Young Children’s Use of ICT: Preschool Teachers’ Perceptions and Pedagogical Practices in Shanghai

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Statement of Originality

The thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to the final version of my thesis being made available worldwide when deposited in the University’s Digital Repository, subject to the provisions of the Copyright Act 1968.

Signed: Date: 22/05/2014
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Abstract

This thesis examines the use of information and communication technologies (ICTs) in preschools in Shanghai. The objectives of the study were to (1) identify the availability of ICT resources and young children’s ICT use in their classrooms; (2) describe preschool teachers’ perceptions and pedagogical practices regarding young children’s use of ICT in the classrooms; and (3) examine the barriers that inhibit full integration of ICT into teaching and learning.

To achieve the objectives, a survey was first undertaken with a sample of 316 teachers who directly taught young children in 20 preschools in one urban district of Shanghai. Following this, case studies of four teachers involved interviews and observations to provide an in-depth description of the contexts and meanings for those teachers. This study adopted a sociocultural framework to inform the research methodology and help explain the findings.

A wide range of ICT resources was available in the preschools studied, although the number of each device was limited. The majority of surveyed teachers had positive perceptions of the use of ICT in early childhood education (ECE) and the case study teachers had an emerging understanding about the role of ICT for teaching and learning. However, integrating ICT into ECE classrooms was not fully realised. The limited status of ICT in the Chinese ECE system created discontinuities, mismatches and tensions between the teachers’ positive perceptions of the use of ICT and their pedagogies that can maximise ICT potential for teaching and learning.

ICT in the classrooms was mainly used for teacher-led teaching and learning activities, whereas young children’s ICT access was low and their ICT activities were generally simple and passive. However, many children had strong interest and competencies in using ICT and their ICT activities were associated with high enthusiasm and joyful experiences. This fact, along with contextual changes in social and technological advancement, had a significant influence on the teachers’ positive perceptions of the benefits of the use of ICT and their provision of ICT access for the children in the classrooms.
This study identifies six barriers to successfully integrating ICT into teaching and learning in the classrooms. These barriers were: inadequate hardware and inappropriate software; fears and concerns surrounding the use of ICT; the absence of ECE ICT framework and curriculum guidance; ineffective ICT training; restraints from strong cultural and educational traditions; and a lack of technological and pedagogical knowledge and skills that can fully integrate ICT.

Based on the findings of this study and the literature, it is concluded that the successful ICT integration into early learning and teaching relies on a range of factors: adequate and equal access to high quality ICT resources; creation of communities of learners; systematic and effective ICT training and professional development; a high priority for ICT integration in ECE policies and curriculum; young children’s active, meaningful and complex ICT use; and teachers’ positive perceptions, informed technical and pedagogical knowledge and skills.
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Chapter One: Introduction

This chapter introduces the research into early childhood (EC) teachers’ perceptions and pedagogical practices regarding young children’s use of information and communication and technologies (ICTs) in Shanghai preschools. The chapter provides the background to the study, and outlines research questions, the purpose of the study and the specific objectives of the study. In addition, it includes definitions of key terms, and significance of the study, as well as an overview of the theoretical framework and the thesis structure.

Motivation for the Study

When I first arrived in Australia for my PhD studies as an international student, I met many new friends and academics at the University of Newcastle, and quite often I was asked to explain two things: How did I choose to study the interplay of early childhood education (ECE) and ICT, and what were the reasons for studying in Australia. In the beginning, I often had to think for a moment to come up with a short and concise answer, which I could clearly express in a few sentences in English as my first language is Mandarin. After many times of retelling the stories of my ‘adventures’ I almost memorised them so I was able to respond to any similar questions with my limited English vocabularies in a more relaxed way. Due to this experience, my motivation for a journey of overseas study has become very explicit to myself.

The present PhD research is strongly related to my previous study experiences. When I started the studies for my Masters degree in Shanghai, I was ‘advised’ to work on international policies of ICT in ECE. My Chinese supervisor pointed out this research direction for me, rather than letting me select my own research topic. This procedure is quite common in Chinese education and indicates a rather hierarchical teacher-student relation. This is linked to Chinese social and cultural traditions in which I grew up and was educated. These traditions have strongly shaped today's education system. Interestingly, in a completely different context, this traditional aspect of Chinese education turns out to be also an important feature in the present research. In my master’s thesis, I did case studies on the exemplary policies of the UK and New Zealand
due to their leading roles in initiating ICT policies for ECE contexts. This research compared their policies and focused on drawing upon their knowledge and experiences in facilitating ICT childhood educational practices through making specific policies and frameworks. It was hoped that such experiences can inform Chinese policymakers and educational leaders to develop relevant policy frameworks for enhancing the use of ICT in ECE in China at a time when the government aims to turn the educational development in the directions of modernisation, the future, and the rest of the world (Wang & Mao, 1996).

Because of my Master’s study, I unconsciously paid attention to ICT use in ECE settings. During my visits to many preschools in Shanghai and other areas, I noticed that some ICT resources already existed in current preschool environments. In particular, while I observed a few lessons of preschool teaching practices, I found preschool teachers demonstrating their teaching with ICT. I started wondering whether their use of ICT is integrated into their everyday work, or if it was specific for the teaching presentation? At that time I could not find answers due to very limited opportunity for visiting these teachers, and the different focus of my studies. Fortunately, after finishing my degree, I received an opportunity to further my studies with a scholarship in Australia. I realised this as a great chance to further explore the use of ICT in ECE.

In the first phase of my PhD study, I was immersed in reading the literature in this field. The more I read the bigger the surprise for me to find that was only very little research about Chinese EC teachers and young children in relation to ICT use. On the other hand, I found a considerable body of literature on the scepticism of EC teachers in developed countries about the use of ICT in the early years. As a Chinese person who worked as a school teacher prior to PhD study and studied for a Masters degree in education, I could not stop thinking about the simple question ‘What about Chinese teachers’ views and practices regarding young children’s ICT use?’ I searched the literature many times and tried to gain understanding about my people, however, this curiosity was never satisfied, and this naturally led to my PhD research on ICT in ECE in the Chinese context.
Background to the Research

Rapid technological advancement and profound changes in modern society indicate that the world is in the Information Age (Law, Pelgrum, & Plomp, 2008). In response to such widespread changes new technologies, particularly ICT, are being increasingly introduced into people's lives and educational systems. ICT becomes a part of the society and culture which significantly impacts every member of society, including the youngest children. Young children can learn to use some ICT resources such as electronic toys, devices and learning technologies that did not exist just a decade ago (Aubrey & Dahl, 2008; Ebbeck & Waniganayake, 2010; Edwards, 2005; Lemon & Finger, 2013; O'Rourke & Harrison, 2004; Parette, Blum, & Quesenberry, 2013; Sheridan & Samuelsson, 2003; Yelland, 2007a). The potential of ICT for early learning and development has been identified in many educational policies and research studies (Clements & Sarama, 2002; Education Department Centre and SRI International, 2012; Education, 2005; Plowman & Stephen, 2003b; Siraj-Blatchford & Siraj-Blatchford, 2006). Consequently, some governments and ECE organisations have emphasised the importance of integrating ICT into early childhood contexts effectively in order to harness the power of ICT to enhance learning and teaching in ECE (Learning and Teaching Scotland, 2003; Ministry of Education, 2005; NAEYC & Fred Rogers Center, 2012).

Integrating ICT into ECE for early learning and development has significant implications for today's EC teachers (Campbell & Scotellaro, 2009). For them, the central issue in these implications is “change” (Means, 1994, p. 85). It is pointed out that teachers who immerse themselves in ICT rich environments undergo rich and intense changes (Watson, 2001) because many of them are experiencing considerable shifts in their teaching practices such as adopting ICT into teaching. The changes around the use of ICT have profound impacts on EC teachers’ work such as methods of instruction, content of teaching and relationship with young children (Govender & Govender, 2009), which have led to new expectations about their work and their roles to face and deal with the challenges and changes (Max, 2010). For instance, as early as 1996, the National Association for the Education of Young Children (NAEYC, 1996) in the US issued a joint position statement on Technology and Young Children indicating
that early childhood teachers must be prepared to “critically examine the impact of technology on children and use technology to benefit children” (p. 1). Approximately 13 years later, the revision of the NAEYC standard (2009) stipulated that EC teachers should demonstrate skills of using technology effectively to promote child development, learning and communication with families. Early Childhood Australia (ECA)—a national advocacy body for children and families, also stated that educators of young children should “introduce appropriate tools, technologies and media and provide the skills, knowledge and techniques to enhance young children’s learning” (DEEWR, 2009, p. 55). New requirements like these have challenged many EC teachers, with various concerns and fears vividly described in the past, which indicate most EC teachers have had uncomfortable experiences with ICT (Bayhan, Olgun, & Yelland, 2002; Gialamas & Nikolopoulou, 2010). For example, in Campbell and Scotellaro’s study (2009), an EC teacher expressed “the greatest worry is that the children will know much more about technology than I do, although maybe this means that I can learn from them” (p. 17).

As a result, several countries throughout the world such as the US (NAEYC, 1996), England, Portugal, Sweden, Denmark (Saude et al., 2005); Scotland (Plowman & Stephen, 2003b) and New Zealand (Ministry of Education, 2005) have implemented specific guidelines or training programs for EC teachers integrating ICT into ECE. The increasing recognition of the importance of EC teachers may be the result of a growing understanding of their important role in supporting young children’s development of ICT knowledge, attitudes and skills. But the emerging body of international research addressing teachers at ECE level is relatively limited (Campbell & Scotellaro, 2009; Oldridge, 2010). In particular, few studies have addressed EC teachers’ perceptions and pedagogical practices related to young children’s use of ICT in their settings. This is despite early childhood teachers’ perceptions and pedagogy having a profound impact on young children’s experience, knowledge, skills and understanding of ICT, as well as learning outcomes (Ihmeideh, 2009; Liang, 2006; Wang & Hoot, 2006). It is thus important and timely to study this group of teachers to fully understand the effects of their perceptions and practices upon young children’s use of ICT in their preschool environments.
Research Aim and Research Questions

Previous studies have mainly focused on EC teachers’ perceptions of ICT (e.g. Gialamas & Nikolopoulou, 2010; Morrow & Mackey, 2008; Oldridge, 2008) or pedagogical practices of using ICT (e.g. Orlando, 2009; Stephen & Plowman, 2008), rather than studying teachers’ perceptions and pedagogy in relation to young children’s ICT activities. Their studies have relied heavily on questionnaires and interviews with teachers. That is, on what people say about what they do. In fact, what teachers answer in questionnaires or say in interviews may be quite different from what their actions in real classroom situations. This study investigates teachers’ perceptions and pedagogical practices in terms of young children’s use of ICT in the preschool to build new knowledge using mixed methods, especially observational and interview-based case study.

The primary research question to be addressed is “what are preschool teachers’ perceptions and pedagogical practices regarding young children’s use of ICT in preschools in Shanghai”. Five sub-questions frame the study to support the collection of data to answer the primary question.

Sub-questions:
1. What ICT resources are available in classrooms?
2. What do young children do with ICT when they have access to it in classrooms?
3. What are preschool teachers’ perceptions regarding young children’s use of ICT?
4. What are preschool teachers’ pedagogical practices regarding young children’s use of ICT?
5. What are the barriers to integrating ICT into the classroom in the preschools?

The specific objectives to be achieved are to:
- Identify the availability of ICT resources and young children’s ICT activities in the preschool classrooms.
- Describe preschool teachers’ perceptions and pedagogical practices regarding young children’s use of ICT in the preschools.
- Examine the barriers that inhibit full integration of ICT into teaching and learning.
Key Terms of the Study

This study investigates preschool teachers’ perceptions and pedagogical practices in terms of young children’s use of ICT in preschools in the context of Shanghai. There are five key concepts involved in this study: ICT, perceptions, early childhood education, preschools and pedagogy.

ICT

ICT has a number of definitions, which are derived from different contexts. For example, UNESCO provides the following description:

The tools and processes to access, retrieve, store, organize, manipulate, produce, present and exchange information by electronic and other automated means. These include hardware, software and telecommunications in the forms of personal computers, scanners, digital cameras, handhelds/PDAs, phones, faxes, modems, CD and DVD players and recorders, digitized video, radio and TV and programs like database systems and multimedia applications (UNESCO, 2010, Section Two, para 6).

