation with live action components	Anthropomorphic computer generated animal plush toy characters. Each character, or pair of characters has their own train carriage that can be hitched to the Story Train. The audience/ live children actors are asked for their opinion or choice on matters arising[147]. Each episode ends with Dan's story time, which helps involve preschoolers' interaction.	Story Corner	The series is deemed mellow[148] enough for preschoolers. The characters are modelled after handcrafted soft plushies/toys, which makes it look very attractive. The stories reflect some of the challenges that young children's face and also encourage pre-reading skills like active listening, retention, and comprehension.
34	Chugginton 2008 – present 10 minutes http://www.chuggington.com/	UK Ludorum plc Motion Magic (China)	Computer 3D animation	Anthropomorphic computer generated locomotives. 3 main characters and host of other characters. They also interact with other humans such as passengers and maintenance crew[149].	Chuggington	The animation is age-appropriate for preschoolers. The visuals are colourful and attractive to this group of audience. Each character is depicted as a young 'chugger' who, like preschoolers, master new skills even though they each learn differently. Diversity and tenacity is celebrated. The show's dedication to social and emotional development is underscored by stories that celebrate the importance of good listening practices, patience, honesty, and friendship[150].
35	Thomas and	UK	Live-	Anthropomorphic live action and later	Fictitious Island	The series is based on books written by

[147] http://en.wikipedia.org/wiki/Driver_Dan%27s_Story_Train. Accessed February 2014.
[148] https://www.commonsensemedia.org/tv-reviews/driver-dans-story-train. Accessed February 2014.
[149] http://en.wikipedia.org/wiki/Chuggington. Accessed December 2013.
[150] https://www.commonsensemedia.org/tv-reviews/chuggington. Accessed December 2013.

	Friends 1984 – present 10 minutes http://www.thomasandfriends.com/en-au	Clearwater Features Britt Allcroft Gullane Entertainment Hit Entertainment[151]	action/stop motion model trains, Computer 3D animation later	fully computer generated locomotives and human characters. 7 main characters and host of other characters. A railway director, Sir Topham Hat acts as the parental stand-in to the young locomotives. Narrator off screen	of Sodor	Reverend Wilbert Awdry and his son Christopher Awdry. Throughout the series, the characters learn about responsibility, teamwork, loyalty, and being helpful, while overcoming their own challenges when carrying out their tasks. It is not as flashy as Chuggington in terms of design and colours but it attracts parents who themselves had grown up with the original series.
36	小小智慧树 23 minutes http://shaoer.cntv.cn/xxzhihuishu/index.shtml	CCTV14 (China)	Live-action, variety and computer 3D animation	A variety of anthropomorphic creatures represented by actors in body suits and computer animated characters. Show has other computer animation. Adult human hosts and children are featured as part of the show, roleplaying and partaking in song and dance routines in front of live audience. Family competitions are also part of some episodes.	Studio and outdoor shoot	China's CCTV14 most popular TV programme for 1-3 year olds. It states that the programme is to be watched by parents and children. The series' content is varied though the focus is more activities-based, such as song and dance routines, drawing, craft making and reiterations of daily routines such as brushing of teeth. Worth noting is the introduction of English language learning in an animated segment between 2011-2013.
37	快乐大巴 48 minutes http://shaoer.cntv.cn/cctvchildren/kuailedaba/videopage/index.shtml	CCTV14 (China)	Live-action, variety	Adult human hosts and children are featured as contestants partaking in song and dance talent competition in front of live audience.	Studio shoot	China's CCTV14 young children song-dance talent showcase. It is modelled after popular adult variety talent programmes. Generally unlike Western productions, its pace is faster and more dramatic, with a much larger production involved in these programmes. It also serves as a cross publicity platform for Chinese-produced animation series.

[151] http://en.wikipedia.org/wiki/Thomas_%26_Friends. Accessed December 2013.

38	MOMO 歡樂谷 36 minutes	momo 親子台 (Taiwan) http://www.momokids.com.tw/	Live-action, variety and computer 3D animation	A variety of computer animated anthropomorphic creatures and a group of 10 adult performers (5 male, 5 female) partaking in song and dance routines and short sketches. Shot with computer rendered background.	Studio shoot	This is a collection of KTV format music videos targeted at preschoolers. The production is polished and packed with attractive animation targeted at children. The focus is the sing-a-long and dance-a-long routines that get the children on their feet.[152] Latest series included a segment of drama that deals with issues about family relationships, responsibilities and friends.
39	momo 寶貝星樂園 44 minutes	momo 親子台 (Taiwan) http://www.momokids.com.tw/	Live-action, variety	Adult human hosts and children are featured as contestants partaking in music, song and dance talent competition in front of live audience.	Studio shoot	Momo TV's young children music, song-dance talent showcase. It is modelled after popular adult variety talent programmes. Generally unlike Western productions, its pace is faster and more dramatic, with a much larger production involved in these programmes.
40	YoyoMan 2004- 25 minutes	東森幼幼台 （YoYo TV） http://yoyotv.ebc.net.tw/yoyoname/	2D animation	Set of 4 anthropomorphic superhero cartoon characters that are between 4-6 years old. YoYoMan and friends are toys that come alive after a scientific experiment. Cartoon is drawn in anime style.	Earth	The animation with superhero characters battling evil forces has some violence similar in kiddy mecha anime genre. The visuals are colourful and theme songs attractive to preschool and slightly older children. Like its cartoon counterparts from the States/ UK, Yoyoman is currently a very successful syndicated character in both Taiwan and China[153]
41	Super Rover and Friends 2015 – present	Singapore Mediacorp	Live action, puppets and computer 3D	Anthropomorphic computer animated stylized pair of cats as main protagonists. Show incorporates real	Studio / lab oktopolis	The animation is age-appropriate for preschoolers. Computer animated characters are superimposed on live action puppets and

[152] http://www.momokids.com.tw/program/prog/pg_20111111180709.html. Accessed May 2015.
[153] http://media.people.com.cn/GB/22114/70684/220352/14538283.html. Accessed May 2015.

	22 minutes http://video.toggle.sg/en/series/super-rover-and-friends/ep1/338733	Channel 'okto'	animation	puppets as secondary characters and children making appearances in segments.		they deal with mainly problem solving. Themes like teamwork, friendship and responsibility are explored with simple arithmetic and science. The sing-a-long and dance-a-long routines should be attractive to the preschool audience.
42	小农夫 Fresh Farmers 2015– present 23 minutes http://video.toggle.sg/en/series/fresh-farmers/ep1/336714	Singapore Mediacorp Channel 8	Live action	Live action actor/host with children participants. The target audience is 5 and above. The activity segments by child participants, revolves around answering mini quizzes, identifying farm objects and completing certain tasks, supported by their adult/parent participants.	Outdoors (farms)	The info-education series provides urbanized children and parents with an exposure to what agriculture in Singapore and Malaysia is like.
43	放學 ICU 2005-2015 60 min (2005-2014) 30 min (2014-2015)[154]	Hong Kong TVB Jade channel	Live action	Live action actors/hosts with children actors/participants. Characters in costumes and puppets were included as part of cast. The target audience is more of primary school children. The programme is divided into a series of skits segments, some with their own song and dance routine.	Studio	Second longest running Hong Kong children television programme. Content referred to every day issues such as responsibility, civic consciousness, with classmates, hosts and other children.
44	McDull and	RTHK	2D animation	McDull, an anthropomorphic piggy	Hong Kong	Part of the popular McDull franchise (McDull

[154] https://zh.wikipedia.org/wiki/%E6%94%BE%E5%AD%B8ICU. Accessed June 2015

	Chinese Culture 春田花花 中华娃娃博物馆 19 min 4 episodes 2006-2007	(Radio Television Hong Kong)		cartoon character, learns about Chinese culture and history in a 4-episode animation. The episodes follow the format with McDull and friends being lectured by their headmaster about Chinese culture, before being interrupted by one pupil or the other. The narrator would then answer the pupil's questions with examples from the life of McDull's ancestor. This is followed by a short history lesson from McDull's teacher Miss Chan and finishes with the evolution of a Chinese character.[155]		and its classmates are popular cartoon characters created by Hong Kong cartoonist Alice Mak and Brian Tse). The series aimed to make Chinese history and culture accessible to young children. Fans of the characters will relate to its whimsical approach to storytelling.
45	Think Big 天地 30 min 2015 –	Hong Kong TVB	Live action	Live action actors/hosts with children actors/participants. The programme is divided into a series of skits segments, some with their own song and dance routine. The 5-day weekly programming is segmented into info-education, games, discovery and English learning.[156]	Studio	A revamped children television program launched in Jan 2015 after canning 放學 ICU. Currently having mixed review from audience who had grown fond of the previous long running 放學 ICU. Its sister program Think Big 大明星 is a children music, song and dance talent competition recorded in front of live audience.

[155] https://en.wikipedia.org/wiki/McDull. Accessed June 2015
[156] http://programme.tvb.com/kids/kidsthinkbig. Accessed June 2015

Appendix D: (i) Sample of 25 Chinese storybooks for preschoolers (May-June 2014)

All books are sampled from Monash Public Library, Glen Waverley Branch (Victoria, Australia)

No.	Main Title	Author	Imprint	Year	ISBN
1.	百鸟朝凤 Bai niao chao feng = The phoenix and the hundred birds	娇蕾改编 Jiaolei gai bian	Beijing : Zhongguo dian li chu ban she, 北京 : 中国电力出版社,	2007.	9787508357904
2.	画虎 Hua hu Painting a tiger	娇蕾改编 Jiaolei gai bian	Beijing : Zhongguo dian li chu ban she, 2007. 北京 : 中国电力出版社,	2007	9787508357959
3.	谁在那儿, 小玻? Shui zai na'er, Xiao Bo?	艾力克希尔 彭懿译. Ailike Xi'er zhu ; Peng Yi yi.	Nanning : Jie li chu ban she 南宁 : 接力出版社	2006	9787807329848
4.	布力的秘密 Buli de mi mi	李岫青 Li, Xiuqing	Kunming : Chen guang chu ban she	2011	9787541436772
5.	爸爸的乖孩子 Ba ba de guai hai zi	谭恩美 Tan, Enmei	Chengdu Shi : Sichuan mei shu chu ban she,	2010	9787541042232
6.	贝尔熊的圣诞夜 Beier xiong de sheng dan ye	Wilson, Karma 卡玛・威尔逊 查普曼 ; 翻译	Beijing : Zhong yang bian yi chu ban she 北京 : 中央编译出版社	2010	9787511702395
7.	贝尔熊生病了 Beier xiong sheng bing le	Wilson, Karma 卡玛・威尔逊 查普曼译	Beijing : Zhong yang bian yi chu ban she 北京 : 中央编译出版社	2010	9787511702494

8.	从前有一条毛毛虫 Once there was a caterpillar	Anderson, Judith 朱蒂斯·安德森 于水译	Beijing : Dian zi gong ye chu ban she. 北京 : 电子工业出版社,	2010	9787121115240
9.	富兰克林的小宠物 Fulankelin de xiao chong wu	Bourgeois, Paulette 波莱特 · 布尔乔亚文 白鸥译	Nanning : Jie li chu ban she, 南宁 : 接力出版社,	2010	9787544813266
10.	换装记 Huan zhuang ji	Escoffier, Michaël 米夏埃尔 · 埃斯科菲耶 荣信文化编译.	Xi'an : Wei lai wen hua chu ban she. 西安 : 未来文化出版社.	2010	9787541741142
11.	咔咔嚓讲故事 Ka ka ca jiang gu shi	曹曦予 Cao, Xiyu	Changchun : Jilin chu ban ji tuan gong si 长春 : 吉林出版集团公司	2010	9787546310794
12.	糖猫 Tang Mao	曹曦予 Cao, Xiyu	Changchun : Jilin chu ban ji tuan gong si 长春 : 吉林出版集团公司	2010	9787546310701
13.	小鲤鱼斗恶龙 Xiao li yu dou e long	曹曦予 Cao, Xiyu	Changchun : Jilin chu ban ji tuan gong si 长春 : 吉林出版集团公司	2010	9787546310640
14.	一个冬夜. 友爱篇 Yi ge dong ye. You ai pian	Freedman, Claire 克莱儿 · 弗莱德曼	Beijing : Zhong yang bian yi, 北京 : 中央编译出版社,	2010	9787511702630
15.	56 号绵羊的传说	Pauline Pinson	[Changchun Shi] : Jilin chu ban	2011	9787546345611

	56 hao mian yang de chuan shuo	张持译	ji tuan you xian gong si [长春市]：吉林出版集团有限责任公司		
16.	不一样的小狗俏俏 Bu yi yang de xiao gou Qiaoqiao	白冰 Bai Bing	Zhongguo ming jia yuan chuang tu hua shu 中国名家原创图画书	2011	9787535364104
17.	黑猩猩来了 Hei xing xing lai le A black gorilla is coming	幼福 Youfu	Shijiazhuang : Hebei shao nian er tong chu ban she 石家庄：河北少年儿童出版社	2011	9787537643733
18.	马先生过生日 Ma xian sheng guo sheng ri	Goossens, Ray 戴露译	[Wuhan] : Hubei mei shu chu ban she. [武汉]：湖北美术出版社.	2011	9787539438832
19.	爸爸妈妈, 快回来吧! Ba ba ma ma, kuai hui lai ba!	Pappas, Debra 微笑译	Beijing : Hua xue gong ye chu ban she	2012	9787122128782
20.	长颈鹿不会跳舞 Chang jing Lu bu hui tiao wu	Andelie, Jiersi 兰童译	Beijing : Beijing ke xue ji shu chu ban she 北京：北京科学技术出版社	2012	9787530457047
21.	刺猬亨列塔的感冒 Ci wei Henglieta de gan mao	Buchanan, Heather 任溶溶译	Beijing : Zhongguo he ping chu ban she	2012	9787513701976
22.	迷路的小鸭子 Mi lu de xiao ya zi	葛翠琳 Ge, Cuilin	Nan chang Er shi yi shi ji chu ban she. 南昌 二十一世纪出版社.	2012	9787539171043
23.	爱做梦的小毛虫 Ai zuo meng de xiao mao chong	Bodesita, Weiluonika 周林莎译	Guilin : Guangxi shi fan da xue chu ban she.	2013	9787549531547

			桂林 : 广西师范大学出版社,.		
24.	丛林好兄弟 Cong lin hao xiong di	Weilunshaofu, Yilianna, 李颖妮译	Tianjin Xin lei chu ban she. 天津 新蕾出版社.	2013	9787530758434
25.	木房子花房子 Mu fang zi hua fang zi	杨红樱 Yang Hongying	[Wuhan] Hubei shao nian er tong chu ban she [武汉] : 湖北少年儿童出版社	2013	9787535380609

(ii) Collated list of 320 Chinese characters for juBloks & their allocated categories

CATEGORIES

		COMMON WORDS	QUANTIFIERS/ COMPARISONS	ACTIONS	OBJECTS	DIRECTIONS/ POSITIONS	TIME	FEELINGS/ EMOTIONS	BODY/ PRONOUNS	SOUNDS/ VOICES	FOOD	PLACE	COLOURS	FIRE/ HEAT	WATER	ANIMALS
	A	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／称呼	声响	饮食	地方	色	火	水	兽
1	啊									1						
2	爱							1								
3	安							1								
4	暗						1						1	1		

	B	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
5	办			1												
6	吧									1						
7	把	1	1													
8	不	1														
9	边					1						1				
10	被	1			1											
11	本		1		1											
12	包		1	1	1											
13	比	1														
14	必	1														
15	便	1			1											
16	杯		1		1						1					
17	鼻								1							
18	八		1													
19	爸								1							
20	白												1			

	C	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽

21	才	1														
22	从					1										
23	错	1														
24	次		1													
25	菜				1						1					

	CH	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
26	吃										1					
27	出		1			1										
28	长						1									
29	吹			1												
30	茶				1						1				1	
31	穿			1												
32	常						1									
33	成			1												
34	迟						1									

	D	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
35	的	1														
36	但	1														
37	到	1				1										
38	得	1														
39	对	1	1			1										
40	当	1					1									
41	都	1			1							1				
42	多		1													
43	点		1	1			1									
44	地	1			1							1				
45	带			1	1											
46	丢			1												
47	打		1	1												

48	大		1													
49	电				1											
50	东					1										
51	读			1												

	E	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
52	饿										1					
53	耳								1							
54	儿	1							1							
55	二		1													

	F	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
56	发			1	1											
57	分		1	1			1									
58	份		1													
59	非	1														
60	放			1												
61	服			1	1											
62	丰		1													
63	饭										1					
64	飞			1												
65	方				1	1										
66	房				1							1				
67	法				1											

	G	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
68	给			1												
69	个		1													
70	过			1		1	1									
71	更		1	1												
72	刚				1		1									
73	该	1														

74	高		1													
75	改			1												
76	工			1												
77	各		1													
78	关			1	1											
79	狗															1
80	光	1	1											1		

	H	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
81	后					1	1									
82	好	1						1								
83	和		1													
84	很	1	1													
85	会	1	1													
86	还	1		1												
87	喝									1	1					
88	回	1				1										
89	话	1														
90	换			1												
91	坏	1														
92	何	1														
93	喊									1						
94	号		1													
95	红												1			
96	黄												1			
97	黑												1			

	J	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
98	就	1														
99	儿		1													
100	具				1											
101	将	1					1									

102	旧						1									
103	家	1	1									1				
104	叫									1						
105	见	1														
106	进			1												
107	讲	1														
108	脚								1							
109	九		1													
110	今						1									
111	近					1										
112	经			1	1											

	K	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
113	看			1												
114	可	1														
115	快						1	1								
116	开			1												
117	哭							1		1						
118	口		1		1				1							
119	块		1													
120	扣			1	1											
121	肯	1														

	L	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
122	了	1														
123	来					1										
124	里		1			1										
125	拉			1												
126	路	1										1				
127	另					1										
128	亮						1							1		
129	乐							1		1						

130	老						1									
131	两		1													
132	冷														1	
133	六		1													
134	粒		1													
135	离			1		1										
136	蓝												1			

	M	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
137	没	1	1													
138	吗									1						
139	买			1												
140	们	1							1							
141	么	1								1						
142	卖			1												
143	猫															1
144	面		1						1		1					
145	米		1		1						1					
146	明						1							1		
147	慢			1				1								
148	抹			1												
149	目		1						1							
150	名		1		1											
151	妈								1							
152	美							1	1							