In investigating the literature to clarify the definition of ICT some confusion in the common terminology has emerged, because of the way that understanding has changed over time. People tend to “associate ‘technology’ to mean the ‘new’ technologies” (Finger et al., 2007, p. 2) and use the term ‘technology’ to refer to ‘ICT’ interchangeably in contemporary times. For instance, Yelland (2007b) used ‘new technologies’, ‘learning technologies’ and ‘ICT’ interchangeably to refer to technologies that “enable learners to function in new ways that were not possible prior to their introduction” (p. 2).

The terms such as ‘educational technology’ and ‘learning technology’ have been coined since technological tools and processes were involved to address educational problems and needs (Newby et al., 2006; Roblyer & Edwards, 2000). With the rapid change of new technologies, the understanding of ICT has gradually shifted from a narrow focus on computers to a more comprehensive set of new technologies (Finger, et al., 2007) such as digital cameras and iPhones. Notably, the definition of ICT in childhood educational research (e.g. Aubrey & Dahl, 2008; Bolstad, 2004; McPake et al., 2005) is often broadened and extended to a range of other electronic products that can be used for information and communication, which has led to the establishment of vague boundaries around ICT and associated difficulties in defining this term.
For the purpose of clarity, *ICT* is used in this study to mean technologies that can access, store, manipulate, present and communicate information, including hardware, software and telecommunications devices. It is extended to other technological devices and processes, but includes the use of electronic mail, blogs, text message, and internet for supporting learning (Leung, 2010; Parette, et al., 2013).

**Perception**

This term has been studied in diverse fields and resulted in a variety of definitions. Based on its literal meaning perception is the act or the effect of perceiving and insight or intuition gained by perceiving (Merriam-Webster, 2011). Pearsall (2001, p. 76) referred it to “an interpretation or impression based on one’s understandings of something” in the concise Oxford dictionary. In the present study, perception is defined as individual understandings and views.

**Early childhood education**

It is traditionally recognised as the educational programs, strategies and services for young children from birth to age eight (UNESCO, 2007). While the Australian definition of ECE is consistent with this (Cameron, 2009), ECE refers to educational services for children from birth to age six in China (Zhu, 2008a).

**Preschool/ Kindergarten**

Chinese educational institutions for children from three to six are called *kindergartens* or *preschools*; for children younger than three years they are called *nurseries* or *childcare* (Zhu, 2008a). I will use the word *preschool* throughout this thesis when referring to my research or ECE centres in the Chinese system. In describing the literature I will use the term or terms originally used by authors. The names of Chinese ECE policies such as ‘Kindergarten Work Regulations and Procedures’ are used as they have been translated in the literature. Shanghai public preschools are categorised into different levels based on a series of guidelines and regulations to evaluate the level of development and enhance the quality of ECE settings (Shanghai Education Commission, 2006c). The premier preschool is called *Model Preschool* and below that is *Level One*, followed by *Level Two* and *Level Three*.

**Pedagogy**
According to Alexander (2001, p. 507), “pedagogy is defined as both the act of teaching and the discourse in which it is embedded.” Pedagogy is about teaching strategies, provision of learning environment and opportunities, instructional techniques or approaches that enable learning to take place (Siraj-Blatchford et al., 2002; Wang, 2008). In this study pedagogy also refers to interactive process between teachers and children and to their learning materials and contexts.

**Early Childhood Education in China**

**Early Childhood Education Reforms in China**

Early childhood education is non-compulsory for children from birth to six in China, including preschool education for children aged 3-6. By 2011, China had approximately 166,800 preschools and approximately 34.24 million children in preschools, with 62.3% of young children registered for preschool education (China Education Statistics, 2011). Generally, there are two categories of ownerships in the ECE sector in China: non-government preschools are privately owned preschools, and public preschools are operated by various education bureaus of the government. The public preschools include community-owned and collectively owned preschools (Zhu, 2008a). The differences in the development and quality of preschools across the country are mainly due to economic and social reasons. In particular, rural preschools are generally short of teachers and basic infrastructure because the government prioritises the nine-year compulsory education, starting from the age of seven when allocating education budgets (Zhao & Hu, 2008; Zhu, 2008a).

Since the national ‘open-door’ policy (an economic policy initiated by Deng Xiaoping that opened up China to foreign business and investment) and economic reforms in the 1980s, the Chinese government has increased its legislation efforts in early childhood care and education to meet the demands of China’s rapidly changing social and economic conditions (Wang & Mao, 1996; Zhu, 2008b; Zhu & Wang, 2005). Influenced by the policy of opening the nation to the world, Chinese people have come into contact with western culture and ideas. Foreign theories in philosophy, psychology, child development and early childhood education such as those of Dewey, Freud, Bronfenbrenner, Montessori and Bruner, especially Piaget and Vygotsky, have begun to
have great impacts on Chinese ECE (Wang & Mao, 1996; Zhu & Zhang, 2008). The Chinese EC teacher education and training programs have also started to put great emphasis on child development theories and introducing western ECE ideas since the 1980s (Wang, Elicker, et al., 2008). Tobin et al., (2009, p. 88) noted that the modern Chinese ECE has rapidly become “more constructivist, play-oriented, and child-initiated, borrowing progressive ideas freely from Western countries.” These progressive and modern educational ideas have created opportunities for the Chinese ECE system and challenged traditional educational concepts such as individual subject teaching which have existed for almost 40 years (Wang & Mao, 1996).

During the ECE curriculum reforms, a series of ECE policies has been made to ensure the development of ECE and enhance child care and education to cultivate fully-developed children in terms of their moral, intellectual and physical development as well as in their appreciation of aesthetics. Kindergarten Work Regulations and Procedures (National Education Committee of China, 1989) is the first formally promulgated decree on childhood education. This document not only states the basic administrative requirements for kindergarten work and management, but also stipulates on ideological principles, aims, goals and curriculum requirements (Wang & Mao, 1996). It requires EC teachers to move from emphasising on teaching knowledge and skills to focus on child development and acquisition of abilities, stressing child-initiated activity, individual difference, the importance of play, integrated curriculum, the process of activities and democratic child-teacher relationship (Wang & Mao, 1996; Zhu & Zhang, 2008). Compared to traditional Chinese ECE practices characterised by knowledge-transmission and teacher-centred practices, this policy adopts theories and practices from abroad and presents progressive ideas and practices to domestic EC teachers, which marks a turning point in the ideology of Chinese childhood education.

However, carrying out the reform ideas has been difficult for many Chinese EC teachers as the deep-rooted cultural and educational traditions in many aspects run counter to modern educational ideas and progressive ideology (Wang & Mao, 1996). The Chinese traditional values of respecting authorities, emphasising order and obeying rules are contrary to the goals of the reforms such as establishing an equally democratic child-teacher relationship. Over two thousand years, Confucianism played a dominant role in
shaping traditional Chinese culture and rigid social stratification of the clan system in feudal society (Wang & Mao, 1996), where teachers were accorded high prestige (Cleverley, 1991). Confucian culture has strongly influenced the relationship between teachers and children in the Chinese society (Llasera, 1987), which has laid great emphasis on adoring authority and respecting teachers (Hargreaves, 2000). Respecting teachers has been a moral heritage and consistent virtue of the Chinese nation. Under such circumstance, most Chinese teachers “deem it reasonable to put themselves above the children,” without being aware of their sense of authority (Wang & Mao, 1996, p. 148).

As Tobin et al. (1989, p. 122) noted, Chinese preschools are “the product of a fusion of political ideology and cultural tradition,” which value unity, order, collectivism and control (Cleverley, 1991; Stimpfl, Zheng, & Meredith, 1997; Tobin, et al., 1989; Wang & Mao, 1996). Daily activities within preschools are characterised by an emphasis on ‘peace’, ‘good order’ and ‘harmony’ with a purpose of shaping and fitting every individual into a harmonious society (Liu & Elicker, 2005; Llasera, 1987; Stimpfl, et al., 1997; Tobin, et al., 1989). In the Chinese educational tradition, organisation, administration and detailed lesson plans are viewed as good preparation for teaching and basis for good professional performance (OECD, 2011; Wang & Mao, 1996). The focus on planning lessons has a pedagogical root in following the former Soviet Union Model of curriculum, which came to China in 1950s and advised that teachers instruct children in purposeful and planned activities (Cleverley, 1991; Zhu & Wang, 2005). Influenced by this model, early childhood programs specified unified content and schedules, and required teachers to teach individual subjects (Zhu, 2002). As EC teachers’ training programs are traditional in nature and emphasise large group instructional skills (Wang, Elicker, et al., 2008), Chinese early childhood traditional teaching is mainly done by lecture and demonstration, consisting mostly of direct specification and instruction (Wang & Mao, 1996). Such cultural and educational traditions in the Chinese ECE system have gradually shaped many contemporary EC teachers’ educational beliefs and practices.

In addition to traditional practices, a lack of practical curriculum guidance has left many teachers not knowing how to implement the advanced ideas of progressive education
into their everyday practices (Zhu & Zhang, 2008). To solve these issues, the Ministry of Education (2001) issued the *Kindergarten Education Guidelines* to add curriculum standards and state specific requirements and content in five learning domains (society, health, language, science and art). This policy considers the gap between the incoming progressive ideas and realities by making more concessions for local traditions and offering compromise solutions for teachers (Tobin, et al., 2009; Zhu & Zhang, 2008). For example, the guidelines suggest that the curriculum could be divided into five learning domains, but teachers are encouraged to integrate the content. Notably, it mandates that EC teachers should respect individual differences in learning and development as a basic principle of their practices (Ministry of Education, 2001).

The process of ECE curriculum reforms in China is complex, contentious, collaborative, dialectic and ongoing (Tobin, et al., 2009). Through top-down administration and organisation, many stakeholders including ECE experts, teacher trainers and teachers have been involved and worked together to discuss, negotiate, debate, reassemble and develop new ECE curriculum and pedagogy (Tobin, et al., 2009). Diverse curriculum approaches such as Project Approach and Reggio Emilia are widely adopted and localised in kindergartens at different levels in provinces (Li & Li, 2003). In the late 1990s, the aggressive push toward progressive and child-centredness of Chinese ECE reforms has begun to be counterbalanced by an acknowledgement of Chinese traditional cultures and educational theories (Tobin, et al., 2009). Therefore, the current reforms tend to put more effort in connecting with Chinese philosophical and ideological values and pedagogical culture, which lead to a hybrid system of Chinese ECE combining Chinese traditional culture, communist culture and western culture (Tobin, et al., 2009; Zhu, 2002; Zhu & Zhang, 2008).

In general, the curriculum reforms in ECE are more like an idea revolution, through which ideas such as ‘respecting children’, ‘active learning’, ‘learn from play’, ‘play-based teaching and learning’, and ‘teaching for individual learning needs’ have been popularised in kindergartens (Liu & Feng, 2005; Zhu, 2008b; Zhu & Zhang, 2008). Chinese EC teachers are gradually accepting the value of the child as an individual and recognising individual needs and interests (Stimpfl, et al., 1997; Wang & Mao, 1996; Zhu, 2002). Teachers are putting more emphasis on respecting young children’s
individuality and shifting to focus on individual differences and individual learning and development (Hsueh, Tobin, & Karasawa, 2004), moving from viewing children as passive recipients of knowledge, teaching explicit communist ideology and ethos of collectivism (Tobin, et al., 2009; Zhu, 2008b; Zhu & Wang, 2005). However, the collective interest of the group is to remain a high priority in the new ideology of the Chinese ECE curriculum reforms (Wang & Mao, 1996; Zhu & Wang, 2005).

As the national level ECE curriculum reforms develop, a parallel process is under way at local governments to adapt educational reform ideas to their contexts (Tobin, et al., 2009). The central government also requires local governments to develop their own guidelines to fit preschools in their local areas. Shanghai issued its trial policy *Shanghai Early Childhood Education Curriculum Guidelines* in 2000, six months earlier than the release of the national version. Shanghai’s leading role in making the guidelines on the reform is due to many reasons. Shanghai traditionally has more resources and heavy investment in ECE, as well as well-developed educational research and curriculum development infrastructure (Tobin, et al., 2009; Zhu, 2002). Shanghai also develops a comprehensive reform of basic education that anticipated many key features of the national reform. In 2002, Shanghai released another version of its guidelines that combines its earlier version and the national guidelines.

The year of 2010 was a milestone for the Chinese ECE system because for the first time it has been placed on the agenda of national educational reform and development (Ministry of Education, 2010b), which puts previous ECE curriculum reforms into a systematic framework. The Chinese State Council issued its *Views on Developing Early Childhood Education* (Ministry of Education, 2010a), placing ECE in a more important place in national development to enhance its quality through a range of strategies, including the use of ICT to improve educational outcomes. EC teachers seem to be put at the heart of this reform as several specific policies were developed to enhance their professional qualification. For example, the policy *Enhance the Team-Building for Early Childhood Teachers Forces* (Ministry of Education, 2012b) was developed to equip ECE settings with more teachers and improve teachers’ qualifications through pre-service education and professional development programs. In-service EC teachers are required to spend at least 360 hours on professional development programs within
every five years period, which is financially supported by the local government and institutions. The *Early Childhood Teachers Professional Standards* (Ministry of Education, 2012c) specifies four underpinning principles of teachers’ professional development: putting educational moral and ethics first, adopting a child-oriented approach, focusing on qualifications and competencies, as well as lifelong learning. These new strategies may guide Chinese EC teachers’ to achieve the modern objectives for education and help them develop their profession to some extent. Notably, none of these documents have mentioned EC teachers’ ICT professional development. Due to the lack of explicit reference to the development of teachers’ ICT competencies in such new professional standards, the current Chinese ECE system may not guarantee that local educational authorities provide sufficient and equal opportunities for ICT professional development for all EC teachers.

The efforts in developing these policies show that the Chinese government is actively interested in making policies and regulations for the ECE system to meet the changing needs of society. Given the importance of ECE in national policies, the stakeholders in the Chinese ECE system may create changes or meet challenges in the future. Taking ICT for example, these policies can influence the introduction and use of ICT in preschools such as funding on ICT infrastructure, but changes can also create new challenges. For instance, EC teachers may be required to use ICT for integrating curriculum. Under such complex circumstances, this study focuses on the use of ICT at the preschool level and in particular locates the study in the context of fast development of advanced technologies and ECE reforms in Shanghai. Studying preschool teachers’ classroom practices can not only reflect those social and educational changes in classroom practices, but can also further help understand the implementation of these policies.

**ICT in Chinese Early Childhood Education**

China like many countries around the world facilitating educational modernisation through the use of ICT in education, aims to enhance children’s competitive knowledge and skills in this world for fear of falling behind. At the beginning of the 21st century, the government has consistently given priority to education, adapting to the international trend of educational reforms and the application of ICT in education (Xu
& Jiao, 2010; Zhang, Fang, & Mao, 2010). The State Council (2001) started implementing *Information Technology in Education Projects* for primary and high schools, aiming to support school teachers ICT professional development and students’ information literacy and technological skills. Moving to a new decade, the government issued the *Ten-Year Plan of Education Informatisation (2011-2020)* to harness the power of ICT for developing creative citizens for the future and increasing national competitiveness (Ministry of Education, 2012d). (The word ‘informatisation’ is usually translated for the term ‘Xin Xi Hua’ in China, and refers to using information strategically for the application of knowledge and innovative activities.) This plan stipulates developing ICT infrastructure for different kinds of educational institutions including ECE settings and suggests that all teachers should basically meet the standards of ICT capabilities by 2020. But school and vocational teachers’ development of ICT competences are emphasised as the focus of ICT training and professional development programs. However, this Ten-Year plan does not give details about the standards or specifics of teachers’ ICT competencies. According to *ICT Competency Standards for Primary and High School Teachers* (Ministry of Education, 2004), school teachers are required to effectively integrate ICT into their curriculum by 2020. This document states that teachers should be able to efficiently and effectively use ICT to support and manage teaching and learning activities, and communicate and collaborate with children and their families (Ministry of Education, 2004). But this policy does not specifically refer to early childhood teachers’ ICT competencies. It is worth noting that there is no specific national ICT policy for the ECE system and EC teachers’ ICT professional development is scarcely mentioned.

Nevertheless, there are some promising signs of an increasing acceptance of ICT in major cities like Beijing and Shanghai, which have started to pay attention to ICT incorporation into ECE (Guo et al., 2006). About a decade ago, the *Shanghai Early Childhood Education Curriculum Guidelines* (Shanghai Education Commission, 2002, p. 2) first mentioned that EC teachers should effectively integrate ICT into the curriculum and “young children should feel the impacts of scientific and technological achievements on life.” Four years later, the Shanghai Education Commission (2006a) explicitly stated that the availability and application of ICT should meet the needs of teaching and promote communication between preschools, parents and communities. It
also emphasises utilising ICT resources to establish information network service systems and improve ECE quality. This plan partially recognises ICT potential for teaching and enhancing relationships with stakeholders such as parents and teachers, but the value of ICT for early learning and development is not recognised.

With regard to the provision of ICT resources in ECE settings, the *Shanghai Early Childhood Education Equipment* mandates that each classroom should be equipped with a TV, a tape recorder, a video recorder, and an electronic player used with earphones (Shanghai Education Commission, 2006b). The multimedia classrooms in each ECE setting should have internet connections, computers, electronic projectors, and a stereo system for different activities. Further, it suggests the provision of computers, DVD players, internet connections, e-projectors, digital cameras, and observation and documentation devices in classrooms. This document refers little to technological toys for children’s play, but it clearly requires EC teachers to incorporate new technologies into literacy development. For this purpose, each classroom should be equipped with audio-visual reading materials and electronic literacy resources.

Two years later, the Shanghai Education Commission (2008) established the ECE Information Centre to enhance the use of ICT in ECE to facilitate informatisation and network construction of all ECE settings. In 2010, Shanghai made the *Three-Year Plan for Early Childhood Education* (2011-2013), placing the development of standards of ECE informatisation on the agenda (Shanghai Municipal Government, 2010). This plan aims to establish a curriculum database to improve the efficiency and effectiveness of early childhood care and education. While the plan requires EC teachers to use ICT to innovate curriculum content and pedagogy and support children’s learning and creativity, it does not refer to young children’s use of ICT.

In these years, ICT has been given significant attention from Shanghai educational policymakers. These efforts have set a leading model of introducing ICT into ECE for other areas across the nation. This shows that the efforts to incorporate ICT into ECE have been based on the assumption that teachers having ICT in the classroom then would adopt it and change their practices in particular ways. The assumption that ICT can improve education is prevalent and governments have invested in it for fear of being
left behind (Nordkvelle & Olson, 2005). However, anticipated changes in educational practices regarding the use of ICT have yet to be realised in China, with questions relating to Shanghai EC teachers’ ICT integration into their classrooms remaining unanswered. These unanswered questions have led to the development of research questions for this study.

**An Overview of the Theoretical Framework and Methodology of the Study**

The differences in social, cultural and historical tradition impact human perceptions and practices (Blanck, 1990; Rogoff, 2003), which make human activities such as classroom practices in each context unique. This view raises the importance of contextual resources for and in learning which provides an opportunity to consider the use of ICT in culturally different preschools. The understanding of teachers’ perceptions and pedagogical practices revealed in previous research cannot represent the realities of Chinese preschools because the realities at each time in each place are shaped by social, cultural and historical factors (Cohen, Manion, & Morrison, 2013). Drawn from my own understanding about the reality and sociocultural perspectives (outlined in the methodology chapter), the present study is located in the interpretive paradigm, which assumes that reality is socially constructed and rejects the idea of objective reality. The interpretive paradigm is characterised by a concern for individuals and aims to understand individuals’ perceptions of their realities and subjective world of human experiences (Cohen, et al., 2013).

Within the interpretive tradition, this study aims to generate a “thick description” (Geertz, 1973) of the participants’ and the researcher’s perspectives. Case study is chosen as the research method because it provides rich information and an in-depth description of the contexts and meaning for those involved (Merriam, 2009). Although an interpretive paradigm assumes that reality is socially constructed, this does not preclude the possibility that there can be systematic patterns and common attributes in the construction of meaning in social and cultural contexts. As a result, quantitative research should also be used to study social and human issues. The aim of generating quantitative data in the present study is to identify the salient themes, which are then enhanced by a description of the findings.
Significance of the Study

This study hopes to fill the gap identified in the literature by providing an international perspective on the use of ICT in ECE within different sociocultural backgrounds with a thorough in-depth description and analysis. As this study investigates preschool teachers’ perceptions and pedagogical practices regarding young children’s use of ICT in Shanghai preschools, the rich and holistic account of teachers’ views and pedagogical practices uncovered in the research can help achieve a better understanding of such aspects of teachers’ work and identify problems. Solving any problems effectively firstly requires a clear understanding of the problem. This study will provide an insight into the successful integration of ICT through identifying strengths and barriers in the current landscape and proposing possibilities for changes, which are critical steps in enhancing teaching and learning through the use of ICT. The results will be useful for stakeholders such as policymakers and educational leaders to examine their issues and inform policies. The results will also contribute to the development of more effective pedagogy that support early learning and development.

Early childhood education is the fundamental stage for education and future life. Hedegaard (1990) argued, the kindergarten determines the dominant activities for the following two aspects: “development of motives and development of skill and knowledge for relating theoretically and reflectively to the world” (p. 352). Thus, the use of ICT in the early years is of great importance in shaping young children’s skills, knowledge, experiences and future learning with ICT. In addition, the exploration for fully integrating the use of ICT for early learning and development in ECE have significant implications for implementing ICT strategies and building an Information Society of a particular nation. If young children can have positive experiences and attitudes towards ICT in ECE settings, these early experiences can possibly help them become independent and competent lifelong learners with and through ICT in future. In the long term, the efforts carry potentials for improving and promoting the development of the whole society.
Overview of the Thesis

The thesis contains eight chapters. The first chapter establishes the foundations upon which this study is grounded by outlining the overall context of the study and a theoretical and methodological framework to justify the research aim in exploring the phenomenon under study.

Chapter two provides a comprehensive review of literature relating to the use of ICT in ECE. In this chapter limitations of current theory and research are identified and have been used to guide the research questions and design.

Chapter three outlines the research design and provides a rationale for the chosen research paradigm and methodological approach. It presents methods of data collection and the approach to analysis used in this study. Methodological issues including ethical considerations, and validity and reliability in relation to the present study are addressed.

Chapter four provides the quantitative analysis and findings in relation to the availability of and access to ICT resources in 20 preschools. It describes the teachers’ backgrounds and presents these teachers’ overall perceptions and pedagogical practices regarding young children’s use of ICT in these preschools. Chapter five and chapter six comprise the qualitative aspects of this study through narratives and classroom observations of four case study teachers.

Chapter seven presents a synthesis of the findings. It identifies the main themes that have emerged through the research and discusses these in relation to the literature. It illuminates the sociocultural contexts where the use of ICT in the preschools took place and the influences these have on the teachers’ perceptions and their classroom practices.

Finally, in chapter eight the main conclusions of the study are drawn. The chapter reflects on implications for classroom practices regarding the ICT equipment, ICT professional development and ECE ICT policies. In addition, the research questions are returned to in summarising the findings of this study. The chapter concludes by suggesting possible areas for future research.
Chapter Two: Review of the Literature

“We live in times of unprecedented changes when the very nature of our work and leisure time has been transformed due to the presence of information and communication technologies” (Yelland, 2006, p. 13).

The contemporary world is marked by rapid technological advancement and proliferation of new technologies in many aspects of human activities (Law, et al., 2008). The profound changes arising from new technologies have influenced the youngest children in many societies because their play and learning are shaped by the existence of new technologies in their environment (Yelland, 2006; Zevenbergen & Logan, 2008). In order to live and succeed in the Information Age, today’s young children need to develop their experiences, knowledge, capabilities and skills of using ICT (Clements & Sarama, 2002; Parette, Quesenberry, & Blum, 2010; Yelland, 2007b) and become creative thinkers, effective communicators and capable workers through the use of ICT in the present and the future (DEEWR, 2009; Leung, 2010). In fact, there is a growing sense among policymakers, educators and parents that young children should be educated to develop abilities and skills to learn and work in the technology rich world (Jimoyiannis & Komis, 2007; Parette, et al., 2010; Plowman, McPake, & Stephen, 2012; Yelland et al., 2008).