	N	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
153	内					1						1				
154	你	1							1							
155	那	1				1										
156	能	1														
157	难	1						1								

158	呢									1						
159	年		1				1									
160	女		1						1							
161	拿			1												
162	男		1						1							
163	哪	1				1										
164	闹							1		1						
165	念							1								

	O	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
166	哦									1						

	P	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
167	平	1		1	1											
168	拍		1	1												
169	怕							1								
170	跑			1												
171	爬			1												
172	陪	1		1												
173	片		1		1											
174	排		1	1												
175	匹		1													
176	破			1												
177	朋								1							

	Q	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
178	前					1	1									
179	去					1										
180	却	1														
181	请	1						1								
182	起			1												
183	全		1													

184	其		1													
185	切		1	1												
186	期						1									
187	求	1						1								
188	七		1													
189	钱		1		1											
190	青												1			

	R	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
191	然	1												1		
192	让	1		1												
193	如	1														
194	日						1							1		
195	认	1														
196	任	1														
197	入			1		1										
198	热													1		
199	人		1						1							

	S	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
200	色												1			
201	虽	1														
202	扫			1												
203	所	1			1											
204	思							1								
205	随	1		1												
206	三		1													
207	送			1												
208	四		1													
209	岁		1				1									

	SH	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽

210	说	1														
211	谁	1														
212	生								1							
213	睡			1												
214	上					1										
215	是	1														
216	少		1													
217	手								1							
218	双		1													
219	实	1														
220	商				1											
221	什	1														
222	十		1													
223	时		1				1									
224	书				1											
225	水										1				1	

	T	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
226	头								1							
227	条		1													
228	听			1												
229	同		1													
230	停			1												
231	提			1												
232	逃			1												
233	汤										1				1	
234	天		1				1									
235	突	1					1									
236	太	1	1													
237	他	1							1							
238	跳			1												
239	腿								1							

240	推			1												

	W	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
241	我	1							1							
242	为	1														
243	无		1													
244	完		1													
245	问	1														
246	位		1			1										
247	玩			1												
248	忘							1								
249	外					1										
250	晚						1									
251	午						1									
252	屋				1							1				
253	往			1		1										
254	五		1													

	X	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
255	小		1													
256	笑							1		1						
257	想							1								
258	星				1		1									
259	新						1									
260	下					1										
261	心				1			1								
262	像		1		1											
263	写			1												
264	先					1	1									
265	学			1												
266	些	1	1													
267	行			1												

268	喜							1								
269	吓							1								
270	谢	1						1								
271	现						1									

	Y	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
272	有	1	1													
273	也	1														
274	月				1		1									
275	要	1														
276	又		1													
277	用			1												
278	已	1					1									
279	眼								1							
280	越		1	1												
281	以	1					1									
282	由	1														
283	于	1														
284	一		1													
285	遇			1												
286	应	1								1						
287	衣				1											
288	医			1												
289	椅				1											

	Z H	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
290	祝	1														
291	找			1												
292	中			1		1										
293	着	1														
294	张		1	1												

295	这	1				1										
296	只		1													
297	真	1														
298	终					1	1									
299	站			1	1							1				
300	抓			1												
301	追			1												
302	住			1												
303	之	1														
304	正					1	1									
305	桌				1											

	Z	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽
306	自	1														
307	做			1												
308	在					1										
309	子				1				1							
310	最		1													
311	再						1									
312	走			1												
313	怎	1														
314	足								1							
315	早						1									
316	总		1													
317	嘴								1							
318	坐								1							
319	昨						1									
320	字				1											

total count	86	78	72	41	37	33	24	21	14	11	9	7	7	4	2
category	造句／对话	数量／比较	动作	东西	方向／位置	时间	心情	人体／人	声响	饮食	地方	色	火	水	兽

Appendix E- Project number CF10/2205 – 2010001244
(Use of portable digital devices by preschool children in bilingual families)

(i) Explanatory statement for participants

Date: 01.08.2010
Explanatory Statement – For Parents Participants

Title: The Use of Portable Digital Devices by Preschool Children in Bilingual Families

This information sheet is for you to keep.

The Use of Portable Digital Devices by Preschool Children in Bilingual Families

My name is Wilkie Tan and I am conducting a research project with Mr Gene Bawden, Senior Lecturer, Course Coordinator - Bachelor of Design (Visual Communication) in the Department of Design/ Faculty of Art & Design, towards a MDes (Research) at Monash University. This means that I will be writing an exegesis to accompany my studio production.

Why did you choose this particular person/group as participants?
The group is chosen as they are parents currently with children aged 5 and below.

Describe <u>how</u> (from whom?) you obtained the participants' contact details and <u>why</u> you chose this particular person/group of participants.
Participants will be contacts from my online social network accounts (Facebook, Twitter, email). They are chosen as they fit the profile I require for the survey.

The aim/purpose of the research
The aim of this study is to examine how the mode of storytelling is changing with the advent of affordable portable interactive media devices and consequentially how it affects the parent-child relationship and the child's literacy in bilingual families. It will also look at the challenges that writers, editors and designers now face with regards to working and publishing on such interactive platforms.
Hence the studio component will attempt to address the current design limitations in ergonomics and navigation; and pedagogical improvements in narrative content development and personalization to facilitate Mother Tongue and English language acquisition for preschoolers.
I am conducting this research to find out if the increasing popularity and availability of portable digital devices represent a new learning platform and opportunities for young children as parents readily cascade the use of such technology to them.
It is hoped that the findings from this research project will better inform educators, content developers and designers in the creation of better tools or applications for preschool learners. The project will also focus on how parents from bilingual families can tap on the potential of such platform to promote Mother Tongue literacy in their preschool children.

Possible benefits
Educator and parents may better understand the potential of using ubiquitous portable digital devices in the literacy development of their preschool children.

What does the research involve?
The study involves the analysis of data collated from this survey.

How much time will the research take?
The survey will take no more than 10 minutes.

Inconvenience/discomfort
There will be no inconvenience and/or discomfort to the participant.

Payment
There will be no form of payment or reward offered, financial or otherwise.

Can I withdraw from the research?

Being in this study is voluntary and you are under no obligation to consent to participation. Please be assured that all submissions are anonymous. Kindly note that by submitting your answers in this survey, you are consenting to them being used for my research. You will not be able to withdraw your answers once you have submitted them at the end of the survey.

Confidentiality
All survey respondents are anonymous. Only details provided by respondents in the survey will be used in the final publication of my exegesis.

Storage of data
Storage of the data collected will adhere to the University regulations and kept on University premises in a locked cupboard/filing cabinet for 5 years. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report.

Use of data for other purposes
The anonymous data collated may be used for other purposes and as it is anonymous, none of the respondents will be named or be identified in any way.

Results
If you would like to be informed of the aggregate research finding, please contact **Wilkie Tan** on **+61 4 66281974** or **portabledigitaldevices@gmail.com**. The findings are accessible from **01.01.2011-01.06.2011**.

If you would like to contact the researchers about any aspect of this study, please contact the Chief Investigator:	**If you have a complaint concerning the manner in which this research is being conducted, please contact:**
Mr Gene Bawden. Tel: +61 3 99032081 Fax:+61 3 99031440 Email: Gene.Bawden@artdes.monash.edu.au PO Box 197, Caulfiled East, 3145, VIC	Executive Officer Monash University Human Research Ethics Committee (MUHREC) Building 3e Room 111 Research Office Monash University VIC 3800 Tel: +61 3 9905 2052 Fax: +61 3 9905 3831 Email: muhrec@adm.monash.edu.au

Thank you.

Wilkie Tan

(ii) Survey questions

Title: The Use of Portable Digital Devices by Preschool Children in Bilingual Families

1. Which of the following portable digital devices do you own?

- ☐ Smart phone (e.g. Palm, iPhone, Blackberry)
- ☐ Digital media player (e.g iPod, Zune)
- ☐ Netbook/mini notebook (e.g. ASUS eeePC)
- ☐ Tablet (e.g. iPad, Tablet PC)
- ☐ eBook Reader
- ☐ Portable gaming device (e.g. PSP, Nintendo DSi)
- ☐ Other (Please Specify)

2. What is the age of your oldest child?

- ○ 0-12 months old
- ○ 1-2 years old
- ○ 2-3 years old
- ○ 3-4 years old
- ○ 4-5 years old

3. Does your oldest child have access to your portable digital devices or have you purchased at least 1 similar device specifically for his/her use?

- ☐ My oldest child has access to my portable digital device/s and does not have his/her own digital device
- ☐ My oldest child has his/her own device and does not have access to my portable digital device/s
- ☐ My oldest child neither has his/her own digital device nor have access to mine
- ☐ My oldest child has access to the my portable digital device/s and I have also procured at least 1 similar device specifically for his/her use
- ☐ Please specify device recently procured for your child and its approximate price

4. At what age did you introduce your oldest child to portable digital device/s?

- ○ 0-12 months old
- ○ 1-2 years old
- ○ 2-3 years old
- ○ 3-4 years old
- ○ 4-5 years old
- ○ My oldest child has not been introduced to any portable digital device

5. What is the total amount of time (per day) your oldest child spend on all the device/s he/she has access to?

- ○ 0 -15 minutes
- ○ 15 - 30 minutes
- ○ 30 - 60 minutes
- ○ 1 - 2 hours
- ○ more than 2 hours
- ○ My oldest child does not have access to any portable digital device

6. What is your oldest child's level of interest in your/his/her portable digital device/s?

- ○ My oldest child prefers it over his/her other toys
- ○ My oldest child's level of interest is the same as his/her other toys
- ○ My oldest child is not at all interested in any portable digital device
- ○ Not sure about my oldest child's level of interest
- ○ My oldest child does not have access to any portable digital device

7. Is your oldest child confident in the use of your/his/her portable digital device/s?

- ○ My oldest child is confident across most applications
- ○ My oldest child is confident only on certain applications
- ○ My oldest child is somewhat confident but needs guidance from time to time
- ○ My oldest child needs guidance all the time
- ○ I am not sure of my oldest child's confidence level
- ○ My oldest child does not have access to any portable digital device

8. How does your oldest child go about learning to operate your/his/her portable digital device/s?

- ☐ My oldest child is self taught (intuitive design on the portable digital device/s and applications)
- ☐ My oldest child learnt from peers (from sibling/s or from other children)
- ☐ My oldest child learnt by watching me perform tasks on the portable digital device/s
- ☐ I have actively taught my oldest child how to operate the portable digital device/s
- ☐ Not applicable as my oldest child has no access to any portable digital devices
- ☐ Other (Please Specify)

9. What do you think of the duration of time your oldest child is spending on these portable digital devices?

- ○ Too long
- ○ Just right

- ○ Too short
- ○ Not applicable as my oldest child has no access to any portable digital devices

10. Do you regulate the duration your child/children spend/s on these portable digital device/s?

- ○ Yes
- ○ No
- ○ Sometimes
- ○ I've tried but it does not work on my child/children
- ○ Not applicable as my oldest child has no access to any portable digital devices

11. What are the concerns that you may have of your child/children using the portable digital device/s? Please tick on all applicable concerns.

- ☐ Concerns about the effect on eyesight
- ☐ Concerns about the effect on posture
- ☐ Concerns about the effect on attention-span
- ☐ Concerns about my child/children accessing appropriate content
- ☐ Concerns about the availability of suitable content for my child/children's learning
- ☐ Other concerns (Please Specify)

12. Do you intend to procure and install child-oriented applications/appropriate content for your own/your child's/your children's portable digital device/s in the near future?

- ○ I have already procured and installed such child-oriented applications/appropriate content and will continue to do so in the near future
- ○ I have not procured or installed such child-oriented applications/appropriate content and will consider doing so in the near future
- ○ I have not procured or installed such child-oriented applications/appropriate content and will not be doing so in the near future

13. What kind of child-oriented applications/appropriate content is/are currently installed on your own/your child's/your children's portable digital device/s? Please tick on all applications/content that is/are currently installed.

- ☐ I have not installed any child-oriented applications/content
- ☐ I have installed word recognition & vocabulary building applications/content
- ☐ I have installed arithmetic-related applications/content
- ☐ I have installed puzzles (e.g. shape sorting/colour matching activities)
- ☐ Other applications/content (Please Specify)

14. How often do you procure such child-oriented applications/appropriate content for your own/your child's/your children's portable digital device/s?

- ○ Once every week

- ○ Once every 2 weeks
- ○ Once every month
- ○ Infrequently
- ○ Never

15. What do you think of the prices of such child-oriented applications/appropriate content for your own/your child's/your children's portable digital device/s?

- ○ Too expensive
- ○ Expensive but affordable
- ○ Very affordable
- ○ Not sure

16. What do you look for when you procure such child-oriented applications/appropriate content for your own/your child's/your children's portable digital device/s? Please tick on all relevant considerations.

- ☐ Level of interest of your child/children
- ☐ User interface
- ☐ Relevance of content
- ☐ Appeal of graphics and audio clips
- ☐ Degree of interactivity
- ☐ Cost of application/content
- ☐ File size
- ☐ Degree of customisation/personalisation/authoring of content
- ☐ Possibility of future upgrades to the application/content
- ☐ Availability of other language options
- ☐ Produced by established content developers
- ☐ Application/content has identifiable elements (e.g. same characters) from existing children TV/video programmes
- ☐ Other considerations (Please Specify)

17. What other preschool educational material have you provided for your child/children? Please tick on all applicable material that you have provided.

- ☐ Flash cards
- ☐ Story books
- ☐ Puzzles
- ☐ Writing-practice & object/word-recognition books
- ☐ Pretend-play toys

☐ Battery-operated learning toys with preset audio-visual responses (e.g. talking teddy bear)

☐ Other (Please Specify)

18. What do you look for when you procure the above selected preschool material for your child/children? Please tick on all your considerations.

☐ How much interest the child/children has/have on the material

☐ How relevant is the content to his/her/their school's curriculum

☐ How appealing are the visuals in the material (e.g. colourful graphics)

☐ How interactive is the material (e.g. for battery operated toys)

☐ How expensive is the material

☐ How long can your child use the material for (e.g. greater age range)

☐ How current is the material (e.g. is it the latest version/print)

☐ Whether other language options are available (e.g. provision of corresponding text in your mother tongue)

☐ Whether the material is produced by established publishers or manufacturers

☐ Whether the material has identifiable elements (e.g. same characters from existing children TV/video programmes)

☐ How safe is the material for the child/children (e.g. choking hazard)

☐ Other considerations (Please Specify)

19. Do you think exposure to educational material (including those developed for portable digital devices) to your child/children will be/has been beneficial to his/her/their current literacy development?

○ I have provided such exposure as I believe that such material will definitely be/has been beneficial to his/her/their literacy development

○ I have provided such exposure but am not sure if such material will be/has been beneficial to his/her/their literacy development

○ I have not provided such exposure as I do not think such material will be beneficial to his/her/their current literacy development

20. Do you think your child/children learn better from education-related applications/content on portable digital devices than from books?

☐ Yes

☐ No

☐ Not sure

☐ Please elaborate on your choice of answer.

21. Would you be interested in child-oriented applications/appropriate content being delivered in your Mother Tongue?

○ Yes

No

22. What is your usage of English and your Mother Tongue at home and at work?

I use only English at home and at work

I use mainly English at home and mainly my Mother Tongue at work

I use mainly my Mother Tongue at home and mainly English at work

I use only my Mother Tongue at home and at work

I use more English than my Mother-Tongue, both at home and at work

I use more of my Mother Tongue than English, both at home and at work

I use English and my Mother Tongue, in equal amounts of time, both at home and at work

23. Which language do you use most often with your child/children?

I only use English with my child/children

I only use my Mother Tongue with my child/children

I use more English than my Mother Tongue with my child/children

I use more of my Mother Tongue than English with my child/children

I use both English and my Mother Tongue for equal amounts of time with my child/children

Other Language (Please Specify)

24. How do you rate the importance of your Mother Tongue in your child's/children's literacy development?

Very important

Important

Somewhat important

Not important

25. Kindly state your main reason for your above choice.

_____

26. How often do you, your partner and/or caregiver (e.g. day-carer/grandparent, if applicable) read to your child/children?

	Daily	On most days of the week	At least once a week	At least once every 2 weeks	At least once a month	Never
You						
Your Partner						
Caregiver (e.g. day-carer/grandparent, if applicable)						

27. Please indicate the education level for yourself, your partner and/or caregiver (e.g. day-carer/grandparent, if applicable).