In response to such changes, many studies have been conducted to examine the effects of young children’s use of new technologies and explore appropriate ways of teaching and learning through new technologies. The majority of influential studies since the 1980s have originated from the US (Yelland, 2001), while more have emerged from the UK in the last decade (e.g. Aubrey & Dahl, 2008; Plowman, 2006; Siraj-Blatchford & Whitebread, 2003). With the advent of new technologies in young children’s lives in non-western countries, some new research has emerged from different countries such as Jordan (Ihmeideh, 2009) and China (Guo, 2011), but the total number and scope of studies in non-western countries are still limited. In particular, few studies have addressed early childhood (EC) teachers’ classroom practices in relation to young children’s use of ICT in early childhood education (ECE) (Campbell & Scotellaro, 2009; Oldridge, 2010). However, EC teachers have a profound impact on young children’s experiences, knowledge, skills and understanding of ICT, as well as learning outcomes (Ihmeideh, 2009; Liang, 2006; Wang & Hoot, 2006). Thus it is important and timely to
study teachers at the ECE level to fully understand their influence upon young children’s use of ICT in the early years. Thorough examination of these teachers’ work may further help gain an insight into how the changes can be made from the viewpoint of teaching to maximise ICT potential for young children’s learning and development.

This literature review on national and international studies of new technologies in the early years sets the stage for a research study that forms the basis of this thesis and provides a framework to locate the current study inside the broad literature about the use of ICT in ECE. It mainly surveys three phases of literature to consider the use of ICT in childhood educational settings and homes. Firstly, in consideration of the sociocultural nature of the study, the review places young children and new technologies in a historical context by looking back to research studies in the last three decades and analysing effects and implications of these studies on young children’s use of ICT. Then it moves to investigate international trends of ICT in ECE policies and curriculum and locates this topic in the context of studies from China. Secondly, it turns to explore factors that influence ICT integration in classrooms. Built on this discussion, the review then examines EC teachers’ perspectives and practices in relation to the use of ICT in classrooms around the world. Thirdly, the review extends the discussion to theoretical perspectives on learning and teaching in order to broaden the base of this study to explore effective pedagogy that support young children’s use of ICT. Together these three sections map the field within which this research is investigating and point out the ‘space’ that will be filled in this study. This framework for studying the literature blends the historical, cultural and social nature of development and use of ICT in young children’s lives.

The following Figure 2.1 presents four core elements reviewed in the literature and their relationship as they come together in the teaching and learning nexus: ICT, young children and EC teachers, as well as home and communities. It presents overlapping and entwined nature of these elements in the use of ICT in ECE contexts: young children’s use of ICT for play and learning in ECE settings; EC teachers using ICT to learn and teach; teaching and learning mediated by ICT between teachers and young children; and ICT use in home/family settings. In order to understand the nature of teaching and learning mediated through the use of ICT in the early years, it is essential to examine a
broad context of children’s social and cultural lives in which their learning and development take place. Thus, in addition to studying ICT use in centres, young children’s home ICT use prior to coming to preschool, and while at preschool is also reviewed in this chapter.

Figure 2.1. ICT in early childhood education

New Technologies and Young Children

The Historical Debates on Young Children’s Use of New Technologies

Since new technologies, particularly computers and the internet are increasingly accessible to children, social expectations and promises, issues of concerns, fears and moral panics (Cohen, 1972) about the influence on the younger generations among parents, educators and researchers occurred (Wartella & Jennings, 2000). These adults are worried about threats or dangers that new technologies may have on children’s development. Vigorous arguments and discussion about the role of computer assisted learning and development of children started in the 1980s (Brady & Hill, 1984; Papert, 1980; Taylor, 1980) and criticisms about the use of new technologies in the early years can be traced to the 1990s and continued throughout the next two decades (e.g. Cordes & Miller, 2000; Elkind, 1998; Haugland & Wright, 1997; Healy, 1998; NAEYC, 1996; Plowman, McPake, & Stephen, 2010; Yelland, 2006). Such long-term debates have raised many concerns over ICT effects in early childhood contexts and led to huge
confusions and uncertain stances by teachers and parents (NAEYC & Fred Rogers Center, 2012). Many parents and teachers are sceptical and hold negative attitudes toward new technologies, especially computer-based activities (Maynard, 2010). For example, a 18-month empirical study surveyed parents from 346 families in central Scotland and conducted case studies with 24 families, revealing that parents were not sure how to respond to contradictory accounts reported in the media about the effects of ICT on young children (Plowman, et al., 2010).

The rigorous debates have centred on impacts of new technologies on young children and resulted, broadly, in two schools of opinion. One group of scholars (Cordes & Miller, 2000; Elkind, 1998; Healy, 1998; House, 2012; Straker et al., 2006) underscored the bad influence and referred to possible threats to young children’s learning and development and strongly argued against young children’s use of ICT, in particular computers and the internet. Their objections to the use of new technologies by young children revolved around the main issues of: abstract or inappropriate learning content, risks to children’s health, hazards to children’ mental development, reduced social interaction and replacing traditional learning activities. For example, the Alliance for Childhood (2000) cautioned that computers in childhood posed health hazards and potentially serious problems and impaired intellectual growth to a majority of children, except children with disabilities. Notably, it seems that they saw the evidence of ICT benefits only for children with disabilities. Therefore, this group strongly called for a moratorium on further introduction of computers in early childhood and elementary education (Cordes & Miller, 2004). Due to good media coverage of the critics’ opinions against the use of ICT in the early years, many people are led to believe in harmful effects or became anxious about the way in which children are influenced by technologies (Plowman, et al., 2010; Yelland, 2005). But these claims and warnings about potential ICT harm are more rhetoric than solid evidence in that the association of using ICT and harmful effects are not based on rigorous research (Brady & Hill, 1984; Learning and Teaching Scotland, 2003; Plowman, et al., 2010; Yelland, 2005). Byron (2008, p. 1), in her introduction to a report about risks children face from the internet and video games, pointed out a “fiercely polarised debate in which panic and fear often drown out evidence.” Opposing arguments were often supported by misleading views
and anecdotal stories of wary parents (Yelland, 2005) who tended to be more aware of risks and dangers of ICT use than the potential benefits (Plowman, et al., 2010).

The critics placed greater emphasis on the importance of active, physical play, outdoor learning environment and hands-on experiences for young children. Morgan and Siraj-Blatchford (2010, p. 5) noted that the natural learning environment were used as “compensation for ‘toxic’ influence[s]” on early childhood that include ICT. In this sense, the critics had narrowly viewed new technologies as only desktop computers and ignored many ICT using situations because a wide range of new technologies embedded in a range of everyday objects can be used in children’s outdoor play environment (Plowman & Stephen, 2003a). For example, broad ICT resources such as electronic music players and mobile phones are common in everyday life and laptops can be used wirelessly outdoors and video cameras are commonly used in nature environments (Siraj-Blatchford & Siraj-Blatchford, 2006).

Notably, one of the strongest claims made by the critics was that children from birth to concrete operational stage (Piaget, 1955), which begins around age seven and continues until approximately age eleven, should not be introduced to computers because they are not able to cope with abstract symbols and cognitive processing required when using computers. Put in another way, they believed that young children were too young to comprehend or operate computers. For instance, House (2012) recently claimed that young children should avoid being exposed to sensory impressions as far as possible which are machine-originated, and abstract and complex for their levels of understanding in that such impressions on the senses will generate addiction and non-comprehension. Such objections to young children’s use of computers heavily draw on Piaget’s theory that children’s development experienced a series of four universal stages and learning occurred according to children’s age and the level of their maturation (Piaget, 1955). However, the completeness of Piagetian-based theory of cognitive development was questioned partly because it fails to take account of the complexity and diversity of development for individual children, and in different areas of development and underestimated children’s capabilities (Dockett, 1995) (further discussion can be found in the section of ‘Cognitive-developmental theory’).
Piaget’s developmental views on a child’s thinking and behaviour at different stages, maturation and increasing abilities to learn and understand the world have strongly shaped critics’ opinions on the role of computers in early childhood contexts (Harasim, 2012; Oldridge, 2010; Shade & Watson, 1990). Scholars (e.g. Elkind, 2007; Healy, 1998) strongly argued the brain undergoes a certain ‘critical period’ in childhood, in which using technology to assist the process is not appropriate or necessary because young children’s brains have different developmental tasks to accomplish such as acquiring sensory experiences and psychological development through spontaneous play with concrete learning materials. These views have shaped many EC teachers’ attitudes towards the use of ICT in the early years. For instance, a study on American and Japanese early childhood teachers identified that they had worries and hesitance to encourage children to use computers (Joshi et al., 2010). Many of these teachers believed that the use of computers conflicted with principles of children’s development. In this regard, the theoretical base for objections drawn on a rigid, stereotypic view of Piaget’s theory is not unproblematic as considerable research since Piaget’s original work has demonstrated rich evidence that preoperational children at age 3-5 are able to actively use computers such as operating a mouse or computer function keys, insert and remove disks and work collaboratively in small groups (McPake, et al., 2005; O’Hara, 2011; Plowman, et al., 2010; Shade & Watson, 1990; Zevenbergen & Logan, 2008). These important findings show that young children advance their understanding and construct knowledge in a creative process in which they actively participate in the practices of their communities (Rogoff et al., 1993).

Furthermore, the opponents seem to hold a radical technological determinism view as they were concerned about technologisation of childhood and saw technologies as responsible for making childhood ‘toxic’ (Morgan & Siraj-Blatchford, 2010) or in danger. Such fears and negative views related to young children’s access or exposure to ICT reflect their image of children as lacking in agency. This is at odds with contemporary image of children as active and competent learner (Aubrey & Dahl, 2008; Plowman, et al., 2010). From a sociocultural perspective, children from the earliest age are active participants in the socialising process of development (Rogoff, 2003) and they are “active in the construction and determination of their own lives, the lives of those around them and of the societies in which they live” (Prout & James, 1990; cited
in Thomas, 2009, p. 39). Regarding the use of ICT, studies showed that very young children at age 3-4 used software with comfort and confidence (Clements & Sarama, 2003) and they were active rather than passive users of technology (Plowman, et al., 2010). Thus, the opposing view that children can only use computers or other ICTs when they reach the age 7 is now soundly challenged.

Negative opinions and claims against young children’s use of ICT have raised many responses and disagreements however, and led to more empirical research in this field (Clements & Sarama, 2003; Haugland & Wright, 1997; Morgan & Siraj-Blatchford, 2010; Siraj-Blatchford & Whitebread, 2003; Yelland, 2006). Consequently, ECE organisations and scholars have demonstrated rich and valid research in evidence of ICT potential in the areas of language and communication, creativity, mathematical thinking and problem-solving, cooperation and literacy to refute the oppositions’ criticisms (Aubrey & Dahl, 2008; NAEYC, 1996; NAEYC & Fred Rogers Center, 2012; Plowman, 2006). Clements and Sarama (2003) thoroughly reviewed research publications on young children and technology and strongly pointed out opposing opinions ignored or misinterpreted most of the current research findings. In their review, they showed that young children’s use of technologies contributes to their cognitive, social and emotional development. Taking the benefit of using ICT in developing literacy for example, Robinson (2003) and others (Moody, Justice, & Cabell, 2010) identified computerised literacy materials or electronic interactive storybooks could play a scaffolding role in helping young children acquire interactive literacy experience as multimedia features could provide personalised stories, animated graphics and built-in feedback in comparison to traditional storybooks. Moody et al., (2010) further found that electronic storybooks afforded benefits to children’s engagement and communication initiation and adult-led reading with electronic storybooks had a higher level of persistence and participation in reading tasks than child led e-storybooks reading activities.

Consequently, Clements and Sarama (2002), along with others (Cook, 2003; Siraj-Blatchford & Whitebread, 2003) called for attention to move beyond asking simple questions of whether the use of technology is appropriate and urged understanding on how these new technologies can enhance early learning. An important reason for moving forward is that new technologies increasingly become a part of children’s life
contexts. Neither it is sensible to pretend ICT has no influence on children, nor is realistic to separate young children from ICT. Young children live in the same material world as adults so that they can hear and see the use of ICT and they even bring their ICT experiences in their play and learning in different contexts (Morgan & Siraj-Blatchford, 2010; Zevenbergen & Logan, 2008). Morgan and Siraj-Blatchford (2010) argued that educators do not have a choice in deciding whether ICT should be included or excluded in the early years, but they can decide whether to provide appropriate ICT resources, and when and how to use ICT to realise ICT potential for young children (Yelland, Grieshaber, & Stokes, 2000). Byron (2010) in her report on the progress made on children’s digital safety, strongly suggested that educators adopt positive attitudes towards children’s use of technologies.