	Diploma holder or lower	Graduate	Postgraduate or higher
You	○	○	○
Your Partner	○	○	○
Caregiver (e.g. day-carer/grandparent, if applicable)	○	○	○

28. Please indicate your age group.

○ <21

○ 21-25

○ 26-30

○ 31-35

○ 36-40

○ 41-45

○ >45

29. Please indicate your present occupation.

_____

30. Please indicate your family's income level.

○ Low income family

○ Middle income family

○ High income family

(iii) Full set of survey responses

1. Which of the following portable digital devices do you own?	% of Respondents	Number of Respondents
Smart phone (e.g. Palm, iPhone, Blackberry)	32.73%	36
Digital media player (e.g iPod, Zune)	20.91%	23
Netbook/mini notebook (e.g. ASUS eeePC)	17.27%	19
Tablet (e.g. iPad, Tablet PC)	7.27%	8
eBook Reader	0.00%	0
Portable gaming device (e.g. PSP, Nintendo DSi)	15.45%	17
digital camera	0.91%	1
The closest I have is a Nokia N80	0.91%	1
MP3 player	0.91%	1
wii	0.91%	1
None	0.91%	1
Portable Media Player (Ainol)	0.91%	1
Camera	0.91%	1
Number of respondents		***48***
Number of respondents who skipped this question		***0***

2. What is the age of your oldest child?	% of Respondents	Number of Respondents
0-12 months old	8.33%	4
1-2 years old	10.42%	5
2-3 years old	20.83%	10
3-4 years old	20.83%	10
4-5 years old	39.58%	19
Number of respondents		***48***
Number of respondents who skipped this question		***0***

3. Does your oldest child have access to your portable digital devices or have you purchased at least 1 similar device specifically for his/her use?	% of Respondents	Number of Respondents
My oldest child has access to my portable digital device/s and does not have his/her own digital device	57.69%	30
My oldest child has his/her own device and does not have access to my portable digital device/s	1.92%	1
My oldest child neither has his/her own digital device nor have access to mine	25.00%	13
My oldest child has access to the my portable digital device/s and I have also procured at least 1 similar device specifically for his/her use	7.69%	4
Sony Cybershot - S$60	1.92%	1
The only time my children has access to my phone is when we are stuck somewhere with nothing to do and I let them either listen to music, watch videos or play a game that came with the phone.	1.92%	1
Ainol Stryker V8000HDS (S$170)	1.92%	1
ipod 8GB $300	1.92%	1
Number of respondents		***47***
Number of respondents who skipped this question		***1***

4. At what age did you introduce your oldest child to portable digital device/s?	% of Respondents	Number of Respondents
0-12 months old	10.42%	5
1-2 years old	18.75%	9
2-3 years old	20.83%	10
3-4 years old	12.50%	6
4-5 years old	14.58%	7
My oldest child has not been introduced to any portable digital device	22.92%	11
Number of respondents		***48***
Number of respondents who skipped this question		***0***

5. What is the total amount of time (per day) your oldest child spend on all the device/s he/she has access to?	% of Respondents	Number of Respondents
0 -15 minutes	31.25%	15
15 - 30 minutes	18.75%	9
30 - 60 minutes	16.67%	8
1 - 2 hours	8.33%	4
more than 2 hours	0.00%	0
My oldest child does not have access to any portable digital device	25.00%	12
Number of respondents		***48***
Number of respondents who skipped this question		***0***

6. What is your oldest child's level of interest in your/his/her portable digital device/s?	% of Respondents	Number of Respondents
My oldest child prefers it over his/her other toys	17.02%	8
My oldest child's level of interest is the same as his/her other toys	53.19%	25
My oldest child is not at all interested in any portable digital device	0.00%	0
Not sure about my oldest child's level of interest	4.26%	2
My oldest child does not have access to any portable digital device	25.53%	12
Number of respondents		***47***
Number of respondents who skipped this question		***1***

7. Is your oldest child confident in the use of your/his/her portable digital device/s?	% of Respondents	Number of Respondents
My oldest child is confident across most applications	14.89%	7
My oldest child is confident only on certain applications	21.28%	10
My oldest child is somewhat confident but needs guidance from time to time	25.53%	12
My oldest child needs guidance all the time	6.38%	3
I am not sure of my oldest child's confidence level	8.51%	4
My oldest child does not have access to any portable digital device	23.40%	11
Number of respondents		***47***
Number of respondents who skipped this question		***1***

8. How does your oldest child go about learning to operate your/his/her portable digital device/s?	% of Respondents	Number of Respondents
My oldest child is self taught (intuitive design on the portable digital device/s and applications)	24.24%	16
My oldest child learnt from peers (from sibling/s or from other children)	6.06%	4
My oldest child learnt by watching me perform tasks on the portable digital device/s	36.36%	24
I have actively taught my oldest child how to operate the portable digital device/s	13.64%	9
Not applicable as my oldest child has no access to any portable digital devices	16.67%	11
They have no access to my work tablet nor my smart phone without me around. They're not taught to operate any of them. I will only play some youtube videos to show them. I don't think they understand anything, but just like to hold, touch something they have little access to.	1.52%	1
We turn on the digital devices for him when he asks for it, mainly to watch his cartoons.	1.52%	1
Number of respondents		***47***
Number of respondents who skipped this question		***1***

9. What do you think of the duration of time your oldest child is spending on these portable digital devices?	% of Respondents	Number of Respondents
Too long	4.26%	2
Just right	72.34%	34
Too short	0.00%	0
Not applicable as my oldest child has no access to any portable digital devices	23.40%	11
Number of respondents		***47***
Number of respondents who skipped this question		***1***

10. Do you regulate the duration your child/children spend/s on these portable digital device/s?	% of Respondents	Number of Respondents
Yes	61.70%	29
No	2.13%	1
Sometimes	12.77%	6
I've tried but it does not work on my child/children	2.13%	1
Not applicable as my oldest child has no access to any portable digital devices	21.28%	10
Number of respondents		***47***
Number of respondents who skipped this question		***1***

11. What are the concerns that you may have of your child/children using the portable digital device/s? Please tick on all applicable concerns.	% of Respondents	Number of Respondents
Concerns about the effect on eyesight	27.27%	42
Concerns about the effect on posture	16.23%	25
Concerns about the effect on attention-span	20.78%	32
Concerns about my child/children accessing appropriate content	14.29%	22
Concerns about the availability of suitable content for my child/children's learning	16.23%	25
Addiction	0.65%	1
no concerns as the materials she can access are appropriate for her age.	0.65%	1
afraid he damages it by dropping it or deletes something erroneously, and hogging it, refusing to return it when i need it.	0.65%	1
Overly reliant on interaction with others over the internet rather than face to face	0.65%	1
Eg, the ability to write with pen as compared to tracing with fingers.	0.65%	1
reliance on such devices may be counter productiveon a the child's intellectual and social development.	0.65%	1
damaging the device as they don't really know much about them.	0.65%	1
Not interested in non IT methods of playing or living	0.65%	1
Number of respondents		***47***
Number of respondents who skipped this question		***1***

12. Do you intend to procure and install child-oriented applications/appropriate content for your own/your child's/your children's portable digital device/s in the near future?	% of Respondents	Number of Respondents
I have already procured and installed such child-oriented applications/appropriate content and will continue to do so in the near future	46.81%	22
I have not procured or installed such child-oriented applications/appropriate content and will consider doing so in the near future	42.55%	20
I have not procured or installed such child-oriented applications/appropriate content and will not be doing so in the near future	10.64%	5
Number of respondents		***47***
Number of respondents who skipped this question		***1***

13. What kind of child-oriented applications/appropriate content is/are currently installed on your own/your child's/your children's portable digital device/s? Please tick on all applications/content that is/are currently installed.	% of Respondents	Number of Respondents
I have not installed any child-oriented applications/content	20.22%	18
I have installed word recognition & vocabulary building applications/content	29.21%	26
I have installed arithmetic-related applications/content	13.48%	12
I have installed puzzles (e.g. shape sorting/colour matching activities)	23.60%	21
Games	1.12%	1
Videos for children found in YouTube	1.12%	1
Phonics, letter writing, numbers	1.12%	1
digital books	1.12%	1
drawing, colouring app. kinder music tracks are also stored on my device for her entertainment.	1.12%	1
Digital Art application software	1.12%	1
camera/photo viewer	1.12%	1
storybooks	1.12%	1
games?	1.12%	1
Have not installed anything but watch Youtube videos on Alphabets, Numbers and Lifeskills.	1.12%	1
age appropraite movies and moral content	1.12%	1
drawing/doodling applications	1.12%	1
	Number of respondents	***47***
	Number of respondents who skipped this question	***1***

14. How often do you procure such child-oriented applications/appropriate content for your own/your child's/your children's portable digital device/s?	% of Respondents	Number of Respondents
Once every week	2.17%	1
Once every 2 weeks	6.52%	3
Once every month	17.39%	8
Infrequently	41.30%	19
Never	32.61%	15
	Number of respondents	***46***
	Number of respondents who skipped this question	***2***

15. What do you think of the prices of such child-oriented applications/appropriate content for your own/your child's/your children's portable digital device/s?	% of Respondents	Number of Respondents
Too expensive	14.89%	7
Expensive but affordable	34.04%	16
Very affordable	19.15%	9
Not sure	31.91%	15
	Number of respondents	***47***
	Number of respondents who skipped this question	***1***

16. What do you look for when you procure such child-oriented applications/appropriate content for your own/your child's/your children's portable digital device/s? Please tick on all relevant considerations.	% of Respondents	Number of Respondents
Level of interest of your child/children	15.46%	45
User interface	9.28%	27
Relevance of content	14.09%	41
Appeal of graphics and audio clips	11.68%	34
Degree of interactivity	11.68%	34
Cost of application/content	11.34%	33
File size	3.09%	9
Degree of customisation/personalisation/authoring of content	3.09%	9
Possibility of future upgrades to the application/content	4.47%	13
Availability of other language options	4.12%	12
Produced by established content developers	5.15%	15
Application/content has identifiable elements (e.g. same characters) from existing children TV/video programmes	5.84%	17
Most apps are free. :)	0.34%	1
not sure for now.	0.34%	1
	Number of respondents	***47***
	Number of respondents who skipped this question	***1***

17. What other preschool educational material have you provided for your child/children? Please tick on all applicable material that you have provided.	% of Respondents	Number of Respondents
Flash cards	15.32%	36
Story books	19.57%	46
Puzzles	17.87%	42
Writing-practice & object/word-recognition books	14.47%	34
Pretend-play toys	15.32%	36
Battery-operated learning toys with preset audio-visual responses (e.g. talking teddy bear)	13.62%	32
lego, playdough	0.43%	1
NA	0.43%	1
we do not purchase toys for our children. they use items such as paper boxes, discarded food containers and kitchen utensils and lots of imagination to make play things and role play.	0.43%	1
DVDs	0.43%	1
Building blocks, (you name it, I should have it :))	0.43%	1
self made toys, play mobil, lego and printouts from friends and websites. Good quality programs from TV such as animal planets, discovery channels and national graphic and children educational program. These programs widen his horizon.	0.43%	1
wooden blocks, drawing, various brush and textural materials, window painting and canvases, cut and paste, writing and drawing books	0.43%	1
maps, alphabet & word pinup charts, drawing material like newsprint and crayons	0.43%	1
Sudoku	0.43%	1
	Number of respondents	***48***
	Number of respondents who skipped this question	***0***

18. What do you look for when you procure the above selected preschool material for your child/children? Please tick on all your considerations.	% of Respondents	Number of Respondents
How much interest the child/children has/have on the material	12.93%	38
How relevant is the content to his/her/their school's curriculum	7.14%	21
How appealing are the visuals in the material (e.g. colourful graphics)	12.24%	36
How interactive is the material (e.g. for battery operated toys)	8.50%	25
How expensive is the material	9.52%	28
How long can your child use the material for (e.g. greater age range)	11.22%	33
How current is the material (e.g. is it the latest version/print)	4.76%	14
Whether other language options are available (e.g. provision of corresponding text in your mother tongue)	5.10%	15
Whether the material is produced by established publishers or manufacturers	6.80%	20
Whether the material has identifiable elements (e.g. same characters from existing children TV/video programmes)	5.78%	17
How safe is the material for the child/children (e.g. choking hazard)	12.59%	37
not sure	0.34%	1
Whether the mother thinks it's worth it and can use it.	0.34%	1
Match with age, thus level of mental and cognitive development	0.34%	1
NA	0.34%	1
how it stimulate my child's creativity.	0.34%	1
Durability	0.34%	1
see whether can borrow from friends or siblings or cousins to make a copy.	0.34%	1
safety is 1st priority over others	0.34%	1
moral content	0.34%	1
Whether material develops the right attitude, e.g. patience and child have a sense of achievement or learn something that is new in which the child finds it intriguing	0.34%	1
	Number of respondents	***48***
	Number of respondents who skipped this question	***0***

19. Do you think exposure to educational material (including those developed for portable digital devices) to your child/children will be/has been beneficial to his/her/their current literacy development?	% of Respondents	Number of Respondents
I have provided such exposure as I believe that such material will definitely be/has been beneficial to his/her/their literacy development	63.83%	30
I have provided such exposure but am not sure if such material will be/has been beneficial to his/her/their literacy development	27.66%	13
I have not provided such exposure as I do not think such material will be beneficial to his/her/their current literacy development	8.51%	4
	Number of respondents	***47***
	Number of respondents who skipped this question	***1***

20. Do you think your child/children learn better from education-related applications/content on portable digital devices than from books?	% of Respondents	Number of Respondents
Yes	17.46%	11
No	20.63%	13
Not sure	34.92%	22
sites such as Starfall and eresource from national library board sg compliment my child's learning.	1.59%	1
It's a mix. Such as mental mathematics. He has to learn through coaching. this apply to writing too for both english and chinese. We can't depend on diogital aid to assist the development of achild. a Child needs to be exposed to a varitey of ways in learning. Unless he had gobe through the test on his learning style, kinetic, visual etc..	1.59%	1
Educational devices are beneficial to a certain extent. Child stares at screen all the tie and if parentl guidance in terms of control is given by parents, children will not know how to limit their time on portable devices. Books allows a child to learn how to be still and concentrate their attention on the illustrations, understanding the pictures and matching it to the words provided. A child, if trained to read books can have better attention span and in my observation of my kids would generally be more able to keep still and not find their surrounding boring when there is no portable device.	1.59%	1
i think they are better at multi-tasking with exposure to these devices. not sure if it affects his attention span.	1.59%	1
she seems to remember more of stuff she sees on the device but then again could be reinforced by other stuff she gets in books/tv. i think i learn more / at least find it more interesting and maybe tend to expose more of it to her.	1.59%	1
Cos children's attention span's limited. Portable device is but one of the MANY toys, and each toy wont last too long. So good to have a variety.	1.59%	1
Learning from portable digital devices can be quite passive and lacks communication, whereas children can involved parents participation when learning from books.	1.59%	1
im old sch and believe books are still better.. but havent explore digital devices and would be open to trying it if there are recommendations form peers	1.59%	1
It is a different type of learning, not better but still a learning process. Both types of learning are important.	1.59%	1
she has more chances of accessing learning content as portable devices allow her to learn on the go. i do not want to lug her books during trips out of the house.	1.59%	1
No conclusive research evidence about learning from digital devices.	1.59%	1
books allow for more interaction/imagination development from kids. portal digital devices are convenient, but not sure about long term impact on kids	1.59%	1
there are some things that cannot be learnt from portable devices and would require practical practices to make it real to the child (and to his memory)	1.59%	1
they need ti learn from both hence balanced exposure	1.59%	1
we have never relied solely on digital devices for our childrens' intellectual development	1.59%	1
I don't own any portable digital device myself.	1.59%	1
NA	1.59%	1
	Number of respondents	***45***
	Number of respondents who skipped this question	***3***

21. Would you be interested in child-oriented applications/appropriate content being delivered in your Mother Tongue?	% of Respondents	Number of Respondents
Yes	100.00%	48
No	0.00%	0
	Number of respondents	***48***
	Number of respondents who skipped this question	***0***

22. What is your usage of English and your Mother Tongue at home and at work?	% of Respondents	Number of Respondents
I use only English at home and at work	10.42%	5
I use mainly English at home and mainly my Mother Tongue at work	2.08%	1
I use mainly my Mother Tongue at home and mainly English at work	27.08%	13
I use only my Mother Tongue at home and at work	0.00%	0
I use more English than my Mother-Tongue, both at home and at work	39.58%	19
I use more of my Mother Tongue than English, both at home and at work	4.17%	2
I use English and my Mother Tongue, in equal amounts of time, both at home and at work	16.67%	8
Number of respondents		***48***
Number of respondents who skipped this question		***0***

23. Which language do you use most often with your child/children?	% of Respondents	Number of Respondents
I only use English with my child/children	6.25%	3
I only use my Mother Tongue with my child/children	4.17%	2
I use more English than my Mother Tongue with my child/children	47.92%	23
I use more of my Mother Tongue than English with my child/children	22.92%	11
I use both English and my Mother Tongue for equal amounts of time with my child/children	16.67%	8
Mandarin and Cantonese	2.08%	1
Number of respondents		***48***
Number of respondents who skipped this question		***0***

24. How do you rate the importance of your Mother Tongue in your child's/children's literacy development?	% of Respondents	Number of Respondents
Very important	62.50%	30
Important	27.08%	13
Somewhat important	10.42%	5
Not important	0.00%	0
Number of respondents		***48***
Number of respondents who skipped this question		***0***

25. Kindly state your main reason for your above choice.

1. To know the roots
2. China is a growing market and Mandarin will be a language that is required.
3. cultural identity
4. It's to reinforce the learning that takes place in school which is the primary means of mother tongue language acquisition
5. It's the language to the culture and race.
6. He's a Chinese. His roots.
7. Survival in the 21st century
8. Cultural awareness
9. i see my little girl understanding both English and Mother Tongue (chinese) and she is able to translate from english to mother tongue even at 2 years 10 months. She'll be 3 years old in a few months time. Compare to my eldest son, whom i started speaking chinese only at 3, he doesn't understand alot of the general sentences that i converse with my daughter. My son is 5 years old now and will turn 6 in January 2011.
10. My child will need to have a good grasp of his mother tongue for what I feel is a well-rounded education.
11. its good to know another language and hopefully with it comes a better understanding of her own culture. will like to think also it helps shapes moral outcomes in a kid's deveopment.
12. She is going back to Singapore's rat race system where grasp of mother tongue is necessary
13. they are chinese and should know their mother tongue
14. I want him to be bilingual.
15. Mantain the roots
16. We are chinese so should have a decent level of the language, recognition and speech
17. Mother tongue language is extremely important
18. Chinese should be able to speak Chinese and I think it is very useful to know another language.
19. i believe that chinese should learn our own language
20. Mother Tongue is harder to pick up due to lack of exposure/usage. important to maintain cultural roots. good to know more than 1 language.
21. Want to instill cultural ties
22. A language not only offers another way of communication but open doors to another culture.
23. Because of S'pore education system and gahmen also says so
24. Mother Tongue is still a core subject during Primary School Leaving Examinations (PSLE).
25. My child needs to know his culture and custom. In order for him to understand this, he first needs to understand his mother tongue.
26. greater opportunities in Asia now and in years to come.
27. Native language?
28. To be able to speak and write in their mother tongue will help them to connect to grandparents
29. Knowing another language is always an advantage and knowing Chinese helps with the development of the right brain
30. It is good to be able to speak more than one language and also because of heritage/cultural reasons.
31. being chinese, he should at least be conversant
32. It would be great if he picks it up but it is not a big deal if he doesn't. I come from a mixed heritage so have different mother tongues so it is not fair to expect him to pick them up or to choose. he is very interested in different languages and play his games in different languages so even if he doesn't know my mother tongue, it is not a big deal since he is picking up other languages.
33. We are after all Chinese and should maintain a certain level of proficiency in the language.
34. While it is not a must but I think it is good to be effectively bilingual, for more effective coomunication and a better social relationship.
35. It is help to retain our roots as who we are.
36. Good to be bilingual, Children can pick up languages quickly
37. self and cultural identity
38. Get ready for china market.
39. mainly for interaction with other children
40. Cultural Roots
41. Be able to have knowledge and understanding of own culture.
42. It is important to be sufficiently proficient in their Mother Tongue.
43. cultural background
44. its an important part of what he needs to learn in school

Number of Respondents **44**

Number of respondents who skipped this question **4**

26. How often do you, your partner and/or caregiver (e.g. day-carer/grandparent, if applicable) read to your child/children?