In educating children and young people we should empower them to learn how to use digital technology responsibly, not simply block what they can access. We must give them the information and skills they need to be digitally literate and savvy users. This enables them to take advantage of the opportunities that new technologies can offer, as well as being able to deal with any risks that arise (p. 1).

It seems there is strong support in the literature that an effective strategy to support children’s learning is to accept the challenges that arise from ICT and make the most of the best opportunities that it offers. For this purpose, the role of teachers, especially their guidance and interactions in young children’s ICT activities is increasingly regarded as a key to meaningfully integrate ICT into ECE classrooms (Barbut et al., 2003; Gialamas & Nikolopoulou, 2010; Loveless, 2011; O'Rourke & Harrison, 2004). An example of this is the joint position statement on the use of technology and interactive media for children from birth through age 8 (NAEYC & Fred Rogers Center, 2012) which underscored that new technologies could be harnessed for learning with guidance and responsive interactions rather than being taken away from young children’s lives.

**International Trends of ECE ICT Policies and Curriculum**

The wide range of ICT resources available in living environments has led to many changes in ECE contexts in many countries and areas. ICT has infiltrated into some western early childhood classrooms (Campbell & Jobling, 2008; Keengwe & Onchwari, 2009; Yelland, et al., 2008; Zevenbergen & Logan, 2008) and some early childhood programs use a variety of ICT resources to enhance and document early learning
(Edwards, 2005; Hayes & Whitebread, 2006; Wang, Jaruszewicz, et al., 2008). In line with these changes, ECE policies and curriculum have begun to emphasise the importance of integrating ICT into early childhood practices and provide guidelines for the use of ICT in ECE settings. Globally, western countries like the UK, Scotland and New Zealand have a leading role in recognition of the importance and value of ICT in ECE and assigned an extraordinary status to the role of ICT in formal and specific ECE ICT frameworks (Dong, 2010; Leung, 2010; Oldridge, 2010).

Notably, introducing ICT into ECE environments and integrating it into early learning have been placed high on the agenda of a political commitment in Scotland. As early as 1999, the *Curriculum Framework for Children 3 to 5* (Scottish Consultative Council on the Curriculum, 1999) began to value the role of technologies in young children’s growth and the importance of young children’s understanding and capabilities of using them. This framework clearly indicates that technologies are important in children’s everyday lives and children should become aware of the everyday uses of technology and acquire an understanding and ability to use it appropriately. This goal is supported by expectations for developing young children’s knowledge and understanding of the world, but despite this, the curriculum does not provide a detailed reference to ICT and pedagogical suggestions for EC teachers to integrate ICT into the curriculum.

Following this policy, a more specific ICT framework *Early learning, Forward thinking: the Policy Framework for ICT in Early Years* (Learning and Teaching Scotland, 2003) was developed to reflect on the relevance of ICT in ECE contexts and promote incorporating ICT into practices. Within this policy young children’s rights to gain equal access to a range of ICT resources in educational settings are stressed to ensure all children could learn with and through ICT to enhance early learning and extend development. A significant feature of the framework is its recognition of the use of ICT within the pedagogical context of enhancing early learning in childhood educational settings. It not only firmly acknowledges ICT potential for young children, but also provides detailed principles and advices for ECE practitioners to deal with issues raised by the use of ICT in classrooms, such as when and which ICT can be used effectively and appropriately. The emphasis on the role of adults, particularly their pedagogy
concerning the use of ICT, reflects that an aspiration of introducing young children to new technologies in the early years largely relies on teachers’ teaching strategies.

In the UK, a review on the use of ICT in the early years (Aubrey & Dahl, 2008) identifies that ICT can contribute towards three main areas of learning and development: developing dispositions to learning, extending knowledge and understanding of the world, and acquiring operational skills. With such clear awareness of the value of ICT for young children, the UK ECE policies encourage young children to use ICT for learning and development. As the standards for learning, development and care for children from birth to five, the UK Statutory Framework for the Early Years Foundation Stage explicitly stipulates that young children should be able to recognise a range of technologies in their everyday lives and “select and use technology for particular purposes” (Department for Education, 2012, p. 10). This framework highlights young children’s agency in choosing and using ICT resources, as well as their hands-on experiences with ICT for a range of learning purposes, such as sharing thoughts, ideas and feelings through a variety of activities in design and technology.

Another excellent example of showing the impetus of incorporating ICT into early learning is the New Zealand ECE ICT framework Foundations for Discovery (Ministry of Education, 2005). In developing this framework, a review was conducted to examine the role and potential of ICT in ECE. In this review, Bolstad (2004) gave a broader definition of ICT than the traditional focus on computers and provided international evidence of ICT in ECE. She clearly explained at least three reasons why ICT is important in ECE:

First, ICT already has an effect on the people and environments that surround young children’s learning. Second, these technologies offer new opportunities to strengthen many aspects of early childhood education practice. Third, there is support and interest across the whole education sector for the development and integration of ICT into education policy, curriculum, and practice (p. vii).

Such justification for including ICT into ECE classrooms shows that the author considers a wide range of social and cultural contexts and circumstances where young children live and learn. More significantly, the review appears with an aim of legitimating a systematic introduction of ICT in childhood educational settings (Gibbons, 2006) because it emphasises that all young children should benefit from it.
Subsequently, the framework *Foundations for Discovery* (Ministry of Education, 2005) was issued to provide guidance to inform ICT integration, ICT investment and effective professional development in ECE settings. This framework focuses on five key areas to enhance the use of ICT in ECE settings: teachers’ collaboration with families, teachers’ professional learning, ongoing research to inform practices, appropriate ICT resources and curriculum materials, and provision of infrastructure and innovative systems.

A distinctive feature of the framework is its sociocultural approach to drive the use of ICT and address issues related to the use of ICT in ECE contexts. It encompasses wider life contexts of ECE practices and learning experiences that include “all the people within ECE services”: children, educators, administrators, families and communities and government (Ministry of Education, 2005, p. 10). It reveals the importance of roles that the government and administrators play in providing an informed basis for educators to make their decisions on the use of ICT and investment on ICT infrastructure. More significantly, professional support for EC teachers’ integrating ICT has been given great attention as it clearly stresses providing opportunities to develop this group of teachers’ ICT competences, professional learning and capabilities. Since researchers (Chen & Chang, 2006; Guo, et al., 2006; Plowman & Stephen, 2006b) found that the access to ICT professional development and training were limited or even excluded for many EC teachers, it is a promising sign to see that EC teachers’ ICT professional development are included in this national policy. Moreover, the financial support and programs for EC teachers’ professional development in New Zealand have been gradually carried out in their practices (Dong, 2010; Oldridge, 2010).

It can be seen that the interest of integrating ICT into ECE policies comes at a time when the role of ICT in the early years has been increasingly recognised and valued. This interest mainly indicates two expectations of educators and policymakers: (1) preparing young children with knowledge and skills for the technological world and (2) harnessing the potential of ICT to support learning and teaching practices. The purpose of preparing young children for the future are shaped by the stakeholders’ perceptions that ICT is important for young children’s lives, which are actually linked to socioeconomic and political discourses of a particular nation (Stevenson, 2008).
For instance, in the beginning of the new millennium, Taylor (cited in Blagojevic, 2003, p. 28) argued that “without opportunities to learn to use technology and develop computer literacy skills, children and families will have a hard time succeeding in society when more than 60 percent of new jobs require these technology skills.” This view is based on assumptions that mastering ICT skills and understanding the knowledge created by ICT are the key for making sure the success of learning and future employment. Nevertheless, the vocational driving force for including ICT in ECE has received criticisms because it makes technologies appear as being “at the heart of the new world of education” (Elkind, 2007, p. 199) or an essential learning area (Gibbons, 2006). The solely preparation for employment and the future also does not reflect the process of children’s changes as they grow and learn because it ignores the present of children’s everyday life.

The impetus of innovating classroom practices through integrating ICT has significantly been given priority while incorporating ICT into ECE curriculum. For example, the Australian Early Years Learning Framework explicitly requires EC teachers to “introduce appropriate tools, technologies and media… to enhance children’s learning” and give young children access to technologies for support of pedagogical goals to investigate ideas, solve problems, and represent their thinking (DEEWR, 2009, p. 37). The pedagogical purpose of implementing ICT based practice sheds light on the potential of ICT that transforms educational practices and facilitates young children’s full development. In fact, meaningful ICT integration into early learning environments is increasingly emphasised to encourage engagement, active learning, creativity and social interaction and cultivate a healthy, confident and capable child (Parette, et al., 2013; Plowman & Stephen, 2003a; Wang, Jaruszewicz, et al., 2008). The New Zealand ICT Framework (Ministry of Education, 2005) depicts a vision for the use of ICT in ECE, which focuses on the development of children’s competencies and confidence in learning and communication, well-being, and a sense of belonging, as well as contributing to society.

The thoughtful and meaningful use of ICT in early childhood education services can support children “to grow up as competent and confident learners and communicators, healthy in mind, body and spirit, secure in their sense of belonging and in the knowledge that they make a value contribution to society” (p. 8).
It is important to note though that the development of ECE ICT frameworks is only taking place in a few areas across the world. Lack of explicit statements on the role of ICT, young children’s appropriate use of ICT and a wide range of pedagogical strategies were identified in some European countries (Turja, Endepohls-Ulpe, & Chatoney, 2009). Based on analysis of ECE curriculum of six European countries, these authors found technology education was presented generally or implicitly in various curriculum areas and that the existing curricula did not offer much support for teachers to understand the nature, aims and pedagogy of teaching the use of ICT in ECE.

In the Chinese context, influentially dominant ECE policies at both national and local levels have not indicated the importance of ICT for young children’s learning and development. The national Kindergarten Education Guidelines does not mention ICT in the early years except for a short statement that “young children should feel the impacts of scientific and technological achievement on daily life” as an early learning goal of science (Ministry of Education, 2001, Science, para 2). The first national Guidelines for Learning and Development of Children Aged 3-6 (Ministry of Education, 2012a) stipulates that children aged 4-5 should develop a preliminary understanding about the relationship between technological products and their own lives and understand that technologies have both benefits and negative effects. For this purpose, it suggests that teachers should lead young children to understand the relationship between technological products and people’s lives, and discuss the pros and cons of technologies. It is interesting to note that the learning goals of technologies are only explicit for children aged 4-5, excluding young children in other age ranges. The goals also seem to separate young children from the use of technologies because they are only required to discuss technologies with their teachers, rather than to explore them through active use. At the local level, the Shanghai curriculum guidelines (Shanghai Education Commission, 2002) states that EC teachers should use ICT to improve curriculum management and assessment, without referring to young children’s ICT access. In addition, the learning goals of young children’s use of ICT have been simply defined as learning about relationships between technologies and young children.

These important ECE policies generally show little attention to young children’s exploration and hands-on use of technologies, which reflects a very low priority of ICT
in the Chinese ECE policies and curriculum. This lack of concern about the value of ICT for young children does not encourage Chinese EC teachers to provide opportunities for young children to freely explore ICT with the implication that ECE systems are less likely to support teachers to develop relevant pedagogy that can facilitate young children learning through the use of ICT. Compared with those western ICT policies discussed earlier that show a growing aspiration of promoting the use of ICT in ECE, Chinese policymakers seem to downplay or not to recognise the importance in harnessing ICT potential. It is thus a significant gap in the current Chinese policies and curriculum to encompass ICT into young children’s lives in the context of ECE settings.

**Young Children’s ICT Home Use**

In the context of ever-increasing access to ICT in living environments, many children have acquired ICT experiences before they enter childhood education settings (McPake, et al., 2005; O’Hara, 2011; Plowman, et al., 2010; Stevenson, 2008; Zevenbergen & Logan, 2008). Research and scholarship into the young children’s home use of ICT can be clustered into three main areas: young children’s ICT competencies, potential digital divide and pedagogical implications. In terms of young children’s ICT competencies, studies in the UK (McPake, et al., 2005; O’Hara, 2011; Plowman, et al., 2010; Plowman et al., 2011) and Australia (Zevenbergen & Logan, 2008) have consistently found that young children from 3 to 5 were able to use ICT with relevant knowledge and ICT skills drawn from parental perspectives of what they could do.

McPake, et al. (2005) identified that young children developed three types of ICT competences: technical, cultural and learning. They surveyed 204 parents whose children aged 3-5 attended eight preschools and conducted case studies with 16 families, as well as interviewed eight teachers from preschools and schools in central Scotland. Through the questionnaire, interviews, parents’ diaries and photographs of children’s ICT activities, they found that the children were developing technical and operational abilities such as switching items on and off, and conducting necessary operations for their desired activities (e.g. opening games stored on computer and playing). They understood roles of ICT in society and used it for a range of purposes like entertainment and communication, which were referred to as cultural competences. For the purpose of
learning, young children could use ICT to support their early literacy and numeracy, musical and communication skills at home. These results have provided detailed knowledge of young children’s ICT activities and their capabilities of using ICT for a range of social and cultural purposes. This knowledge can be very useful for policymakers and EC teachers as they can reflect on the impact which home ICT experience may have on children’s learning and on the potential to build on existing competencies in different educational contexts. The result of young children’s ICT competencies in particular technical capabilities are supported by another small-scale study through surveying and interviewing 20 parents in England, showing that the children aged 4-5 were in acquisition of basic operating skills using a variety of common ICT resources at home and developing technological literacy and fine motor control necessary to perform simple functions with ICT (O'Hara, 2011). More recent reports (e.g. Holloway, Green, & Livingstone, 2013; Ofcom, 2012) revealed that young children constitute a large user group for mobile technologies. There is an emerging trend for very young children to use internet connected devices and apps, especially touchscreen computer tablets and smartphones. For example, a third of young children aged 3-4 in the UK go online “using a desktop PC, laptop or netbook and 6% of them going online via a tablet computer and 3% via a mobile phone (Ofcom, 2012, p. 5).

Similarly, Zevenbergen and Logan (2008) conducted a survey in which parents reported children aged 4-5 used computers at home in a large regional community of Australia. Approximately 25% of families (150) from 45 centres in the region responded to the questionnaire. Their study revealed that the children had considerable access to computers and they were skilled in many facets of computer use. The authors noted that differences in computer use in genders were emerging at a very early age. Boys were more frequent users of the computers for different activities and more likely to play educational or recreational games, use the internet and play with computers than girls. Notably, due to a relatively low response rate, the result of gender differences in access to computers and how computers were being used may not represent the general population.

Together the findings generated from these three studies in the UK and Australia (McPake, et al., 2005; O'Hara, 2011; Zevenbergen & Logan, 2008) provide knowledge
of what children aged 3-5 can do with ICT in the home environment. The findings demonstrate clear evidence of young children’s agency, potential and capabilities in acquiring knowledge, experiences, abilities and skills with materials (ICT) in their surrounding world. This knowledge can help EC teachers build up their understanding about children’s developing experiences, which they may take into account in their work with young children. Nevertheless, the data collected through the methods of interviews and surveys have centred on parents’ perspectives on young children’s interaction with ICT by examining their attitudes and past experiences from parents’ behavioural observation in daily lives, rather than based on researchers’ professional and direct observation. Therefore, the results might be parents’ perceptions of children’s ICT competences and may not fully reflect the children’s ICT activities. Plowman et al. (2010) pointed out that the data that emerged from these studies did not provide enough evidence to establish whether there was variance between the parents’ espoused views and children’s day-to-day practices. In addition, the surveys may be skewed to those responding families who have or have rich ICT resources at home (O’Hara, 2011; Zevenbergen & Logan, 2008) as families which had no or little ICT access might not answer the questionnaire. Thus, there is a shortage of rich and varied data in finding out young children’s ICT competencies, suggesting the method of observation on young children’s use of ICT would provide a rich and powerful addition to data sources when approaching this phenomenon.

The use of ICT in children’s home environment has raised concerns about a potential digital divide and equity among young children from different family backgrounds because the differences in availability of and access to ICT in children’s homes do exist across families and contexts (Aubrey & Dahl, 2008; Education Department Centre and SRI International, 2012). In the project Young Children’s Access to Computers in the Home and at School in 1999 and 2000, 20,000 parents and more than 8,000 kindergarten teachers and first-grade teachers participated across the US (Rathbun, West, & Hausken, 2003). It was noted that computers and computer skills become more prevalent and necessary but that there continued to be a ‘digital divide’ between those with computer access and skills and those without. Already gaps existed across racial/ethnic groups and family income levels with respect to hardware ownership and internet access (Aubrey & Dahl, 2008; Education Department Centre and SRI
International, 2012; Newburger, 2001; Rathbun, et al., 2003). However, a recent study of 14 families of children aged 2-8 in the US showed that, although the digital divide persists, low-income families were increasingly using new forms of technology, in addition to TV, for entertainment, communication and information-seeking. In particular, young children in these families often used websites, iPhones and iPads on their own (Education Department Centre and SRI International, 2012). This study provides some indication of family patterns of media and technology use at home, which can be a great help in informing design and development of appropriate ICT resources that support learning at home.

In contrast to the findings related to the existence of a ‘digital divide’, some authors expressed different views on this issue and rejected the claim of its existence among children. Drawn upon interviews and survey with school children in the UK, Stevenson (2008) concluded that it was not worthy of using the ‘digital divide’ to describe the differences in children’s home ICT experiences in the UK. She noted that some individuals with access to ICT did not always use it because they felt ‘no need’ to use it. Thus, they might have sporadic use or general non-use. In fact, issues that surrounded the digital divide and digital inequality are not simply or purely resulting from socioeconomic and technological barriers to use as there is a fundamental link between children’s interest and their ICT competencies, regardless of access (Stevenson, 2008). In her research, Stevenson found that individuals with access to ICT did not always perceive it as relevant to them and at times did not feel that they required it in their everyday life. Furthermore, other scholars (McPake, et al., 2005; Plowman, et al., 2011) noted that young children’s ICT competencies are influenced by many factors such as availability and access to equipment, support for learning to use it, and particular interest and aptitude of older family members. McPake et al. (2005) did not find evidence of the impact of socioeconomic disadvantage on developing the children’s ICT competences, due to children’s complex family contexts. They found that, although family income was likely to affect the amount and quality of equipment families own, children growing up in low income families who were interested in ICT might be exposed to a wider range of activities and experiences involving ICT than children from more affluent families whose parents restricted or prohibited access or had less time or interest in involving young children in ICT-based activities.
Their study (McPake, et al., 2005) in central Scotland revealed that the preschool and primary teachers were not well informed about children’s ICT activities at home. Due to limited knowledge of children’s home experiences of ICT, the teachers were not able to comprehend the extent to which young children could use with ICT and had rarely considered potential learning opportunities for children using ICT (McPake, et al., 2005). Thus, McPake et al. (2005) concluded that children from low socioeconomic families were not likely to be disadvantaged in preschool and primary school as the teachers tended to teach all students at the same level without being aware of their home ICT experiences.

Nevertheless, the conclusion made about the ‘digital divide’ does not mean that young children’s ICT home experiences or differences between children’s ICT competencies before starting of formal schooling are not important. Quite on the contrary, these results have provided significant implications for the development of ICT policies and practices in the early years as broad sociocultural experiences do play an important role in shaping what is happening in childhood classrooms (Tobin, et al., 2009). From a sociocultural perspective, learning is a social process and bound within larger social, political and historical contexts (Cole & Engeström, 1993; González, Moll, & Amanti, 2005; Rogoff & Wertsch, 1984). Children bring their everyday practices, activities and languages, knowledge and lived experiences into educational contexts. Children’s repositories of knowledge and life experiences acquired in different cultural settings such as home and communities mediate their construction of new knowledge (González, et al., 2005). According to a funds of knowledge approach, finding out children’s competencies and knowledge in households can open up many possibilities for pedagogical actions and facilitate teachers to harness the knowledge, resources and strengths that their families already possess (González, et al., 2005).

Thus, if teachers can take children’s existing ICT experiences into greater account and make connections between their new learning and existing ICT experiences, teachers may be able to facilitate children to learn in a more effective way. Stevenson (2008) strongly argued to extend the type of ICT activities children have already acquired or engaged in, rather than trying to teach them what they have already learnt or should learn. However, the reality of many current teachers’ knowledge and pedagogy related
to children’s ICT use is far from ideal practice. Stevenson (2008) identified that learning with ICT for some children was hands-off experiences in their classrooms, which contradicted their usage at home. It is important to note however that Stevenson’s study was conducted with school-age children and may not be applicable to preschool children, which suggests further research on young children’s activities with ICT in ECE is needed.

**Early Childhood Teachers and ICT**

In this section, the literature regarding factors that influence integration of ICT into the classrooms is firstly explored. Following this, research about preschool teachers’ perceptions of the use of ICT and their pedagogical practices regarding ICT use are presented and analysed. Finally, literature regarding Chinese teachers and the use of ICT are reviewed and the recent research into EC teachers and ICT use is summarised.

**Factors that Influence Teachers’ Integration of ICT into Classrooms**

Although integrating ICT into the classroom is of increasing interest to policymakers, educators and teachers (Keengwe & Onchwari, 2009), effective integration of ICT into classroom practice has not been widely found in many countries and areas (e.g. Brown & Stratford, 2007; Leung, 2012; O'Neil & Perez, 2007; Wood et al., 2008). The literature indicates that factors that influence integrating ICT into classrooms can be manifold and complex, but a body of research has shown that the key to the effective use of ICT in education relies very heavily on how successfully teachers integrate it into teaching and learning (Bingigmlas, 2009; Geisert & Futrell, 2000; Law, et al., 2008; Means, 1994; Nikolopou & Gialamas, 2009; Robertson, Webb, & Fluck, 2007). Indeed, the central role of teachers in the use of ICT has been consistently reported, suggesting that a fundamental reason why ICT is usually underused and poorly integrated into classrooms is related to teachers’ intentions and capabilities of integrating it rather than other factors such as funding for ICT equipment (Chen & Chang, 2006; Cox, Preston, & Cox, 1999; Nikolopou & Gialamas, 2009; Ntuli & Kyei-Blankson, 2010; Sugar, Frank, & Fine, 2004). These researchers generally agree that dealing effectively with the implementation of teaching and learning with ICT relates not only to knowledge, skills and pedagogy, but also to individuals’ psychological factors such as their perceptions of ICT use.
Furthermore, Wang et al., (2008) found that the psychological context of teaching, particularly teachers’ perceptions, were crucial to understanding their everyday work with ICT. Teachers’ perceptions about the use of ICT can strongly impact on their ICT classroom practices (Austin et al., 2010; Sugar, et al., 2004) and affect the full integration of ICT into teaching (Ntuli & Kyei-Blankson, 2010; Wood, et al., 2008). If teachers perceive that ICT is useful then they are likely to adopt it (Austin, et al., 2010; Cox, et al., 1999; Drenoyianni, 1998; Oldridge, 2008). Unless teachers perceive ICT as valuable, they will be unwilling or unable to use them meaningfully (Nikolopou & Gialamas, 2009). This is consistent with the statement that the value that ICT can make to education is dependent upon teachers’ perceptions of how ICT can support their teaching and children’s learning (Oldridge, 2008, 2010). Banas (2010) argued having “a clear picture” (p. 126) of teachers’ perceptions of technology would help teachers use technology to promote their student’s learning. Thus, teachers’ perceptions should be considered paramount to the successful use of ICT in the classroom.

It appears that most research into ICT integration has been focused on western teachers and school-based settings, with much less research at the preschool level (Campbell & Scotellaro, 2009). Although studies of schools provide a useful starting point, school-based and western findings about the use of ICT in classrooms may not be readily applicable to culturally different ECE contexts because teaching philosophies, objectives, classroom realities, pedagogies, professional development and classroom environments in ECE contexts are usually quite different from schools. EC teachers are influenced by national policies, curriculum and assessment procedures, resource provision, professional development and their own philosophy of learning and teaching (Barbut, et al., 2003; Cook, 2003; Gibbons, 2006; Higgins & Moseley, 2001; Jimoyiannis & Komis, 2007; Oldridge, 2008; Sugar, et al., 2004). In addition, some large-scale national surveys on EC teachers indicate that few EC teachers have been involved in ICT professional development or training programs that are available to school teachers (Bolstad, 2004; Plowman & Stephen, 2005). The limited opportunities for ICT professional development probably affect this group of teachers’ perspectives on, and practices with, ICT use (Welsh, 2009). Thus, EC teachers may have their own sets of rationales, principles, ideas and justifications for the way they perceive the use of ICT in their classrooms (Drenoyianni, 1998). While the growing body of research has
evidenced the benefits of ICT, the use of ICT by early childhood teachers is an under-researched field (Ihmeideh, 2009; Nikolopou & Gialamas, 2009; O'Rourke & Harrison, 2004; Oldridge, 2010), and a gap exists in the literature relating to EC teachers’ perceptions and pedagogical practices. Therefore this study focuses on preschool teachers, addressing the research gap in the use of ICT in ECE contexts.