	Daily	On most days of the week	At least once a week	At least once every 2 weeks	At least once a month	Never	Number of Respondents
You	43% (21)	25% (12)	25% (12)	2% (1)	4% (2)	0% (0)	48
Your Partner	31% (15)	29% (14)	23% (11)	4% (2)	6% (3)	4% (2)	47
Caregiver (e.g. day-carer/grandparent, if applicable)	23% (9)	15% (6)	26% (10)	2% (1)	7% (3)	23% (9)	38
						Number of Respondents	***48***
						Number of respondents who skipped this question	***0***

27. Please indicate the education level for yourself, your partner and/or caregiver (e.g. day-carer/grandparent, if applicable).

	Diploma holder or lower	Graduate	Postgraduate or higher	Number of Respondents
You	8% (4)	56% (27)	35% (17)	48
Your Partner	8% (4)	58% (28)	33% (16)	48
Caregiver (e.g. day-carer/grandparent, if applicable)	94% (34)	5% (2)	0% (0)	36
			Number of Respondents	***48***
			Number of respondents who skipped this question	***0***

28. Please indicate your age group.

	% of Respondents	Number of Respondents
<21	0.00%	0
21-25	0.00%	0
26-30	4.17%	2
31-35	56.25%	27
36-40	35.42%	17
41-45	2.08%	1
>45	2.08%	1
	Number of respondents	***48***
	Number of respondents who skipped this question	***0***

29. Please indicate your present occupation.

1. Finance Officer
2. Interior Designer
3. commercial airline pilot
4. Media consultant
5. Teacher
6. Homemaker
7. Ph.D student
8. Educator
9. Educator
10. Program Administrator
11. medical officer
12. Housewife
13. guest service agent
14. Journalist
15. teacher
16. Homemaker
17. Teacher
18. Homemaker
19. home maker
20. SAHM
21. Analyst
22. Teacher
23. Education Officer
24. banker
25. Homemaker
26. Teacher
27. Art Teacher
28. Stay at home mom
29. Journalist
30. Housewife
31. homemaker
32. Educational Technological Officer at MOEHQ
33. Lecturer
34. Production Technology Officer
35. Civil Servant
36. teacher
37. Engineer
38. IT Consultant
39. Manager
40. Teacher
41. Civil Servant
42. postgrad student
43. nurse
44. manager
45. Admin/Artist

Number of Respondents ***45***

Number of respondents who skipped this question ***3***

30. Please indicate your family's income level.

	% of Respondents	Number of Respondents
Low income family	8.33%	4
Middle income family	81.25%	39
High income family	10.42%	5
Number of respondents		***48***
Number of respondents who skipped this question		***0***

Appendix F - Project number CF15/3275 - 2015001389
(Learning with mobile devices by preschool children in bilingual families)

(i) Explanatory statement for participants (Group 1)

EXPLANATORY STATEMENT
(Relevant Participant Group for QR Code Activity)

Project: Learning with mobile devices by preschool children in bilingual families

Dr Stephen Jia Wang
Department of Design
Phone: +61 3 990 34051
email: stephen.wang@monash.edu

Wilkie Tan
Phone : +61 4 662 81974
email: wtan37@student.monash.edu

You are invited to take part in this study. Please read this Explanatory Statement in full before deciding whether or not to participate in this research. If you would like further information regarding any aspect of this project, you are encouraged to contact the researchers via the phone numbers or email addresses listed above.

What does the research involve?

This study is about gauging the response and readiness of preschoolers to mobile technology. The activity required for the subjects to scan a series of 4 QRcodes and access theirs respectively preselected age-appropriate children edutainment video clips on Youtube.
The results collated will be used to support Wilkie Tan's research project. His research aims to develop a design framework from which designers and content developers can develop better play and learning experience for children. It also proposes the consideration of the role of adult carers as important stakeholders and collaborators in their children's experience with technology.

What will the child participants be required to do?

The child participants will be shown how to find and launch a QRcode scanning application on their adult-carers/parents' mobile device/tablet. They will then be shown how they can use the application window to capture the first QRcode (demo) and subsequently launch the linked YouTube video. These videos' are age-appropriate and are preselected for QRcode generation in the activity sheets.
The children will then be asked to scan 3 more codes and launch the linked videos on their own. The adult-carers/parents and children need not continue the scanning of all codes in one seating. They have the option of doing it over time of their choice.
The estimated time for the completion of the activity is under 10 minutes in total. The time required should be whenever the child is comfortable and not near rest times.

What will you be required to do?

You will be assisting with the facilitation of the activities with your child. The details of the activities are outlined in the activity sheets provided. You will also be helping with the photo/video documentation of the activities. You may choose either form of documentation.

Why were you chosen for this research?

You have been invited to participate in this study because (a) your child is between 2 to 5 years old and (b) is from a bilingual family.

Consenting to participate in the project and withdrawing from the research

Being in this study is voluntary and you are under no obligation to consent to participation.

If you do, you are also consenting to aid in the video-recording and/or photo documentation of the child participants.

Kindly email a scanned/photographed copy of your completed consent form to Wilkie Tan (wtan37@student.monash.edu).

Please note that by submitting your data and answers in this study, you are consenting to them being used for the research. You will not be able to withdraw your answers once you have submitted them at the end of the survey.

Possible benefits and risks to participants

There will be no direct benefit to you or your child, but your participation is very important. The results from the study will help inform parents and related industries' developers and designers of the potential of using portable digital devices to retrieve and access information during preschool years.
There may be the possibility of the children subjects mishandling smartphones/tablets but the entire activity requires adults' supervision. Hence there would be little to no risks involved and will result in possibly very little discomfort to both adults and children.

Submission of data

You will be required to submit your activity sheets and video&/photo documentation to Wilkie Tan after completion. Scanned/ photographed copies of the completed activity sheets, along with digital photographs and/or video files may be submitted to him via the following means:

- Email (wtan37@student.monash.edu)
- Whatsapp (+61 4 662 81974)
- Your preferred cloud storage location (e.g. iCloud, Dropbox etc)

Kindly contact Wilkie Tan upon the completion of the activities to schedule your submission. He would also be able to advise on alternative modes of submission if you prefer channels that are not listed above.

Confidentiality

Your data will not be passed to anyone. The information about you collected for the study will be kept strictly confidential. Only the researchers and their staff will have access to the information.

You may be identifiable in any documents published about the study and in any photograph / video footage that you provide for the research project. If you desire to have the face of the child and yourself to be disguised or blurred as the condition of use in the project, you must indicate so in the consent form

Information collected will be stored in accordance with Monash University regulations and kept on University premises. All records will be kept in locked filing cabinets or in password protected computer files indefinitely. Results of the research will be published as group statistics and reports.

Use of data for other purposes

The data collated may be used for other purposes if relevant to related future projects. None of the respondents will be named.

Results
If you would like to be informed of the aggregate research finding, please contact Wilkie Tan on +61 4 662 81974 or wtan37@student.monash.edu. The findings are accessible from February 2016.

Complaints

Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the Executive Officer, Monash University Human Research Ethics (MUHREC):

Executive Officer
Monash University Human Research Ethics Committee (MUHREC)
Room 111, Building 3e
Research Office
Monash University VIC 3800
Tel: +61 3 9905 2052 Email: muhrec@monash.edu Fax: +61 3 9905 3831

Thank you,

(insert Chief Investigator's signature)
Dr Stephen Jia Wang

25/8/2015

(ii) Explanatory statement for participants (Group 2)

EXPLANATORY STATEMENT
(Relevant Participant Group for DUDU Ebook-Craft Activity)

Project: Learning with mobile devices by preschool children in bilingual families

Dr Stephen Wang Jia
Department of Design
Phone: +61 3 990 34051
email: stephen.wang@monash.edu

Wilkie Tan
Phone : +61 4 662 81974
email: wtan37@student.monash.edu

You are invited to take part in this study. Please read this Explanatory Statement in full before deciding whether or not to participate in this research. If you would like further information regarding any aspect of this project, you are encouraged to contact the researchers via the phone numbers or email addresses listed above.

What does the research involve?

This study is about gauging the response and readiness of preschoolers to the use of craft and mobile technology in the learning of Mandarin. The activity required for the participants and parents/adult carers to read 4 ebooks, engage in their respective craft making and post reading activities.

The results collated will be used to support Wilkie Tan's research project. His research aims to develop a design framework from which designers and content developers can develop better play and learning experience for children. It also proposes the consideration of the role of adult carers as important stakeholders and collaborators in their children's experience with technology.

What will the child participants be required to do?

The child participants will be accessing a series of 4 ebooks developed by an education technology company, Commontown Singapore. These ebooks will have unique craft activities tied to their respective content. Parents / adult carers are required to assist in both the reading and craft making activities with the children.
The children will then be required to answer a series of post reading questions. The parents/ adult carers will be provided with an activity outline to guide them through their documentation of this set of activities.

The estimated time for the completion of the reading and craft activity for each ebook is approximately 60 minutes in total. The time required should be whenever the child is comfortable and not near rest times.

What will you be required to do?

You will be assisting with the facilitation of the activities with your child. The details of the activities are outlined in the activity sheets provided. You will also be helping with the photo/video documentation of the activities. You may choose either form of documentation.

Why were you chosen for this research?

You have been invited to participate in this study because (a) your child is between 2 to 5 years old and (b) is from a bilingual (Mandarin and English) family. It is understood that you are able to read and speak both English and Mandarin fluently and has an interest in your child learning Mandarin since preschool age.

Consenting to participate in the project and withdrawing from the research

Being in this study is voluntary and you are under no obligation to consent to participation. If you do, you are also consenting to aid in the video-recording and/or photo documentation of the child participants.

Kindly email a scanned/photographed copy of your completed consent form to Wilkie Tan (wtan37@student.monash.edu).

Please note that by submitting your data and answers in this study, you are consenting to them being used for the research. You will not be able to withdraw your answers once you have submitted them at the end of the survey.

Possible benefits and risks to participants

There will be no direct benefit to you or your child, but your participation is very important. The results from the study will help inform parents and related industries' developers and designers of the potential of using craft as a mean to enhance digital learning experience during preschool years.

There may be the possibility of the children subjects mishandling smartphones/tablets or craft material/stationery but the entire activity requires adults' supervision. Hence there would be little to no risks involved and will result in possibly very little discomfort to both adults and children.

Submission of data

You will be required to submit your activity sheets and video&/photo documentation to Wilkie Tan after completion. Scanned/ photographed copies of the completed activity sheets, along with digital photographs and/or video files may be submitted to him via the following means:

- Email (wtan37@student.monash.edu)
- Whatsapp (+61 4 662 81974)
- Your preferred cloud storage location (e.g. iCloud, Dropbox etc)

Kindly contact Wilkie Tan upon the completion of the activities to schedule your submission. He would also be able to advise on alternative modes of submission if you prefer channels that are not listed above.

Confidentiality

Your data will not be passed to anyone. The information about you collected for the study will be kept strictly confidential. Only the researchers and their staff will have access to the information.

You may be identifiable in any documents published about the study and in any photograph / video footage that you provide for the research project. If you desire to have the face of the child and yourself to be disguised or blurred as the condition of use in the project, you must indicate so in the consent form.

Information collected will be stored in accordance with Monash University regulations and kept on University premises. All records will be kept in locked filing cabinets or in password protected computer files indefinitely. Results of the research will be published as group statistics and reports.

Storage of data

Information collected will be stored in accordance with Monash University regulations and kept on University premises. All records will be kept in locked filing cabinets or in password protected computer files indefinitely. Results of the research will be published as group statistics and reports and will not identify you in any way.

Use of data for other purposes

The data collated may be used for other purposes if relevant to related future projects. None of the respondents will be named.

Results

If you would like to be informed of the aggregate research finding, please contact Wilkie Tan on +61 4 662 81974 or wtan37@student.monash.edu. The findings are accessible from February 2016.

Complaints

Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the Executive Officer, Monash University Human Research Ethics (MUHREC):
Executive Officer
Monash University Human Research Ethics Committee (MUHREC)
Room 111, Building 3e
Research Office
Monash University VIC 3800

Tel: +61 3 9905 2052 Email: muhrec@monash.edu Fax: +61 3 9905 3831
Thank you,

(insert Chief Investigator's signature)
Dr Stephen Jia Wang

25/8/2015

(iii) Consent form for participants (Group 1)

(Relevant Participant Group for QR Code Activity)

Project: 'Learning with mobile devices by preschool children in bilingual families'

Investigators:

Dr Stephen Wang Jia
Department of Design
Phone: +61 3 990 34051
email: stephen.wang@monash.edu

Wilkie Tan
Phone : +61 4 662 81974
email: wtan37@student.monash.edu

I have been asked to take part in the Monash University research project specified above. I have read and understood the Explanatory Statement and I hereby consent to participate in this project.

I consent to the following:	Yes	No
The administering of described activities as outlined in the activity sheet attached.	☐	☐
The logging of details required in the activity sheet attached.	☐	☐
The photo/video documentation of the child participant engaged with the described activities.	☐	☐
The use of part/all of the above mentioned photo and/ or video documentation as part as supporting evidence for Wilkie Tan's PhD research and examination exhibition.	☐	☐
The use of 'undoctored' images of faces of the child participant and myself (i.e. the face of the child will not be disguised/blurred). A choice of 'No' will indicate my consent to the use of images but they will be doctored to protect our identities.	☐	☐
The use of the data for other purposes if relevant to related future projects.	☐	☐

Name of Participant

Participant Signature _____ Date _____

(iv) Consent form for participants (Group 2)

(Relevant Participant Group for DUDU ebook-Craft Activity)

Project: 'Learning with mobile devices by preschool children in bilingual families'

Investigators:

Dr Stephen Wang Jia
Department of Design
Phone: +61 3 990 34051
email: stephen.wang@monash.edu

Wilkie Tan
Phone : +61 4 662 81974
email: wtan37@student.monash.edu

I have been asked to take part in the Monash University research project specified above. I have read and understood the Explanatory Statement and I hereby consent to participate in this project.

I consent to the following:	Yes	No
The administering of described activities as outlined in the activity sheet attached.	☐	☐
The logging of details required in the activity sheet attached.	☐	☐
The gathering of feedback from the child participant at the end of the described activities.	☐	☐
The photo/video documentation of the child participant engaged with the described activities.	☐	☐
The use of part/all of the above mentioned photo and/ or video documentation as part as supporting evidence for Wilkie Tan's PhD research project and examination exhibition.	☐	☐
The use of 'undoctored' images of faces of the child participant and myself (i.e. the face of the child will not be disguised/blurred). A choice of 'No' will indicate my consent to the use of images but they will be doctored to protect our identities.	☐	☐
The use of the data for other purposes if relevant to related future projects.	☐	☐

Name of Participant _____

Participant Signatur _____ Date _____

(v) Instructions for Group 1

PRELIMINARY QUESTIONS FOR PARENT/ ADULT CAREGIVER

Please indicate the age of the child.

- 2-3 years old ☐
- 3-4 years old ☐
- 4-5 years old ☐

Does the child have prior experience using / exposure to smartphone?

- Yes ☐
- No ☐

Please indicate the make, model and operating system of the smartphone used in this activity.

Make: _____
Model: _____

Operating system:
Android ☐ iOS ☐ Windows ☐

INSTRUCTIONS TO PARENT/ ADULT CAREGIVER

1. Print out the activity sheet.

2. You may choose to cut out the QR codes for the activity. They are to be scanned in sequence from Demo to Code 3.

3. Install the following **QuickMark** reader application on your smartphone. Versions are available for Android, iOS and Windows phones.

   http://www.quickmark.com.tw/En/basic/downloadmain.asp

4. Place **QuickMark** on the 1st PAGE OF YOUR PHONE'S HOMESCREEN.

5. Ensure there is internet connectivity on your smartphone before conducting the activity.

6. Supervise and provide the necessary guidance to the child throughout the activity.

7. Demonstrate the use of the application to the child. The use of application includes the following steps:
   - Locating the Quickmark application icon on the home screen
   - Launching the application
   - Framing the QR code within the capturing screen
   - Tapping on the external Youtube link
   - Playing and watching the Youtube video
   - Returning to the QuickMark application to scan the next QR code

8. Assist with the documentation of the following:
   - The duration taken to demonstrate the use of the application to the child.
   - The duration taken for child to successfully scan and load the video from each QR code.
   - You may document a maximum of 4 attempts of your demonstration to your child.
   - You may document a maximum of 4 attempts of every QR code your child attempts to scan.
   - The responses from the child throughout the activity.

9. Allow the child to finish viewing the individual clips on your smartphone before continuing with the scanning of the next QR code.

10. It is NOT ESSENTIAL to have the activity completed in a single session BUT the child must be the primary handler of your smart phone.