**Early Childhood Teachers’ Perceptions of the Use of ICT**

Research into EC teachers’ (including pre-service teachers) perceptions surrounding the use of ICT has vividly described barriers and potential issues in integrating ICT into ECE classrooms. This group of teachers mainly had strong concerns about ICT harm for children’s health (Angeli, 2004; Joshi, et al., 2010; Mantei & Kervin, 2007; Marsh, 2005); fears about children’s social isolation (Morrow & Mackey, 2008; Oldridge, 2010); scepticism of ICT benefits and suitability of ICT (Hall & Higgins, 2002; Joshi, et al., 2010) and little pedagogical understanding of ICT value (Mantei & Kervin, 2007; Morrow & Mackey, 2008; Oldridge, 2010). Together these findings support a view that EC teachers seem to be certainly more aware of the arguments of the harmful effects of ICT than its potential for young children.

Using a questionnaire to survey pre-service teachers, Angeli (2004) found that more than a half of the student teachers in Cyprus were sceptical about the value of ICT in ECE and reluctant to teach with ICT. They expressed their general fears of challenges and misconceptions about pedagogical uses of ICT. Similarly, through participant observations and semi-structured interviews, Campbell and Scotellaro (2009) revealed that Australian ECE pre-service teachers were reluctant, even fearful about ICT teaching programs and most of them did not recognise the potential of ICT to promote early learning and development.

It is worth noting that these findings are rather difficult to generalise to all EC teachers as the subjects were only linked to pre-service teacher populations. The participants of pre-service teacher research may not consider possible future obstacles that prevent them integrating ICT into their work (Nikolopou & Gialamas, 2009) because real situations of incorporating ICT into classrooms may be more difficult than those pre-service teachers’ anticipated. As a consequence, Nikolopou and Gialama (2009)
suggested a need to investigate in-service EC teachers and study different populations across different cultures to understand EC teachers’ intentions and views about integrating technologies into ECE settings.

If negative perceptions and fears of using ICT are great concerns for EC student teachers, it might well be an even greater concern for in-service teachers (Campbell & Scotellaro, 2009) because using ICT with young children in classrooms could be more complex such as employing an appropriate approach to support children’s use of ICT. The continued survey data (Marsh, 2005; Tsitouridou & Vryzas, 2004) showed rich evidence that some EC teachers expressed fears and concerns over the negative effects of ICT on young children, especially on their health. For instance, a large-scale survey (Tsitouridou & Vryzas, 2004) investigated 278 Greek early childhood teachers’ views on the prospect of integrating computers into ECE, showing almost half of the teachers voiced certain reservation with negative feelings related to incorporating ICT into classrooms. They expressed anxiety and concerns about possible adverse consequences for young children’s health in particular exposure to the amount of screen media.

Restricted by the focus on the negative effects of ICT, many EC teachers did not see potential and benefits of computers in children’s lives or believed that the use of computers is not suitable for childhood. For instance, a comparative study (Joshi, et al., 2010) on the role of computers in educating young children revealed that only a small percentage of American (15.1%) and Japanese EC teachers (5.9%) believed that young children should explore computers, whereas most of them believed the use of computers was at odds with principles of children’s development. The low percentage of teachers having positive perceptions of ICT benefits and young children’s ICT use indicates the research-based evidence of ICT value was not known by these teachers.

In addition to their fears and concerns over the negative effects of ICT, these teachers showed lack of pedagogical understanding of the use of ICT to facilitate teaching and learning. In a study on the challenges of using ICT for literacy learning (Mantei & Kervin, 2007), all the teachers from kindergarten to Year 6 across a range of Australian schools perceived ICT as a time-consuming element of their planning and preparation for teaching. However, this study did not provide a sample size of those kindergarten
teachers which may decrease the assertion of their results on EC teachers because the results might be mainly generated from school teachers. An extension of this result is another study done by survey and interviews with New Zealand EC teachers (Oldridge, 2008), in which the researcher identified that the teachers viewed ICT in ECE settings as an addition or a decoration and they were not clear about the potential of learning that may be promoted by ICT experiences. This study provides a deeper understanding of teachers’ perceptions of the use of ICT in ECE, but a relatively small sample (14 questionnaires returned and five teachers interviewed) limits the transferability or usefulness of the findings to other ECE services. Notably, Oldridge’s work is the only study of EC teachers’ perceptions that employed interviews to examine this group of teachers’ perspectives on the use of ICT in ECE settings.

It is worth noting that, because of the main method of survey, these results of in-service teacher’ perceptions of the use of ICT generally provide trends in the data rather than offering rigorous explanations of the phenomenon. What’s more, the response bias is probably existed, which do not accurately reflect “the view of the sample and the populations” (Creswell, 2008, p. 403). These studies indicated that the method of interviews might provide a useful approach to elicit EC teachers’ deep understandings of the use of ICT in ECE.

**Early Childhood Teachers’ Pedagogical Practices with the Use of ICT**

Since a position statement made by National Association for the Education of Young Children (NAEYC) in the US (1996) that EC teachers must use technology to benefit children, the use of ICT in the early years has experienced challenges and changes over the last two decades. To date, however, the potential of ICT for maximising the growth and development in current early childhood classrooms is still seldom realised (Plowman, et al., 2012; Wang & Hoot, 2006) because the effective ICT integration into teaching and learning is not widely found in many childhood classrooms (Leung, 2012; Oldridge, 2010; Siraj-Blatchford, et al., 2002; Yelland, 2001). A great number of EC teachers’ most common use of ICT is computers in the classrooms for low-level tasks such as word processing and internet searches (Ertmer, 2005; Welsh, 2009). The use of ICT in many ECE classrooms is limited to teaching children how to use computer input devices such as opening and accessing of documents (Walters & Fehring, 2009), and
mouse and keyboard skills rather than teaching with the technology and encouraging learning with technology (Ntuli & Kyei-Blankson, 2010; Oldridge, 2008).

Evidence further reveals that many EC teachers did not encourage or support the use of ICT, especially young children’s ICT activities (Campbell & Scotellaro, 2009; Mantei & Kervin, 2007). Oldridge (2008, 2010) in her multiple case studies with ECE centres and services, found that the use of ICT with young children was rare.

In only two centres half of children use ICT in a given week. Moreover, fewer than 10% of children in nine of the remaining centres use ICT on a weekly basis. Three centres (21%) indicated teachers do not use ICT at all with children (Oldridge, 2010, p. 123)

Leung (2010, 2012) further noted that young children’s learning experiences with ICT in Hong Kong were in general limited and constrained by inflexible software with limited opportunities for problem solving and thinking. Plowman and Stephen (2006; 2002, 2003a; 2003b; 2005, 2006a, 2007) conducted sustained research on ICT use in preschool settings in Scotland. They reviewed the evidence on the ways in which ICT was used in both formal and informal preschool settings (2003a; 2002). In their review, the authors provided an overview of the context of using ICT in preschools and showed that various barriers inhibited the use of ICT, including a lack of teacher ICT training, technical support, and accessibility of the equipment, financial constraints of resourcing ICT and time.

Through interviews with teachers and observations on young children’s computer activities in classrooms, Plowman and Stephen (2005) noted that young children seldom used computers in observed free-play sessions. The children even ignored them and preferred to play outside or use other materials. The children tried different games on the computers almost at random, rarely spending more than one minute on each activity. Some left the computers after unsuccessful attempts to complete a task or game. Their findings showed that “boredom, frustration and disengagement were common responses” (p. 150). The features associated with play such as pleasure, spontaneity, engagement and enjoyment in the children’s play with computers were rarely observable in children’s activities. Their further studies (Plowman & Stephen, 2006a, 2007), together with others (Leung, 2010, 2012; Oldridge, 2010) show that although the potential and
benefits of ICT for young children have been widely reported, meaningful and engaged ICT activities have not often appeared in the ECE classrooms studied.

Reasons for unsuccessful use of ICT in ECE are complicated. For example, some EC teachers fear that children will miss out on key experiences that support their development if ICT infiltrates teaching (Murphy, DePasquale, & McNamara, 2003); Some others pay ‘lip service’ to the importance of ICT while they feel personally unable to keep up with ICT development (Hall & Higgins, 2002), while in other studies it was found that some experienced EC teachers are likely to be more sceptical about the value of ICT in the classroom (Hill & Mulhearn, 2007) mainly because they hold a strong belief that does not allow for the inclusion of ICTs as ‘real’ materials. Many EC teachers lack ICT professional development or training to develop pedagogical knowledge and skills that can integrate ICT into teaching and learning (Ajlouni & Aljarrah, 2011; Leung, 2012). Brought together these rationales indicate challenges for incorporating ICT into early learning and development.

Consequently, Yelland (2006, p. 13) argued “a decade [since the NAEYC position statement] has passed yet still we seem to be stuck in a system that only supports the use of new technologies in superficial ways.” While eight more years have now passed since Yelland’s study, there is continued evidence that challenges and barriers for integrating ICT into the early years are still common in ECE classrooms. Along with the barriers identified in Plowman and Stephen’s studies (2003a; 2002), Oldridge (2010) and Leung (2010) in their more recent doctoral studies, identified several more barriers to full integration of ICT such as the location of computer hardware, lack of appropriate software, insufficient funding and relevant professional development, little curriculum guidance, broken equipment and issues with space in the classroom. As these researchers suggested, to ensure the successful integration of ICT, various kinds of strong support and clear guidance to solve or reduce existing barriers are imperative.

**Chinese Early Childhood Teachers and ICT use**

Research on ICT in ECE in mainland China has only been published in English and Chinese since 2006 and findings on preschool teachers’ practices with ICT are rare. Whilst there were a number of studies of ICT in Hong Kong (Han, 2003; Leung, 2010;
Li, 2006), no one had reported exploring the use of ICT in ECE in mainland China until Guo, et al. (2006) investigated the current status of ICT use in Shanghai public and private preschools. In 2006, the researchers (Guo, et al., 2006) surveyed 99 preschools in four categories (Model preschool, Level One, Level Two and Private preschool) to investigate ICT infrastructures, the use of ICT in childhood education and teachers’ ICT professional development. They found that 98% of preschools were equipped with computers and other ICT resources, but there were significant differences in the availability of ICT among different types of preschools. The preschools ranked Level One (47.1%) and Level two (74.4%) did not have computers in children’s classrooms. Through interviewing the principals, the researchers identified three main reasons for teachers’ sporadic use of ICT for teaching and learning, although they had some ICT capabilities and ICT resources in the preschools. First, the use of ICT caused trouble or difficulties in preparing and teaching for teachers. Second, a lack of good quality of ECE software restricted the incorporation of ICT into classrooms. Third, using ICT was not appropriate for the current curriculum. While these reasons have revealed issues of integrating ICT into these teachers’ practices, this research does not provide any further explanation for these three reasons. Moreover, the researchers’ conclusions about the teachers’ use of ICT may not reflect the teachers’ opinions correctly or fully because the data were second hand reports generated by their principals. Another recent Chinese survey (Xiao et al., 2012) on ICT equipment in 12 preschools conducted in a city which is close to Shanghai showed that the preschools owned a range of ICT resources, but an average number of each device was very low. Both Chinese studies used questionnaires to survey the preschools to obtain the latest information about the development of ICT facilities in preschools, but none of them provided detailed explanatory knowledge about the use of ICT in classroom practices. Studies with teachers themselves using interviews and classroom observations, have not yet been done to extend and deepen the knowledge about this group of people who directly interact with children.

A Summary of the Recent Research

The literature on the use of ICT has generally demonstrated the realities and various existing issues in integrating ICT into ECE, which provides insights into the use of ICT in ECE settings and reveals the difficulties of EC teachers adopting ICT into their work,
Despite an acknowledgement of the importance of ICT. However, these past studies hold some underlying implications, which are worthy of attention.

First, the focus of most past studies (Joshi, et al., 2010; Maynard, 2010; Sandberg, 2002; Zevenbergen & Logan, 2008) on the use of ICT has been placed on computers rather than broader definitions of ICT, and thus their findings are related only to computers. As noted by Plowman and Stephen (2005, p. 147), “the evidence base for much of this writing is weak,” and there is a paucity of good evidence-based writing on the ways ICT is used in preschools. Because the conclusion drawn from studying one form of ICT, computers, cannot be generalised to the broad range of ICT resources now available. As a result, it is important to consider a wide range of ICT resources that surround contemporary children’s lives in further studies in order to gain empirical evidence of the use of ICT in ECE.