(vi) QRcode ACTIVITY SHEET

Description	QR code
DEMO CODE **Title:** Sesame Street. Elmo's Ducks **Description**: Sing along with Elmo and his duck buddies. **Duration**: 2:06 **URL:** http://youtu.be/0LEYwoooVfw	Demo code

Time taken to demonstrate the use of the application to the child			
Attempt 1	Date:	Minutes	Seconds
Attempt 2 (optional)	Date:	Minutes	Seconds
Attempt 3 (optional)	Date:	Minutes	Seconds
Attempt 4 (optional)	Date:	Minutes	Seconds

Time taken for the child to successfully load this video clip			
Attempt 1	Date:	Minutes	Seconds
Attempt 2 (optional)	Date:	Minutes	Seconds
Attempt 3 (optional)	Date:	Minutes	Seconds
Attempt 4 (optional)	Date:	Minutes	Seconds

Description	QR code
CODE 1 **Title:** 拔萝卜 (Pulling the Turnip) **Description:** Short animated song about harvesting a giant turnip (in Mandarin) **Duration:** 2:41 **URL:** https://www.youtube.com/watch?v=kEOZTeuzlfl	Code 1

Time taken for the child to successfully load this video clip			
Attempt 1	Date:	Minutes	Seconds
Attempt 2 (optional)	Date:	Minutes	Seconds
Attempt 3 (optional)	Date:	Minutes	Seconds
Attempt 4 (optional)	Date:	Minutes	Seconds

Description	QR code
CODE 2 **Title**: 刷牙歌 (Brushing Teeth Song) **Description**: Short animated song on brushing teeth (in Mandarin) **Duration**: 2:52 **URL:** https://www.youtube.com/watch?v=bAOYjwvgRAE	Code 2

Time taken for the child to successfully load this video clip			
Attempt 1	Date:	Minutes	Seconds
Attempt 2 (optional)	Date:	Minutes	Seconds
Attempt 3 (optional)	Date:	Minutes	Seconds
Attempt 4 (optional)	Date:	Minutes	Seconds

Description	QR code
CODE 3 **Title**: Sesame Street: Feist sings 1,2,3,4 **Description**: Feist sings with muppets from Sesame Street (sesame Street segment) **Duration**: 2:20 **URL:** https://www.youtube.com/watch?v=fZ9WiuJPnNA&index=2&list=PL93C142AB158CCB86	Code 3

Time taken for the child to successfully load this video clip			
Attempt 1	Date:	Minutes	Seconds
Attempt 2 (optional)	Date:	Minutes	Seconds
Attempt 3 (optional)	Date:	Minutes	Seconds
Attempt 4 (optional)	Date:	Minutes	Seconds

Observable responses
Was the child able to handle the smartphone comfortably?
Yes ☐ No ☐ If No, why do you think it may be so?
Did the child find it difficult to learn how to use the application from your demonstration?
Yes ☐ No ☐ If No, why do you think it may be so?
Was the child interested in using the application to capture and load the DEMO video clip after your demonstration?
Yes ☐ No ☐ If No, why do you think it may be so?
Was the child interested in using the application to capture OTHER QR codes and load more video clips?
Yes ☐ No ☐ If No, why do you think it may be so?
Was the child confident in using the application independently?
Yes ☐ No ☐ If No, why do you think it may be so?

- END OF ACTIVITY SHEET -

(vii) Instructions for Group 2

Parent / Adult Carer's Participation for Dudu Ebooks- Craft Activities

Thank you for agreeing to participate with this activity with your child.

Please must read through the following guidelines prior to the activity.

- You are to conduct 4 different activities with your child.
- Each activity comprises of an ebook reading and its related craft-making. Each activity may take approximately 1 hour to complete. You are encouraged to complete the activity in multiple sessions or in the pace which you are comfortable.
- You are to provide guidance when the child reads the ebooks and assist with the related craft activities.
- You may choose to use the voiceover function or read to your child on your own when using the ebook. Do note that network issues may cause a slight delay when the voiceover function is chosen.
- When assisting with the craft activities, please ensure that safety and comfort are observed at all times. You may postpone/stop the activities at whichever point you feel the child or yourself is experiencing discomfort.
- The child is to be respected should he/she refuse to participate at any point in the activity. There is no pressure to achieve full completion of the activities.
- If both the child and you are progressing well, please follow through with the suggested post-reading activities outlined at the end of every worksheet.
- No devices will be provided for the activities. You are responsible for the use of your own devices, tools and material for the activities.

Outline of survey

The survey is divided into 4 sections;

- SECTION 1: Pre-activity Questions
  - This is to understand the child's immersion of Mandarin and his/her attitudes to play and craft toys.
- SECTION 2: Time Log for the 4 Dudu Ebooks and related craft activities.
  - This is to find out how much time is taken by participants to complete the ebooks, their craft activities and post reading activities.
- SECTION 3: Post activity Questions
  - This is to find out what are the adults' observations of the child participants.
- SECTION 4: Post activity Questions for the child
  - This is to find out what the child participants like/dislike about the experience.
  - Please assist the child to complete this by reading out the questions.

A Certificate of Appreciation is especially designed for the child participant.

- Please print out the attached certificate upon completion of the activities.
- The child or yourself can write down his/her name and colour the certificate.

Documentation

- You will be required to assist with the logging of activities and documenting the observations of the child as prescribed in the activity sheets attached.
- You are encouraged to document the child during the reading, craft-making and post-reading sessions with the use of photographs &/or video.
- These documented material may be used as supporting evidence for my research and may be displayed as part of my examination exhibition.
- If you consent to the use of your documentation, kindly do so in writing on the attached consent form and return a scanned copy of the form to the following email address: wtan37@student.monash.edu

- Your consent to share the photo and video documentation will be invaluable to the research project and will be deeply appreciated to the researchers involved.
- Please scan and email all completed question sheets, activity logs and documented material to the following email address: wtan37@student.monash.edu

SECTION 1: Pre-activity Questions

Age of child when activities are conducted: _____

How well do these statements describe you and the child?
Please tick ONE box and ONE RESPONSE for each statement.

	Never	Rarely	Occasionally	Frequently	All the time
I speak Mandarin to the child					
The child responds in Mandarin when spoken to					
Other family members (including siblings) converse in Mandarin with the child					
I read Mandarin stories to the child					
The child needs me to encourage him/her to speak in Mandarin					
I spend time on craft activities with the child					
The child needs company, especially from you / other carers (to be motivated to read and play)					
The child plays with DIY crafted toys, along with other toys					

SECTION 2:

Dudu Ebook- Craft Activity 1 金鱼睡觉了

Time taken by the child and parent on reading this ebook and craft activity:

Activities	**Session**	**Date**	**Time taken in minutes (approximate)**
eBook part 1 (pre-craft reading)	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
Craft activity (co-creating craft object)	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
eBook part 2 (post-craft reading)	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
Post reading activity	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
Total number of sessions & time taken to complete **Dudu Ebook- Craft Activity 1 金鱼睡觉了**			

Dudu Ebook- Craft Activity 2 朋友和熊

Time taken by the child and parent on reading this ebook and craft activity:

Activities	**Session**	**Date**	**Time taken in minutes (approximate)**
eBook part 1 (pre-craft reading)	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
Craft activity (co-creating craft object)	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
eBook part 2 (post-craft reading)	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
Post reading activity	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
Total number of sessions & time taken to complete **Dudu Ebook- Craft Activity 2 朋友和熊**			

Dudu Ebook- Craft Activity 3 小雨点

Time taken by the child and parent on reading this ebook and craft activity:

Activities	**Session**	**Date**	**Time taken in minutes (approximate)**
eBook part 1 (pre-craft reading)	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
Craft activity (co-creating craft object)	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
eBook part 2 (post-craft reading)	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
Post reading activity	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
Total number of sessions & time taken to complete **Dudu Ebook- Craft Activity 3 小雨点**			

Dudu Ebook- Craft Activity 4 小白兔和小蜗牛

Time taken by the child and parent on reading this ebook and craft activity:

Activities	**Session**	**Date**	**Time taken in minutes (approximate)**
eBook part 1 (pre-craft reading)	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
Craft activity (co-creating craft object)	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
eBook part 2 (post-craft reading)	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
Post reading activity	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
Total number of sessions & time taken to complete **Dudu Ebook- Craft Activity 4 小白兔和小蜗牛**			

SECTION 3:

Post-activity Questions (for adult carer / parents)

Kindly tick in the appropriate boxes.

Section	Observation	Yes	Somewhat	Not at all	eBook
eBook part 1 (pre-craft reading)	Was the child keen to start reading the story?				金鱼睡觉了
					朋友和熊
					小雨点
					小白兔和小蜗牛
	Was the child enthusiastic when using the portable device?				金鱼睡觉了
					朋友和熊
					小雨点
					小白兔和小蜗牛
	Did it take long for the child to learn how to navigate through the pages?				金鱼睡觉了
					朋友和熊
					小雨点
					小白兔和小蜗牛

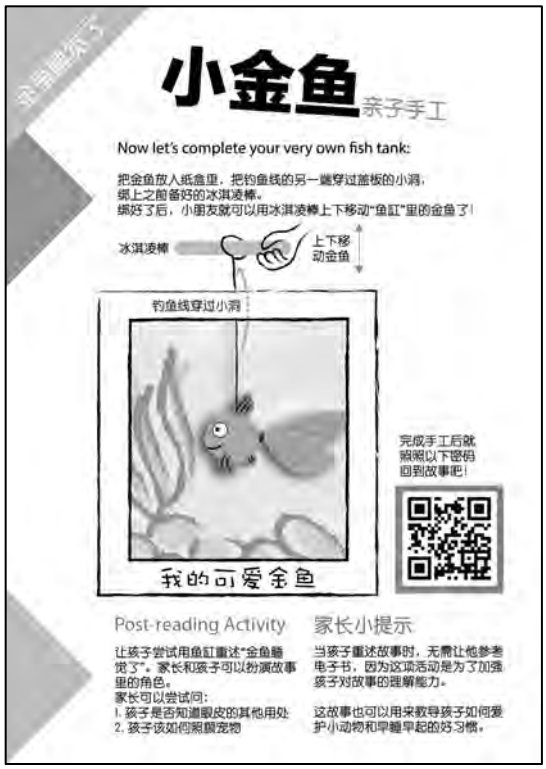
Section	Observation	Yes	Somewhat	Not at all	eBook
Craft activity (co-creating craft)	Was the child keen to create the craft object?				金鱼睡觉了
					朋友和熊
					小雨点
					小白兔和小蜗牛
	Was the child able to follow through the craft activity?				金鱼睡觉了
					朋友和熊
					小雨点
					小白兔和小蜗牛
	Did the child play with / express an interest to play with the craft object after the activity?				金鱼睡觉了
					朋友和熊
					小雨点
					小白兔和小蜗牛

Section	Observation	Yes	Somewhat	Not at all	eBook
eBook part 2 (post-craft reading)	Did the child relate the craft object with the rest of the eBook reading? Example, holding up the craft object when the story is being read.				金鱼睡觉了
					朋友和熊
					小雨点
					小白兔和小蜗牛
	Was the child keen to finish the rest of the story?				金鱼睡觉了
					朋友和熊
					小雨点
					小白兔和小蜗牛
	Did the child express interest to read the story again?				金鱼睡觉了
					朋友和熊
					小雨点
					小白兔和小蜗牛

Section	Observation	Yes	Somewhat	Not at all	eBook
Post reading activity	Was the child able to retell the story without the use of your smart device?				金鱼睡觉了
					朋友和熊
					小雨点
					小白兔和小蜗牛
	Did your child use the craft object when attempting to retell the story?				金鱼睡觉了
					朋友和熊
					小雨点
					小白兔和小蜗牛
	Was the child able to respond adequately to the tasks/questions in the post reading activity?				金鱼睡觉了
					朋友和熊
					小雨点
					小白兔和小蜗牛
	Was the child able to engage in this activity with the use of Mandarin?				

- END OF ACTIVITY SHEET -

(viii) Sample of craft instruction sheet for adult volunteers



小金鱼 亲子手工

Now let's complete your very own fish tank:

把金鱼放入纸盒里，把钓鱼线的另一端穿过盖板的小洞，
纸上之前备好的冰淇凌棒。
绑好了后，小朋友就可以用冰淇凌棒上下移动"鱼缸"里的金鱼了！

完成手工后就照照以下密码回到故事吧！

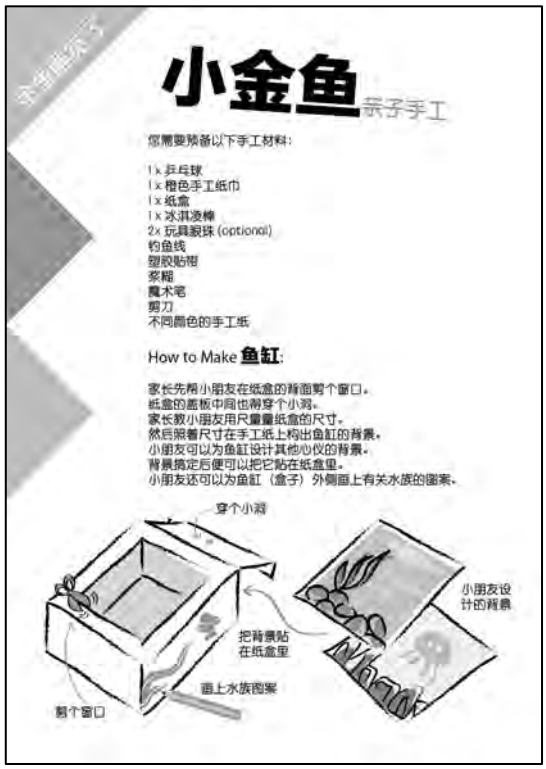
Post-reading Activity

让孩子尝试用鱼缸重述"金鱼睡觉了"。家长和孩子可以扮演故事里的角色。
家长可以尝试问：
1. 孩子是否知道眼皮的其他用处
2. 孩子该如何照顾宠物

家长小提示

当孩子重述故事时，无需让他参考电子书，因为这项活动是为了加强孩子对故事的理解能力。

这故事也可以用来教导孩子如何爱护小动物和早睡早起的好习惯。



小金鱼 亲子手工

您需要预备以下手工材料：

1 x 乒乓球
1 x 橙色手工纸巾
1 x 纸盒
1 x 冰淇凌棒
2x 玩具眼珠 (optional)
钓鱼线
塑胶贴带
家粗
魔术笔
剪刀
不同颜色的手工纸

How to Make **鱼缸**:

家长先帮小朋友在纸盒的背面剪个窗口。
纸盒的盖板中间也需穿个小洞。
家长教小朋友用尺量量纸盒的尺寸。
然后照着尺寸在手工纸上构出鱼缸的背景。
小朋友可以为鱼缸设计其他心仪的背景。
背景搞定后便可以把它贴在纸盒里。
小朋友还可以为鱼缸（盒子）外侧画上有关水族的图案。

小金鱼 亲子手工

How to Make **金鱼**:

在乒乓球上沾上一条约10cm的钓鱼线。
把鱼线的一端穿过橙色手工纸巾后，将纸巾把乒乓球给包上。
帮小朋友扎好纸巾，然后用钓鱼线捆绑好。
拉直捆绑好的纸巾，才修剪出金鱼尾巴的形状。
用魔术笔在手工纸上画上背鳍，胸鳍，尾鳍。
之后将它们粘在金鱼身上。
若没有玩具眼珠，小朋友可以用魔术笔在金鱼头部画上眼睛。
哦，可别忘了画上嘴巴！

(ix) Post-activity questions for child participants

Section 4

想一想 答一答

小朋友，听清楚问题后，把答案圈一圈或上色.
Listen to the questions and circle/colour your answers.

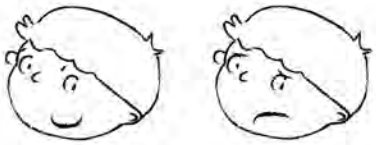
你喜欢这些故事吗?
Did you like the stories?

你喜欢做手工吗?
Did you like making the toys?

你喜欢和我做手工吗?
Did you like making them with me?

手工玩具好玩吗?
Did you like playing with the toys we made?

你喜欢用手工玩具讲故事吗?
Do you like telling stories with these craft toys?



(x) Sample of certificate for child participants

(xi) Collated results for Group 1

Section 1: Number of participants & basic information

The gender distribution was 6 boys and 7 girls in the group, though it has no bearing on the results gathered. While 15 volunteers signed up, only 13 results were collated for the investigation as 1 had not provided his consent form while the other submitted an incomplete activity log.

Parents/carers were initially asked to provide basic information on the participants' age and experience with smartphones prior to starting their activities. The 4-5 years old group is the largest age group in this investigation with 6 participants, followed by 3 for the 3-4 years old group and 4 for the 2-3 years old group. All responded that their children had prior experience using / exposure to smartphone before this activity. All responded that their children had prior experience using / exposure to smartphone before this activity.

The make, model and operating system of the smartphone used in this activity was also logged. The distribution of parents using both iOS and Android smartphones were almost the same. The difference in platform did not impact on the children's performance when accessing the code scanning application and video content, since the processes are identical.

Make / OS / Model	Apple / iOS / iPhone 4	Apple / iOS / iPhone 5	Apple / iOS / iPhone 6	Samsung / Android / Note 2	Samsung / Android / Tab	Samsung / Android / S3	Sony / Android / Xperia
Number	3	2	2	2	1	2	1

Section 2: Averaged time logs of code scanning activities

The significant part of investigation was to have the parents/carers log the time the children took to complete the scanning of 4 QR codes and loading of 4 linked video clips. The participants can make as many as 5 attempts for each QR code scan and the average timing of their respective logged scans are then accounted for.

Average time taken to demonstrate the use of application to the child	91 seconds
Average time taken for the child to load the demo video clip independently	56 seconds
Average time taken for the child to scan CODE 1 and load the corresponding video clip independently	44.6 seconds
Average time taken for the child to scan CODE 2 and load the corresponding video clip independently	31.8 seconds
Average time taken for the child to scan CODE 3 and load the corresponding video clip independently	27 seconds

The average timing recorded from the 5 segments above indicated that the children were getting more confident in the use of the device. They had little or no problem looking up the code scanning application, launching it to scan the printed QRcodes, which in turn triggered YouTube into loading and playing the video clips.

Section 3: Responses to post-activity questions

Parents/carers were required to log down their observations and answers to the following 5 post-activity questions:

Question 1: Was the child able to handle the smartphone comfortably?		
Answer	Number of respondents	Remarks from parents/carers
Yes	9	-
No	4	• Phone was too big for participant to handle • Phone was loaded with many other applications • Needed more time to instruct the participant • Participant was unfamiliar with the device
Question 2: Did the child find it difficult to learn how to use the application from your demonstration?		
Answer	Number of respondents	Remarks from parents/carers
Yes	2	• Difficulty in exiting to camera mode in scanning application • There were other applications, which were accessible to the participant
No	11	• Other quoted they sought to make it more challenging
Question 3: Was the child interested in using the application to capture and load the DEMO video clip after your demonstration?		
Answer	Number of respondents	Remarks from parents/carers
Yes	13	-
No	0	-
Question 4: Was the child interested in using the application to capture other QR codes and load more video clips?		
Answer	Number of respondents	Remarks from parents/carers
Yes	12	-
No	1	Participant may be tired after a few times
Question 5: Was the child confident in using the application independently?		
Answer	Number of respondents	Remarks from parents/carers
Yes	12	-
No	1	Participant was too distracted by other applications found on the device.

Section 4: Feedback by parents/carers and future considerations

The observations gathered from the parents/carers also provided important points to consider when developing future investigative work involving young children.

Feedback	Future considerations

• While all had said that their child had prior experience using a smartphone, there was a couple of the parents/carers who noted that their children did not handle the smartphone comfortably during the course of the activity	• Importance of phone-hand ergonomics • Importance of familiarity of layout to the child • Minimise visual distraction on screen
• Most of the children did not find it difficult to learn to use the application from their demonstration • Some feedback that it was distracting for children as there were other application icons on the homescreen • There was a slight learning curve to exit the video playback and rescan another QRcode	• Minimise visual distraction by isolating the relevant application icon on a blank page on smartphone homescreen • Reduce the number of steps involved / provide visual-audio cues to assist children if integrating scanning function to application design
• All of the children were interested in using the application to capture and load the DEMO video clip after the parents'/carers' demonstration	-
• All finished watching the clips and were interested in repeating them • All but one child were interested in using the application to capture other QR codes and load more video clips	• The condition of the child participants is paramount when conducting any field activities • It had been and will be continually highlighted to future volunteer parents/carers that they must provide the suitable environment and timing when carrying out the tasks with young children
• All but one child were confident in using the application independently	• Minimise visual distraction by isolating the relevant application icon on a blank page on smartphone home screen

(xii) Collated results for Group 2

Section 1: Age groups and prior exposure to Mandarin and crafting

Parents/carers were asked to provide information on the participants' age, use of Mandarin and craft prior to starting their activities. The 4-5 years old groups are the largest in Section 1 of the investigation (1 3 year-old, 6 4 year-olds, 8 5 year-olds.

The participants were from bilingual families and there are certain challenges when it came to engaging the children with Mandarin at home. While all the parents/carers did make an effort to use Mandarin at home, they had to encourage their children to speak the language. They also noted that craft activities are not alien to them and the children did play with them along with their other toys.

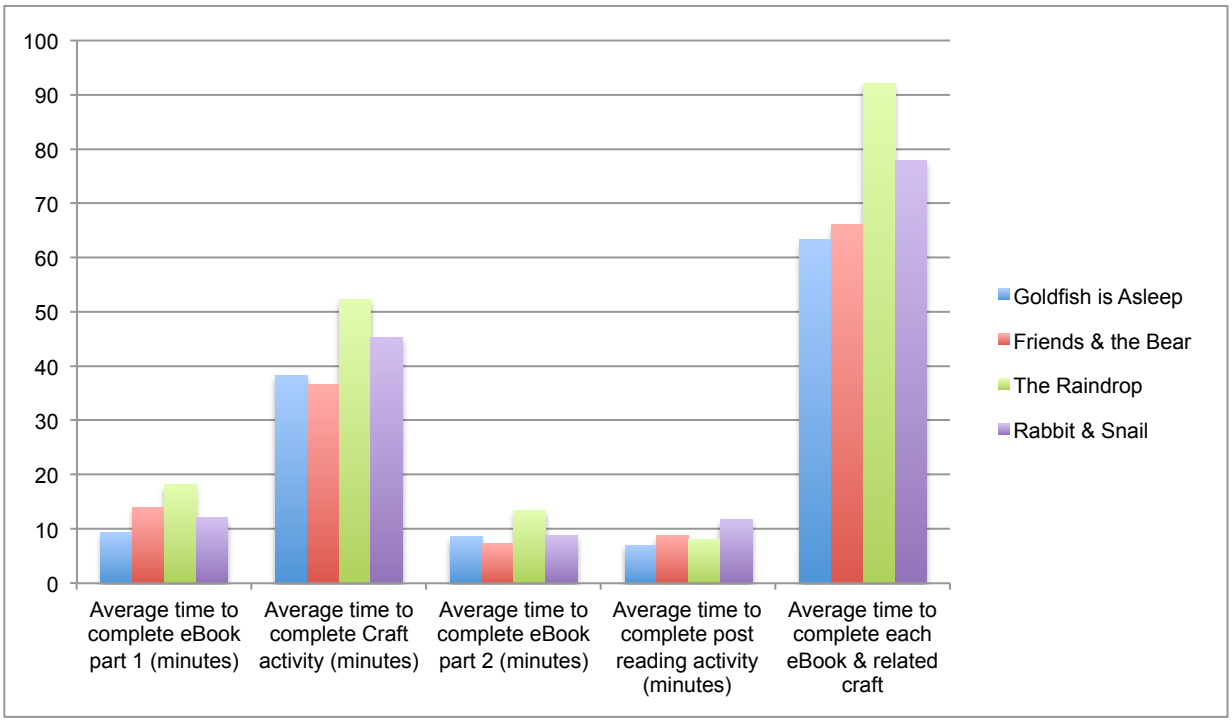
How well do these statements describe you and the child?	Never	Rarely	Occasionally	Frequently	All the time
I speak Mandarin to the child	0	4	7	4	0
The child responds in Mandarin when spoken to	2	4	7	2	0
Other family members (including siblings) converse in Mandarin with the child	2	4	5	4	0
I read Mandarin stories to the child	0	3	11	1	0
The child needs me to encourage him/her to speak in Mandarin	0	0	2	5	8
I spend time on craft activities with the child	0	2	6	7	0
The child needs company, especially from you / other carers (to be motivated to read and play)	0	4	7	2	2
The child plays with DIY crafted toys, along with other toys	0	3	5	4	3

Section 2: Time taken to complete activities

For Section 2, they were required to log down the timing taken by the children when it came to reading the eBooks. The volunteers were briefed that it would take about an hour to complete each of the eBook-craft activity.

Section 2	Average time to complete eBook part 1 (minutes)	Average time to complete Craft activity (minutes)	Average time to complete eBook part 2 (minutes)	Average time to complete post reading activity (minutes)	Average time to complete each eBook & related craft
Goldfish is Asleep	9.4	38.3	8.5	7	63.3
Friends & the Bear	13.9	36.6	7.3	8.9	66.1
The Raindrop	18.1	52.3	13.3	8.1	92.1
Rabbit & Snail	12.1	45.3	8.7	11.7	77.9

However 2 of the eBook-reading and its craft activities, "The Raindrop" and "Rabbit and Snail" took longer due to the complexity of the craft instructions.

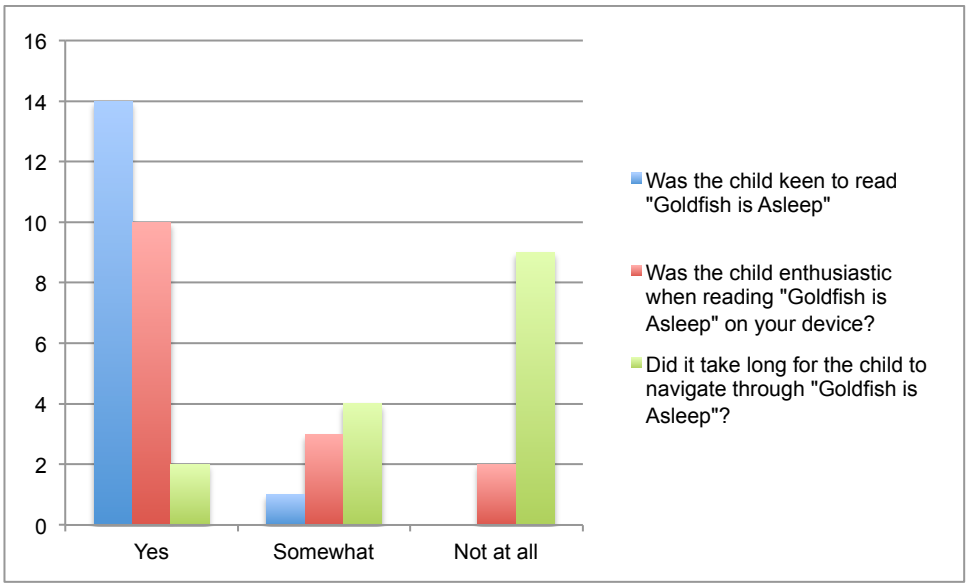


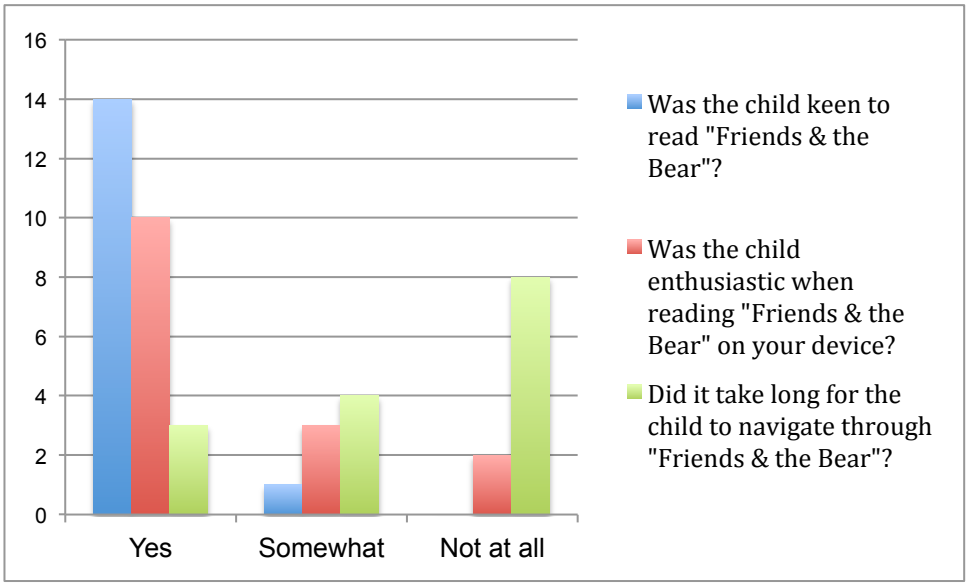
Section 3: Parents/carers observation log

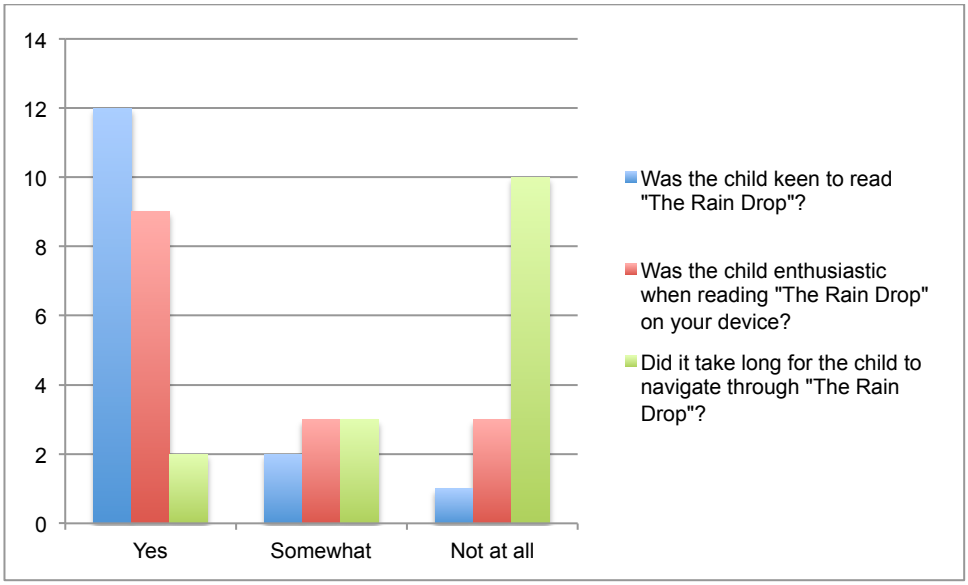
For Section 3, they were required to log their observations of the children throughout the activities. Section 3A pertained to the children's initial interest to reading the eBooks. Parents/carers who have volunteered to facilitate the activities were also asked to document and log down the observations of their children from reading, crafting and post reading activities.

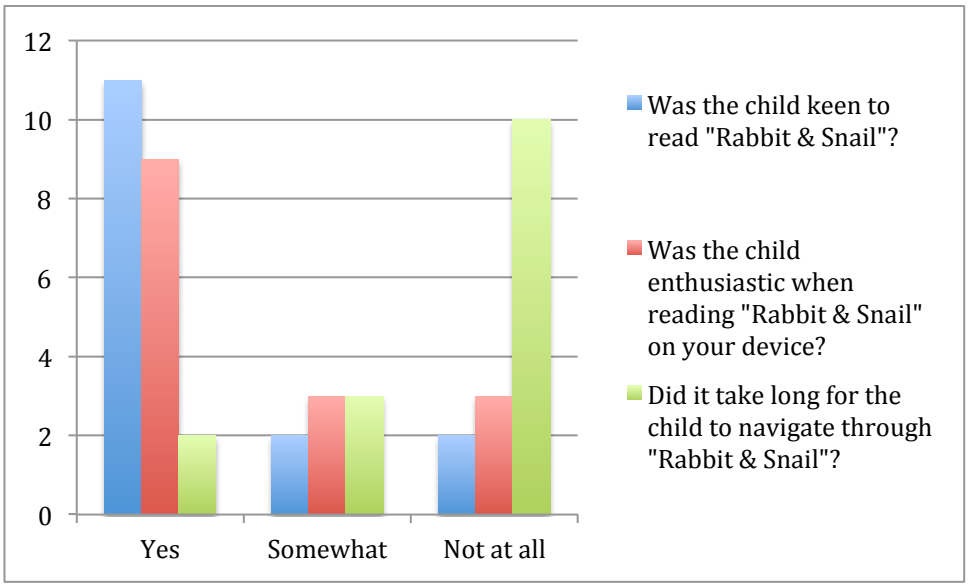
Section 3A: Children's initial interest to reading the eBooks

Questions	Yes	Somewhat	Not at all
Was the child keen to read "Goldfish is Asleep"	14	1	0
Was the child keen to read "Friends & the Bear"?	14	1	0
Was the child keen to read "The Rain Drop"?	12	2	1
Was the child keen to read "Rabbit & Snail"?	11	2	2
Was the child enthusiastic when reading "Goldfish is Asleep" on your device?	10	3	2
Was the child enthusiastic when reading "Friends & the Bear" on your device?	10	3	2
Was the child enthusiastic when reading "The Rain Drop" on your device?	9	3	3
Was the child enthusiastic when reading "Rabbit & Snail" on your device?	9	3	3
Did it take long for the child to navigate through "Goldfish is Asleep"?	2	4	9
Did it take long for the child to navigate through "Friends & the Bear"?	3	4	8
Did it take long for the child to navigate through "The Rain Drop"?	2	3	10
Did it take long for the child to navigate through "Rabbit & Snail"?	2	3	10


16
14
12
10
8
6
4
2
0
Yes
Somewhat
Not at all
Was the child keen to read "Goldfish is Asleep"
Was the child enthusiastic when reading "Goldfish is Asleep" on your device?
Did it take long for the child to navigate through "Goldfish is Asleep"?


16
14
12
10
8
6
4
2
0
Yes
Somewhat
Not at all
Was the child keen to read "Friends & the Bear"?
Was the child enthusiastic when reading "Friends & the Bear" on your device?
Did it take long for the child to navigate through "Friends & the Bear"?


14
12
10
8
6
4
2
0
Yes
Somewhat
Not at all
Was the child keen to read "The Rain Drop"?
Was the child enthusiastic when reading "The Rain Drop" on your device?
Did it take long for the child to navigate through "The Rain Drop"?



The averaged results from Section 3A showed that almost all of the children were keen to read the stories and were especially enthusiastic since they get to read them off the smart devices. Most did not take long to navigate through the interface of the eBooks.

Section 3B: Children's interest and involvement in the craft activities

This section pertained to the children's interest and involvement in the craft activities that were done in conjunction to their reading.

Questions	Yes	Somewhat	Not at all
Was the child keen to do the craft for "Goldfish is Asleep"?	13	1	1
Was the child keen to do the craft for "Friends & the Bear"?	11	3	1
Was the child keen to do the craft for "The Rain Drop"?	8	6	1
Was the child keen to do the craft for "Rabbit & Snail"?	7	6	2
Was the child able to follow through the craft for "Goldfish is Asleep"	12	2	1
Was the child able to follow through the craft for "Friends & the Bear"?	10	5	0
Was the child able to follow through the craft for "The Rain Drop"?	7	6	2
Was the child able to follow through the craft for "Rabbit & Snail"?	2	10	3
Did the child have an interest to play with the craft object after reading "Goldfish is Asleep"?	4	10	1
Did the child have an interest to play with the craft object after reading "Friends & the Bear"?	6	7	2
Did the child have an interest to play with the craft object after reading "The Rain Drop"?	7	7	1
Did the child have an interest to play with the craft object after reading "Rabbit & Snail"?	4	7	4

The averaged results from Section 3B showed that they were mostly keen to do the craft activities and were able to follow through the instructions. Most of the children were also keen to play with the craft objects that they crafted even after the reading of the stories.

Section 3C: Whether the children's related their craft activities with their reading

This section pertained to whether the children's related their craft activities with their reading and it was to also gauge if the stories were worth a re-reading.

Questions	Yes	Somewhat	Not at all
Did child relate craft object with rest of "Goldfish is Asleep"?	9	3	3
Did child relate craft object with rest of "Friends & the Bear"?	7	4	4
Did child relate craft object with rest of "The Rain Drop"?	5	5	5

Did child relate craft object with rest of "Rabbit & Snail"?	5	5	5
Was the child keen to finish "Goldfish is Asleep"?	13	1	1
Was the child keen to finish "Friends & the Bear"?	11	3	1
Was the child keen to finish "The Rain Drop"?	12	1	2
Was the child keen to finish "Rabbit & Snail"?	12	2	1
Did the child express interest to read "Goldfish is Asleep" again?	10	3	2
Did the child express interest to read "Friends & the Bear" again?	9	4	2
Did the child express interest to read "The Rain Drop" again?	8	4	3
Did the child express interest to read "Rabbit & Snail" again?	12	1	2

About 1/3 of the participants did not seem to relate the craft object to the stories readily even though most expressed their interest in finishing their readings after making the craft objects and also in re-reading the stories. This may be attributed to the attention given by the children to the craft activities and how the parents/carers have directed the craft sessions for the children. There may also have been a gap in time between the completion of the craft session and the readings, which affected how the children related the two activities.

Section 3D: Children's performance in the post-reading exercise

This section pertained to the children's performance in the post-reading exercise. The children's ability to retell the stories in their own words and possibly with the craft objects is of interest to the research project. More importantly it was to also for parents/carers to note down if their children were able to engage them in Mandarin during these activities. The children were also given a questionnaire to complete at the end of the activities.

Questions	Yes	Somewhat	Not at all
Was the child able to retell "Goldfish is Asleep" without the use of your device?	8	4	3
Was the child able to retell "Friends & the Bear" without the use of your device?	7	6	2
Was the child able to retell "The Rain Drop" without the use of your device?	7	5	3
Was the child able to retell "Rabbit & Snail" without the use of your device?	5	7	3
Did your child use the craft object when attempting to retell "Goldfish is Asleep"?	8	5	2
Did your child use the craft object when attempting to retell "Friends & the Bear"?	4	8	3
Did your child use the craft object when attempting to retell "The Rain Drop"?	6	6	3
Did your child use the craft object when attempting to retell "Rabbit & Snail"?	3	9	3
Was the child able to respond adequately to the post reading activity for "Goldfish is Asleep"?	10	5	0
Was the child able to respond adequately to the post reading activity for "Friends & the Bear"?	8	7	0
Was the child able to respond adequately to the post reading activity for "The Rain Drop"?	8	6	1
Was the child able to respond adequately to the post reading activity for "Rabbit & Snail"?	8	5	2
Was the child able to engage in this activity with the use of Mandarin?	3	10	2

Most of the children were deemed able to retell the stories by their parents/carers without referring to the smart device and instead most referred/ used their craft objects to assist with their retelling. The adults also deemed most of the children's responses adequate. Interestingly, 13 of the children had engaged in the activities in Mandarin in contrast to the same initial number flagged by the parents/carers as needing encouragement to use the language. While it was not conclusive that the children took to using Mandarin after the exercise, it was helpful to know that the children were not adverse to the experience. These sentiments were also captured in the final questionnaire answered by the children, with

everyone indicating that they liked playing with the toys they made and making them with the adults.

Children's questionnaire	Yes	No
Did you like the stories?	13	2
Did you like making the toys?	14	1
Did you like making them with me?	15	0
Did you like playing with the toys we made?	15	0
Do you like telling stories with these craft toys?	14	1

Appendix G - Project number CF16/42 – 2016000018 (Pairing craft making with mobile devices for language learning)

(i) Explanatory statement for participants

EXPLANATORY STATEMENT
(Relevant Participant Group for "Monsters On the Move" Craft Activity and Mobile Application)

Project: Learning with mobile devices by preschool children in bilingual families

Dr Stephen Wang Jia
Department of Design
Phone: +61 3 990 34051
email: stephen.wang@monash.edu

Wilkie Tan
Phone : +61 4 662 81974
email: wtan37@student.monash.edu

You are invited to take part in this study. Please read this Explanatory Statement in full before deciding whether or not to participate in this research. If you would like further information regarding any aspect of this project, you are encouraged to contact the researchers via the phone numbers or email addresses listed above.

What does the research involve?
This study is about gauging the response and readiness of preschoolers to the use of craft and mobile technology in the learning of Mandarin and English. The activity requires the child participant and you to, create a cardboard toy vehicle to house your smartphone, attempt the prototype mobile application and participate in a post activity review.

The results collated will be used to support Wilkie Tan's research project. His research aims to develop a design framework from which designers and content developers can develop better play and learning experience for children. This activity represents a possible iteration of this proposed framework. It also proposes the consideration of the role of adult carers as important stakeholders and collaborators in their children's experience with technology.

What will the child participants and their parents/ adult carers be required to do?

Pre-activity:

You will be issued a sample craft kit and advised on how to install a prototype mobile application on your smartphone. There will be suggested instructions for you on how to go about preparing the craft material for your child, such as what you need to print and how you may layout the craft objects and the printed codes around your designated play area at home.

Activity: "Monsters On the Move" Toy Craft and Mobile Application

Your child is required to create a craft toy vehicle that will also be used to house the smart device and 12 other cardboard cutout pictures. This activity is to be supervised by you. Once the child finishes the craft toy and you may get him/her to help setup the play area with the 12 cutouts. They will then access the application "Monsters On the Move" on the smart device.
The child will be prompted on screen to search and scan the 12 objects. Each object will present a phrase/word in either Mandarin or English. The application requires the child to 'collect' all 12 words/phrases before he/she can unlock the next set of craft activity and words. The prototype application will only feature the 1st set of craft activity and 12 words/phrases.

General instructions to parents/adult carers:

You and the child need not complete all the activities in a single seating. You have the option of doing it over the time of your choice. Towards the end, you will be asked to log your experiences and observations. The child will be asked to respond to a simple questionnaire.

The estimated time for the completion of the craft activity and the application is approximately 60 minutes in total. The child should only engage in the activity whenever he/she is comfortable and not near rest times.

What will you be required to do?

You will be supervising the activities of your child. The details of the activities are outlined in the activity sheets provided. You will also be required to photo/video document the activities. You may choose either form of documentation.

Why were you chosen for this research?

You have been invited to participate in this study because (a) your child is between 2 to 5 years old and (b) is from a bilingual (Mandarin and English) family. It is understood that you are able to read and speak both English and Mandarin fluently and has an interest in your child learning Mandarin since preschool age.

Consenting to participate in the project and withdrawing from the research

Being in this study is voluntary and you are under no obligation to consent to participation.
If you do, you are also consenting to the video-recording and/or photo documentation of the child participants. Kindly email a scanned/photographed copy of your completed consent form to Wilkie Tan (wtan37@student.monash.edu).

Please note that by submitting your data and answers in this study, you are consenting to them being used for the research. You will not be able to withdraw your answers once you have submitted them at the end of the survey.

Possible benefits and risks to participants

There will be no direct benefit to you or your child, but your participation is very important. The results from the study will help inform parents and related industries' developers and designers of the potential of using craft as a mean to enhance digital learning experience during preschool years.

There may be the possibility of the children subjects mishandling smartphones/tablets or craft material/stationery but the entire activity requires adults' supervision. Hence there would be little to no risks involved and will result in possibly very little discomfort to both adults and children.

Submission of data

You will be required to submit your activity sheets and video&/photo documentation to Wilkie Tan after completion. Scanned/ photographed copies of the completed activity sheets, along with digital photographs and/or video files may be submitted to him via the following means:

- Email (wtan37@student.monash.edu)
- Whatsapp (+61 4 662 81974)
- Your preferred cloud storage location (e.g. iCloud, Dropbox etc)

Kindly contact Wilkie Tan upon the completion of the activities to schedule your submission. He would also be able to advise on alternative modes of submission if you prefer channels that are not listed above.

Confidentiality

Your data will not be passed to anyone. The information about you collected for the study will be kept strictly confidential. Only the researchers and their staff will have access to the information.

You may be identifiable in any documents published about the study and in any photograph / video footage that you provide for the research project. If you desire to have the face of the child and yourself to be disguised or blurred as the condition of use in the project, you must indicate so in the consent form

Information collected will be stored in accordance with Monash University regulations and kept on University premises. All records will be kept in locked filing cabinets or in password protected computer files indefinitely. Results of the research will be published as group statistics and reports.

Storage of data

Information collected will be stored in accordance with Monash University regulations and kept on University premises. All records will be kept in locked filing cabinets or in password protected computer files indefinitely. Results of the research will be published as group statistics and reports and will not identify you in any way.

Use of data for in future research

The data collated may be used in future research if relevant to related projects. None of the respondents will be named.

Results

If you would like to be informed of the aggregate research finding, please contact Wilkie Tan on +61 4 662 81974 or wtan37@student.monash.edu. The findings are accessible from May 2016.

Complaints

Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the Executive Officer, Monash University Human Research Ethics (MUHREC):

Executive Officer
Monash University Human Research Ethics Committee (MUHREC)
Room 111, Building 3e
Research Office
Monash University VIC 3800
Tel: +61 3 9905 2052 Email: muhrec@monash.edu Fax: +61 3 9905 3831
Thank you,

Dr Stephen Jia Wang
18/12/2015

(ii) Consent form from participants

(Relevant Participant Group for "Monsters On the Move" Craft Activity and Mobile Application)

Project: 'Learning with mobile devices by preschool children in bilingual families'

Investigators:

Dr Stephen Wang Jia
Department of Design
Phone: +61 3 990 34051
email: stephen.wang@monash.edu

Wilkie Tan
Phone : +61 4 662 81974
email: wtan37@student.monash.edu

I have been asked to take part in the Monash University research project specified above. I have read and understood the Explanatory Statement and I hereby consent to participate in this project.

I consent to the following:	Yes	No
The administering of described activities as outlined in the activity sheet attached.	☐	☐
The logging of details required in the activity sheet attached.	☐	☐
The gathering of feedback from the child participant at the end of the described activities.	☐	☐
The photo/video documentation of the child participant engaged with the described activities.	☐	☐
The use of part/all of the above mentioned photo and/ or video documentation as part as supporting evidence for Wilkie Tan's PhD research project and examination exhibition.	☐	☐
The use of 'undoctored' images of faces of the child participant and myself (i.e. the face of the child will not be disguised/blurred). A choice of 'No' will indicate my consent to the use of images but they will be doctored to protect our identities.	☐	☐
The use of the data for other purposes if relevant to related future projects.	☐	☐

Name of Participant

Participant Signature Date

(iii) Instruction Sheet to adult volunteers

Parent / Adult Carer's Participation for "Monsters On the Move" Craft Activity and Mobile Application

Thank you for agreeing to participate with this activity with your child.

Please must read through the following guidelines prior to the activity.

You are to conduct 3 activities with your child.

Prior to conducting the activities, you will:

- receive a sample craft kit and instructions to download and install the prototype application on your smart device;

Activity 1: Craft Activity

The craft activity requires you to:

- follow the instructions in the craft kit and facilitate your child in making the craft toy vehicle;
- complete the craft toy vehicle in approximately 1 hour. However it is only a guideline and you may complete the activity in multiple sessions or in the pace which you and your child are comfortable with;
- assist your child to place your smart phone in cardboard toy vehicle;

Activity 2: Mobile Application Activity

The mobile application activity requires you to:

- assist the scanning of codes and navigation of the application if required;
- assist the child to read the words/short phrases that appear on the screen of the smart device;
- ensure the child "collects" a dozen word/phrase set to complete the game.

Activity 3: Post-activity Review

The post-activity review requires you to:

- ask your child a set of questions regarding his/her experience of the above activities;
- assist your child to fill up the simple review document if required.

Please ensure that safety and comfort are observed at all times. You may postpone/stop the activities at whichever point you feel the child or yourself is experiencing discomfort. The child is to be respected should he/she refuse to participate at any point in the activity. There is no pressure to achieve full completion of the activities.

No devices will be provided for the activities. You are responsible for the use of your own devices, tools and material for the activities.

Outline of content in Activity Form

The form is divided into 3 sections;

SECTION 1: Pre-activity Questions (for parents / adult-carers)

- This is to understand the child's immersion of Mandarin and his/her existing attitudes to play, craft toys and mobile applications.

SECTION 2A,B,C: Duration Log, Observation Note & Review of Play Experience (for parents / adult-carers)

- This is to be logged by you. The log will include the time is taken by participants to complete the activities and learning application.
- There will be questions on the child's engagement with the craft activity and the mobile application.
- There will also be questions on how you would review the experience.

SECTION 3: Post-activity Questions for the child

- This is to find out what the child participants may have learnt from the activities and what he/she likes/dislikes about the experience.
- Please assist the child to complete this by reading out the questions.
- A Certificate of Appreciation is specially designed for the child participant. Please print out the certificate upon completion of the activities.

Documentation

- You will be required to assist with the logging of activities and documenting the observations of the child as prescribed in the activity sheets attached.
- You are encouraged to document the child during his/her craft-making and mobile application sessions with the use of digital photographs &/or video.
- These documented material may be used as supporting evidence for my research and may be displayed as part of my examination exhibition.
- If you consent to the use of your documentation, kindly do so in writing on the attached consent form and return a scanned copy of the form to wtan37@student.monash.edu
- Your consent to share the photo and video documentation will be invaluable to the research project and will be deeply appreciated to the researchers involved.
- Please scan and email all completed activity logs and documented material to wtan37@student.monash.edu

SECTION 1: Pre-activity Questions

Age of child when activities are conducted: _____

How well do these statements describe you and the child?
Please tick only ONE RESPONSE for each statement.

	Never	Rarely	Occasionally	Frequently	All the time
I speak Mandarin to the child					
The child responds in Mandarin when spoken to					
The child needs me to encourage him/her to speak in Mandarin					
The child needs company, especially from you / other carers (to be motivated to read and play)					
I plan for what my child plays (e.g. being selective of what toys are made available for play)					
The child plays with DIY crafted toys, along with other toys					
I spend time on craft activities with the child					
The child has access to a smart device in the family					
I specify the duration which the child spends on the smart device					

SECTION 2A: Duration log

Time taken by the child and parent on the craft activity and playing of mobile application:

ities	Session	Date	Time taken in minutes (approximate)
activity (co-creating craft object with child)	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
Playing and completion* of mobile application "Monsters on the Move" *The child must attempt to 'collect' all 12 words in the 1st album to complete the game.	1	__ / __ / __	
	2 (optional)	__ / __ / __	
	3 (optional)	__ / __ / __	
	4 (optional)	__ / __ / __	
	5 (optional)	__ / __ / __	
Total number of sessions & time taken to complete the task. Parents/ adult carers are to print the certificate for the child upon completion of the game.			

SECTION 2B: Observation Note

Kindly tick in the appropriate boxes:

Section	Observation	Yes	Some what	Not at all
Craft activity (co-creating craft)	Was the child keen to create the craft object?			
	Did the child follow through the craft activity (from start to finish)?			
	Did the child request for assistance from you when making the craft?			
	Did the child play with / express an interest to play with the craft object after the activity, i.e. as a standalone object (not housing the device and when not accessing the application)?			

Section	Observation	Yes	Some what	Not at all
Access of Mobile application	Was the child enthusiastic when using smart device?			
	Did it take long for the child to learn how to navigate through the scenes in application?			
	Did the child have difficulty scanning the objects?			
	Was the child able to complete the collection of 12 words independently?			
	Was the child able to sustain his/her interest in this activity?			

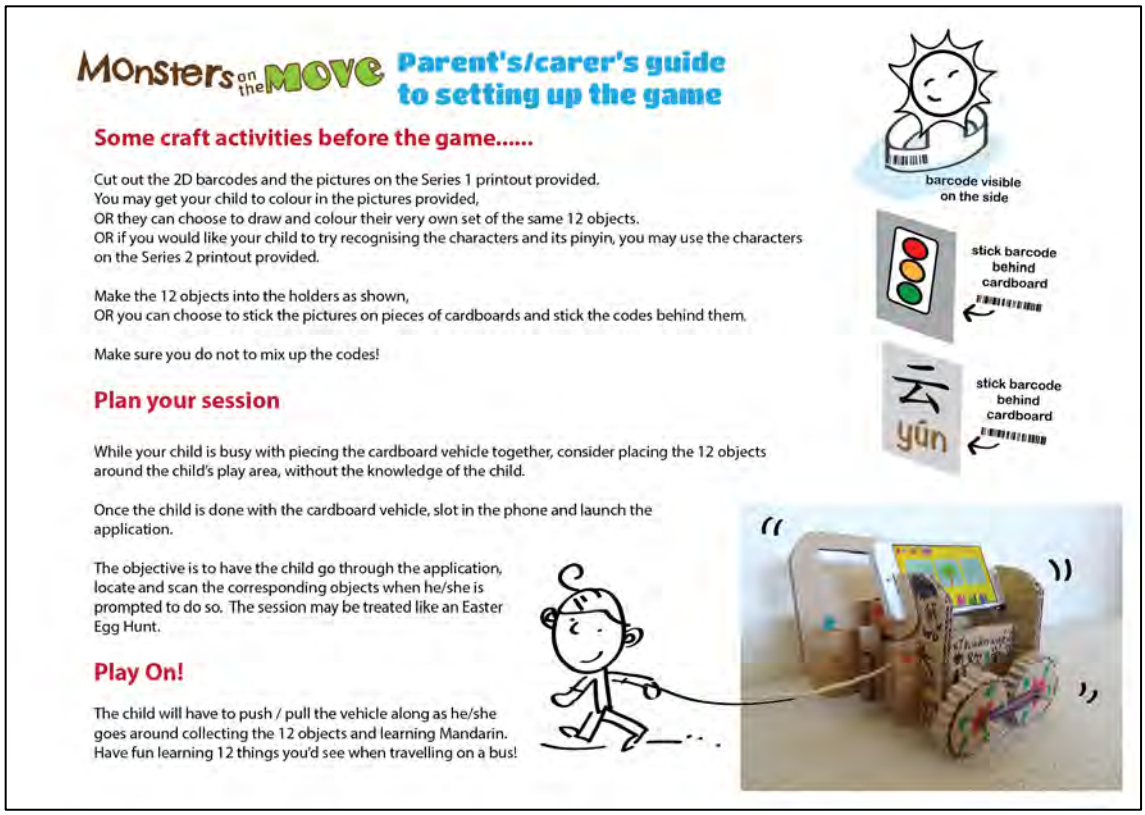
SECTION 2C: Review of Play Experience

Kindly tick in the appropriate boxes:

Section	Questions	es	Some what	Not at all
Review of Play Experience	Was there too much preparation work that goes into facilitating the play activity?			
	Do you find the suggested instructions helpful in planning for the play activity?			
	Do you find the craft activity with your child engaging?			
	Do you think the craft work is helpful in providing a more meaningful context to the subsequent play experience?			

OPTIONAL Comments by parent/adult carer on the craft activity;	

(iv) Sample of craft instruction sheet for adult volunteers



Monsters on the Move **Parent's/carer's guide to setting up the game**

Some craft activities before the game.....

Cut out the 2D barcodes and the pictures on the Series 1 printout provided.
You may get your child to colour in the pictures provided,
OR they can choose to draw and colour their very own set of the same 12 objects.
OR if you would like your child to try recognising the characters and its pinyin, you may use the characters on the Series 2 printout provided.

Make the 12 objects into the holders as shown,
OR you can choose to stick the pictures on pieces of cardboards and stick the codes behind them.

Make sure you do not to mix up the codes!

Plan your session

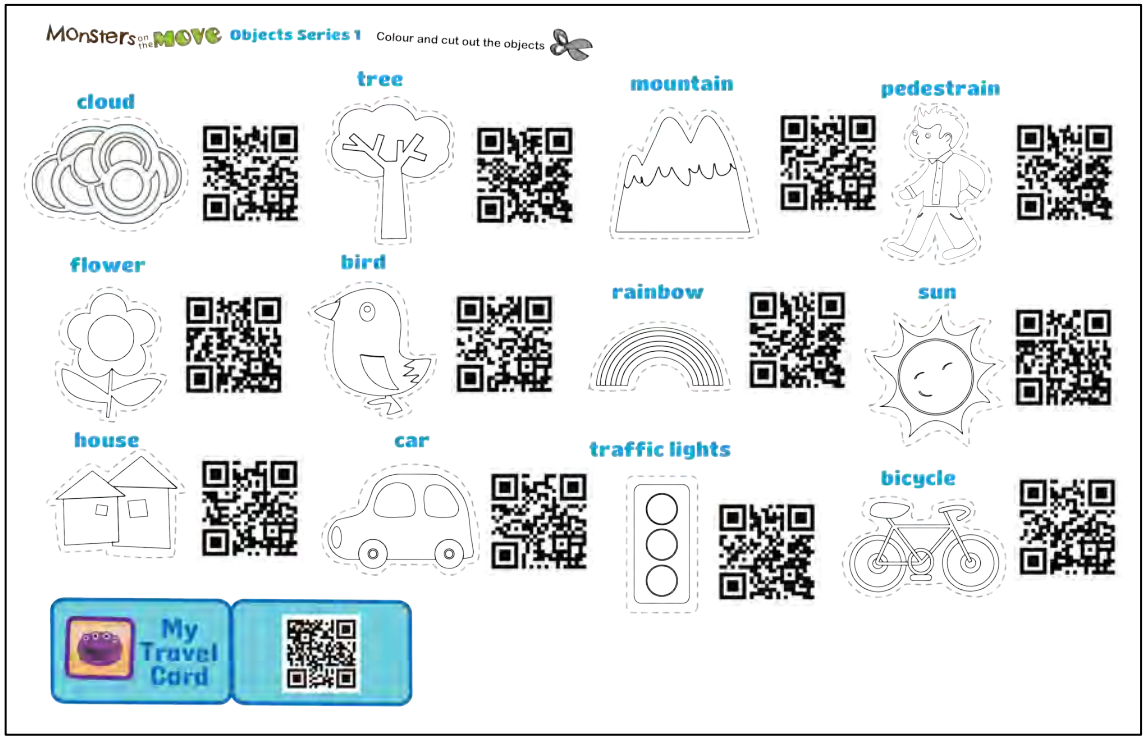
While your child is busy with piecing the cardboard vehicle together, consider placing the 12 objects around the child's play area, without the knowledge of the child.

Once the child is done with the cardboard vehicle, slot in the phone and launch the application.

The objective is to have the child go through the application, locate and scan the corresponding objects when he/she is prompted to do so. The session may be treated like an Easter Egg Hunt.

Play On!

The child will have to push / pull the vehicle along as he/she goes around collecting the 12 objects and learning Mandarin. Have fun learning 12 things you'd see when travelling on a bus!



Monsters on the Move **Objects Series 1** Colour and cut out the objects

Monsters on the Move Objects Series 2 Cut out the characters

山	云	花	树	鸟	屋子	行人
shān	yún	huā	shù	niǎo	wūzi	xíngrén
汽车	彩虹	太阳	红绿灯		自行车	
qìchē	cǎihóng	tàiyáng	hónglǜdēng		zìxíngchē	

If you would like your child to try recognising the characters, use these instead of the pictures in Series 1.

(v) Mandarin sentences related to the 12 objects

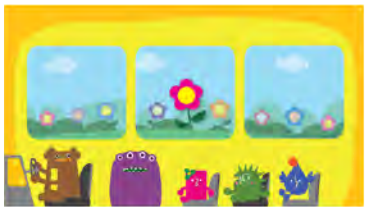
Monsters on the Move Sentences


到了周末，街上的行人很多。


在路上骑自行车时，一定要小心。


白云在蓝天上飘着。

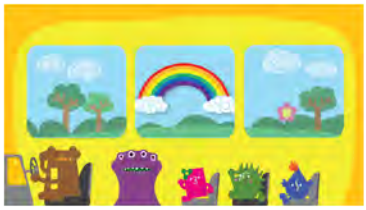

那些屋子都是旧的。


春天的花儿真美丽。


小朋友过马路时要注意红绿灯。


你们看，远处有座山。


中午的太阳高高地挂在天空上。


你们看，天空出现了一道彩虹。


这里的树都长得很高。


路上有很多辆汽车。


鸟儿在树丛里唱歌。

(vi) Post-activity questions for child participants

MONASH University

SECTION 3: Post-activity Questions for the child

小朋友，听清楚问题后，把答案圈一圈.
Listen to the questions and circle your answers.

你喜欢做手工吗?
Did you like making the toys?

你喜欢和我做手工吗?
Did you like making them with me?

手工玩具巴士好玩吗?
Did you like playing with the toy bus we made?

巴士窗外看不到什么?
What can't you see when you are on the bus?

这是 ?
What is this?

树 汽车 云 红绿灯

这是 ?
What is this?

鸟 彩虹 屋子 云 山

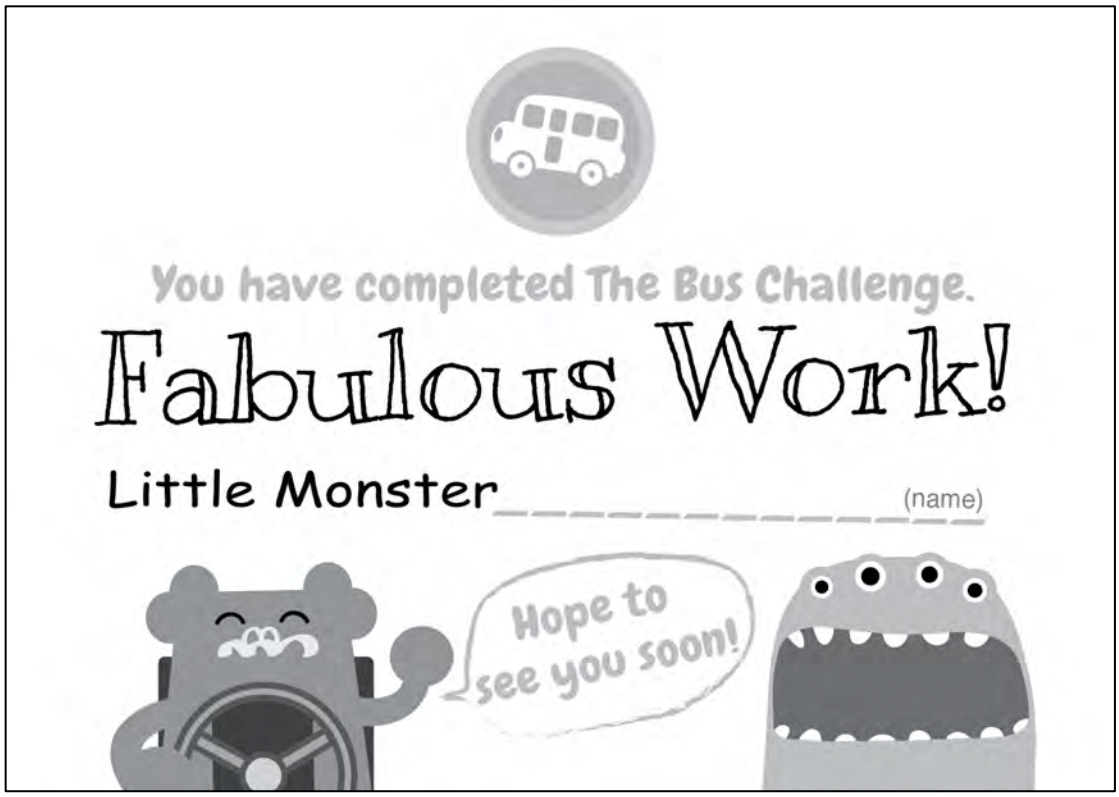
对一对它们吧!
Let's match them!

花 行人 山 自行车

bicycle mountain pedestrain flower

你喜欢用玩具巴士玩游戏吗?
Did you like playing the game using your toy bus?

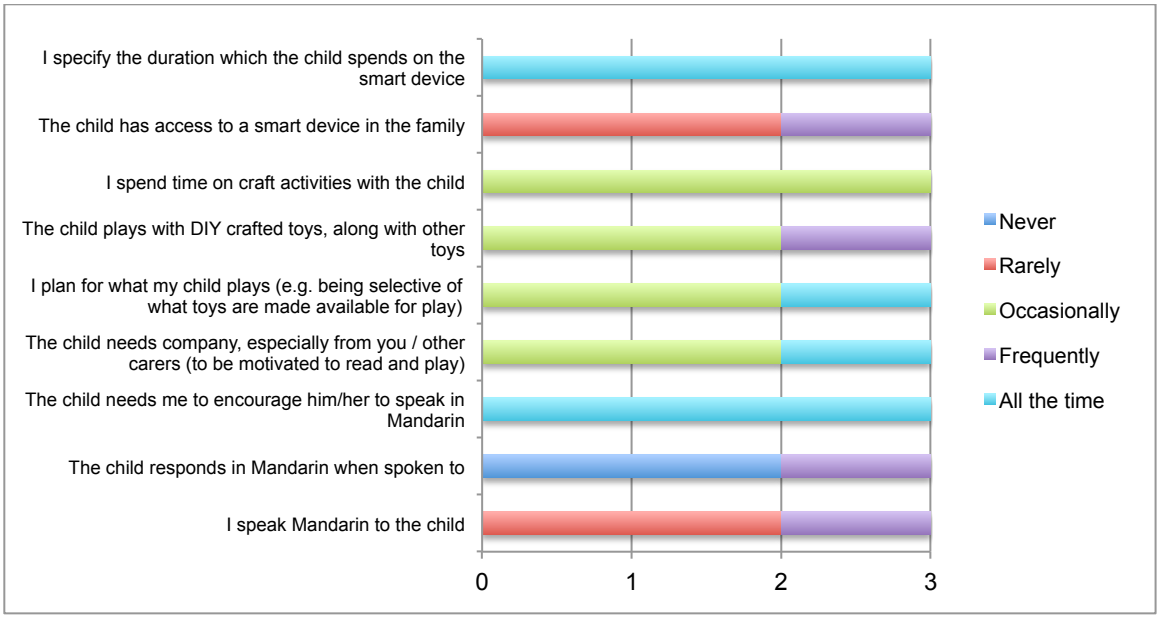
(vii) Sample of certificate for child participants



(viii) Collated results from the participants

Section 1: Pre Activity Questions

A total of 3 children participated in the activities. 2 of them are twins and are 4 years old while 1 was 3.5 years old when the activities were carried out. They were selected because their family background (bilingual ethnic Chinese migrant families) was ideal for the field activities. They had noted that maintaining their HL was a priority in their families.



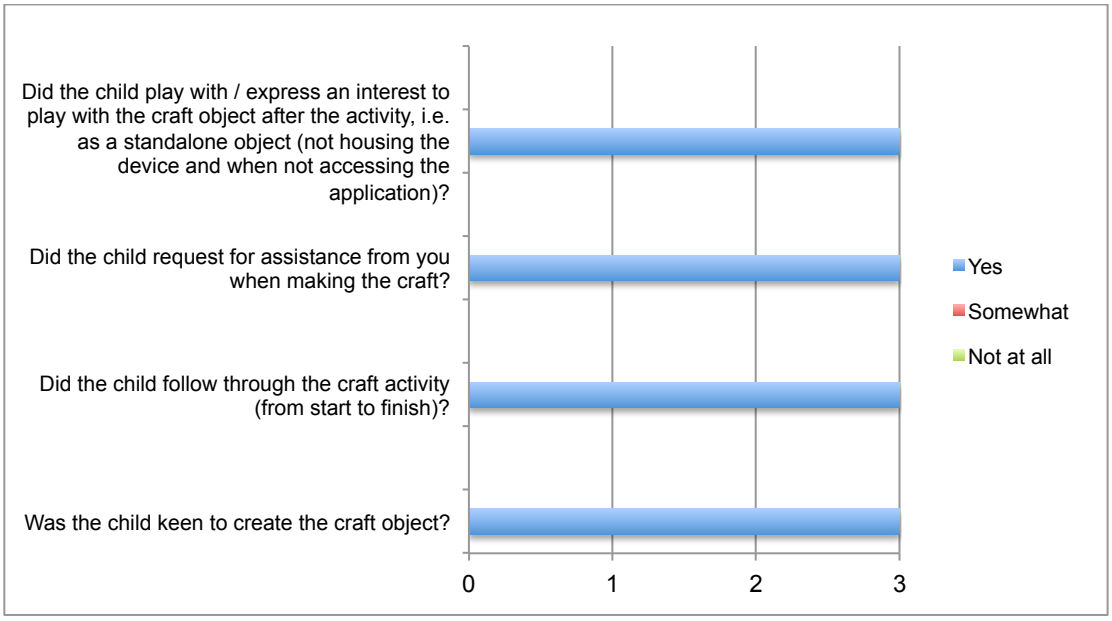
Like the parents/carers who were surveyed in Appendix E, the 3 parents/carers specified the duration on which their children can access their smart devices. All of them also noted that they needed to encourage their children to engage in the use of Mandarin and occasionally spend time doing craft activities with them. Only one of the parent/carer noted that his child responds in Mandarin when spoken to, while the other noted a "never" for this question.

Section 2A: Duration Log

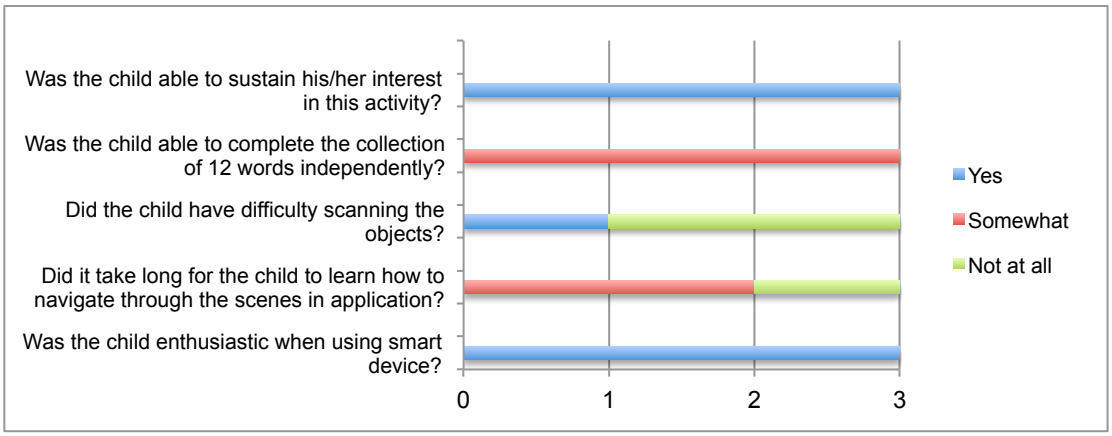
The children took between 1-3 sessions to complete the craft activities. The time they took was between 90-160 minutes. They spent 30-60 minutes playing with the mobile application and the craft objects, and collecting all the 12 words. The activities were conducted within the familiar home space of the children and by the parents/carers themselves.

Section 2B: Observation Notes

All three children were keen to play with the completed craft object on its own, before and after the field activity. Although the children requested assistance in making the craft, they completed it over a few sessions. Their initial interest in the activities saw them through the exercise.

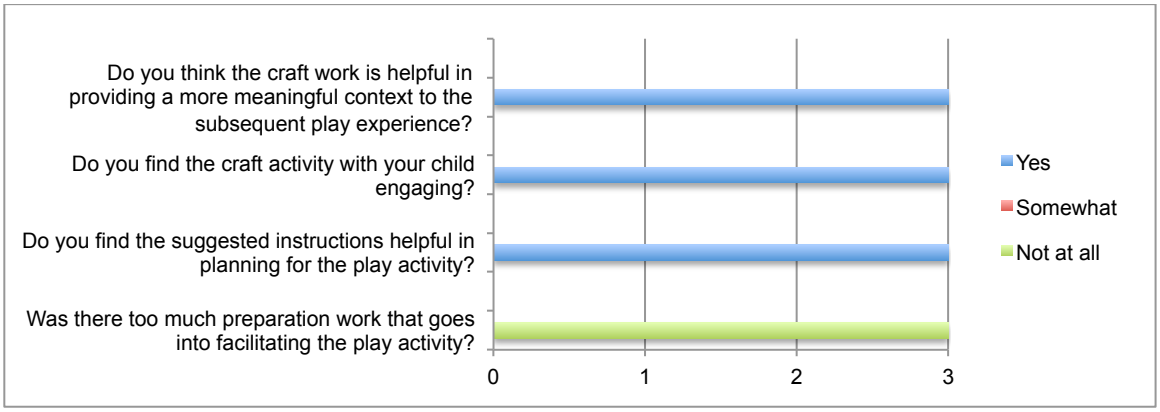


The children like those surveyed earlier and the participants in the previous field activities, expressed enthusiasm when told that they would be accessing content on their parents/carers smart device. The responses were mixed in terms of how long it took for the children to learn to navigate through the content and scan the objects. From the photo and video documentation, the children got better at toggling between the scanning application and content on the browser later on in the activities, hence the parents/carers recorded a "somewhat" response for in their children completing the tasks independently. The children however were kept interested in the task and all were able to complete the tasks within a single session.



Section 2C: Review of Play Experience

The parents/carers did not mind the amount of work that went into the preparation of the craft activities and play sessions and all of them felt that the experience was a positive one. They found the instructions provided helpful and the shared time with their children on the craft activities, engaging. It was also noted that they felt it gave a more meaningful context to both themselves and their children when they started playing with the content on the browser.



The parents/carers provided the following comments at the end of the activities.

- The experience could be better on a tablet as the controls on the phone's screen were too small to be tapped effectively.
- The child picked up the Chinese word easily and the activities made it easier and more interesting for him to do so.

Post-activity questions for child participants

The children answered most of the questions positively except for the 4 questions which required them to remember and recognize the Chinese characters. They were only able to complete these after efforts from the parents/carers in prompting and translating the words to English.