Second, the implementation of ICT into teaching and learning is neither an easy job to accomplish, nor something where there are only a simple range of factors to consider. Studies (e.g. Leung, 2012; Ntuli & Kyei-Blankson, 2010; Yelland, et al., 2008) revealed that ICT was not effectively integrated into educational programs for young children, and preschool teachers often got confused about how to improve practices in a digital age (O’Rourke & Harrison, 2004; Pittman, 2003). Previous studies (Gabor & Ing, 2007; Orlando, 2009; Roblyer & Edwards, 2000) documented that teachers’ pedagogical practices did not keep pace with the rapid changes in the quality and quantity of ICT. Furthermore, the features of those changes continue to contribute to the complexity of implementing ICT into the classroom which makes studying teachers’ pedagogical practices regarding the use of ICT more complex. The complexity of teaching, coupled with the rapid development of ICT change, indicates that identifying effective practices in education will be a challenging and ongoing quest for future research (Bate, 2010). This scenario generates an even more urgent need to investigate meaningful ways of integrating ICT into ECE (Oldridge, 2010; Wang & Hoot, 2006; Wang, Jaruszewicz, et al., 2008). Consequently, identifying the current EC teachers’ views and exploring better classroom practices to promote the use of ICT for young children are of great significance.
Third, most of these studies on EC teachers’ perceptions and pedagogy were undertaken in western countries, especially in developed areas. The result of EC teachers’ perceptions of the use of ICT generated from western studies may not represent other teachers’ views in a culturally different context. Social context is important in determining human’s thinking and activities (Blanck, 1990) as cultural influences and social relationships shape how people perceive the world and implement practices within it.

The structure of perceptions, voluntary attention and memory, emotions, thought, language, problem solving, and behaviour acquire different forms according to the historical context of the culture, its relationships, and its institutions (Blanck, 1990, p. 44).

For these reasons, any understanding about the use of ICT in ECE environments and EC teachers’ perceptions of this complex phenomenon cannot be considered in isolation from their specific social, historical and cultural contexts. These differences impact human’s perceptions and practices, which make human activities in a situated context unique (Cohen, et al., 2013). It is important to note here that even people sharing the same culture may hold different values and opinions (Li & Ranieri, 2009). It can be inferred that different cultural practices impact human’s perceptions and practices related to the use of ICT as much as with any other phenomena. Therefore it is necessary that policymakers, researchers, EC educators and teachers consider the impact of these differences in each social context as well as the pedagogical implications of using ICT with young children. The successful integration of ICT into culturally different educational settings requires an awareness of cultural differences and their possible effects on any ICT practices (Chisholm, 1994). As the literature indicates earlier that the use of ICT in educational environments is a complex matter, it calls for a closer look at the ICT use in each unique situation if changes need to be developed to solve problems of implementation. Due to the phenomenon by which “each society reveals a particular relationship among the diverse practices” (Rosa & Montero, 1990, p. 61) and socially organised activities change over time and space, each human practice such as ICT use in different cultures cannot have identical characteristics. For these reasons, Chinese preschool teachers’ perceptions of the use of ICT are investigated in the context of Shanghai, as a unique study in terms of time, place and social context.
Learning and Teaching Through the Use of ICT

Theories about how humans learn are many and varied, and have been richly explored and debated by philosophers, educators, psychologists and sociologists for centuries (Wood, 1998b). It is important to consider theories of teaching and learning in this thesis about ICT use because the potential of technology to enhance learning can only be realised “if it is based on secure foundation of a robust understanding of learning, teaching and knowledge” (Derry, 2007, p. 503). In the contemporary technological world, it is critical and timely to build a clear understanding about the intersection of learning theories and new technologies so educators can reflect on the implications of how to apply technology to enhance learning and draw a theory-informed approach to rethinking and transforming educational practice (Harasim, 2012). In this section, the historical development of learning theories and its impacts on the use of technologies in education are discussed before going on to explore effective pedagogies in ECE.

Learning Theories and Technologies

The rise of learning theories began in the first half of the 20th century. Psychologists in many parts of the world attempted to seek to understand how learning happens and discover general laws or mechanism that can lead to a scientific theory of learning (Wood, 1998b). Over time theories of how children think and learn have evolved in response to new research findings or theoretical assumptions, inevitably, shaping definitions of what it means to learn and teach in educational contexts and providing a pedagogical basis for understanding what teaching strategies teachers can offer to provide optimal learning (Gredler, 2001; Harasim, 2012). Competing views on the nature of learning and human development are divided into three major main domains: behaviourism, cognitivism and constructivism (Yilmaz, 2011). These three theoretical perspectives have heavily influenced the application of technology in classrooms and its integration into education.

Behaviourism

Behaviourism is the first major theory of learning and focuses on observable and measurable behaviour. One of the early pioneers who demonstrated using simple experimental techniques to teach animal to learn was the Russian physiologist and
psychologist Ivan Pavlov, who focused on a wide variety of behavioural stimulus and response to produce outcomes of learning. His theory was further developed to predict conditions of learning and learning outcomes by influential American psychologists such as Skinner. Skinner defined learning as a function of acquisition of new behaviour and underscored occasional reinforcement of the desired response, which was regarded as the key to “effective teaching” (Wood, 1998b, p. 3). From a behaviourist perspective, learning is considered as acquisition of knowledge and skills so instructions focus on very specific and discrete learning steps (Harasim, 2012). It is clear that this view of learning implies that the learner responds to learning materials passively and teachers have dominant roles in classrooms so that the priority in instruction is on transmission of knowledge to the learner. Teachers are responsible for preparing learning resources and setting up learning experiences, but children are often put in passive situations such as seeing, listening, responding to questions and doing what was instructed.

Critics (Harasim, 2012; Koç, 2005; Pound, 2011; Tryphon & Vonèche, 1996) pointed out the oversimplicity of behaviourism as it greatly underestimated the complexities of human behaviour and could not account for subjectivity, such as ignoring the individual’s differences, feelings and emotions. Despite many criticisms on its limitations, behaviourist perspectives of learning continue to be widely used in practice (Pound, 2011). For example, MacNaughton (2003) indicated that behaviourist ideas were persistently widespread in early childhood education and left a strong influence on EC teachers’ practices.

Behaviourism has had a powerful influence on many early childhood educators’ view of learning. The ideas that we conform to our culture as we learn and that praise, positive rewards such as ‘gold stars’ or a special role in the classroom can reinforce positive behaviours and assist children’s learning are widespread (p. 26).

The rise of applying technologies in the educational field occurred within the behaviourist school of thought and much of the earliest work with computers in the educational field was “coloured by behaviourist views” (Harasim, 2012, p. 41). Learning technologies are designed with specific steps and mechanisation of the learning process to encourage practice and reinforcement of specific tasks. Taylor (1980) made a metaphor of this type of computer use as a tutor. That is, computers present learning material, students respond and computers evaluate the response and decide what to teach, based the evaluation outcome. Approaches like computer-based tutoring
systems, programmed learning and computer-assisted instruction (CAI) were popularly put into practice in some schools (Papert, 1993), teaching children to learn about technology itself or drilling them in the learning of concepts, facts and skills (Bigge & Shermis, 1999).

Deeply influenced by behaviourist learning theory, today’s many computer-based educational programs for children are simply designed to set tasks for the learner, achieving learning objectives through raising questions and providing rewards if answers are right (Harasim, 2012). This way of using computers for learning is only supplying a set of stimuli and response while intervention and interaction with teachers are not recognised. The use of technologies from the behaviourist perspectives mirrors traditional classroom practices (Koç, 2005) because the predetermined learning content focusing on acquisition of lower-level skills and children as users do not have opportunities to explore authentic and creative learning. While some authors criticised this approach to technology use, especially computer and software use, a lack of meaningful use of computers and software such as drill-and-practices is still common in elementary and childhood education (Bigge & Shermis, 1999; Clements & Sarama, 2003; Finegan & Austin, 2002; Leung, 2010; Yelland, 2001).

Cognitivism

The dominant perspective of learning in the first half of the 20th century was behaviourism, but the rise of behaviourism was not unchallenged. During the 1960s, cognitive learning theory emerged as a response to behaviourists’ rigid and simple learning theory of ‘stimulus and response’ and shifted the emphasis from external behaviours to a focus on the internal mental process of behaviours (Bigge & Shermis, 1999; Harasim, 2012). The cognitive theory grew out of Gestalt psychology, developed by Max Wertheimer and his colleagues in Germany in the early 1900s, who were interested in developing the laws of human perception and sensation and applying them to learning and thinking (Gredler, 2001). Cognitivists argued that the human mind was not a blank box as behaviourists thought, quite on the contrary, they stressed the great importance of mind in processing information and making sense of the world (Harasim, 2012). Influenced by this perspective, learning is viewed as an active process involving the acquisition or reorganisation of information (Harasim, 2012). The cognitive learning
theory replaced behaviourism as the major school of thought in the middle 1970s. In particular, the invention of computers had a powerful impact on the rise of cognitive learning theory. The human mind was viewed as computer which can process information and the learner was viewed as an information processor like a computer (Gredler, 2001; Harasim, 2012). In general, behaviourists and cognitivist theories of learning differ in their views on the importance of mental structures and processes in explaining behaviour.

However, cognitivism also shares some common ground with behaviourism because both emphasise the role that environmental conditions play in reinforcing behaviours or facilitating learning (Ertmer, 2008). In the late 1970s, social cognitive learning theory as a subset of cognitive theory created by Albert Bandura, expands on behaviourists’ imitative learning, reinforcement and operant conditioning by considering naturalistic settings and social environment for learning. This theory contends that by observing others or learning from modelled behaviours, individuals acquire knowledge, skills, attitudes and beliefs (Schunk, 2000). Bandura’s theory has several major implications for education. First, modelling is viewed as primary source for learners. Second, learners’ perceived self-efficacy and self-regulatory skills are important for successful learning (Gredler, 2001). Third, learners’ characteristics such as individual differences, readiness and motivation for learning influence learning outcomes. Finally, it indicates that learning in a media rich context can take place beyond classrooms in subtle and pervasive ways (Gredler, 1986).

Social cognitive learning theory has had a powerful influence on EC teachers’ views of how young children learn, and modelling and imitations are regarded as crucial to learning behaviours (MacNaughton, 2003). But observation may be not the best way for young children learning to use technologies, because from a cognitivism perspective, learning is an active process so that children “learn better through their own experience, than through passive acceptance of information provided by others or through technical means” (Barak, 2006, p. 123 ). Barak (2006) suggested that for young children, physical experiences may be necessary for learning because ‘hands-on’ activities may also mean ‘minds-on.’
The technologies influenced from cognitivist learning theories such as artificial intelligence (AI) and Intelligent Tutoring Systems (ITS), demonstrate a didactic, content-specific instructional pedagogy based on individualised learning (Harasim, 2012). However, due to increasing sophistication in the design of new technologies and technology experts’ objections to behaviourism, the design of educational technology is moving forward to develop learners’ understanding of generalisation, rules, principles or tool use and involves teachers’ explanations (Bigge & Shermis, 1999).

Constructivism

Constructivism refers to a theory or set of theories about learning that emerged in Europe and was introduced to the US around the 1970s and views knowledge as human construction (Gredler, 2001; Harasim, 2012). In the 20th century, two major theorists associated with constructivist approach were: Jean Piaget and Lev Vygotsky (Harasim, 2012). Piaget focused on explaining logical thinking and the reasoning process of the child in terms of biological developmental stages while Vygotsky viewed cognitive development as socially and culturally based and emphasised the social context of human development and learning. Due to their differences in explaining human thinking and cognitive development, these two major theoretical perspectives are often classified as cognitive constructivism and social constructivism (Gray & MacBlain, 2012; Harasim, 2012) or cognitive-development theory and sociocultural or cultural-historical theories (Cole & Engeström, 1993; Gredler, 2001). For the purpose of clarity, in this study Piaget’s ideas are referred to cognitive-development theory while the term sociocultural theories is used for Vygotsky and his followers’ theories.

Cognitive-Development Theory

Jean Piaget (1896-1980), a Swiss-born developmental psychologist devoted his life to the question of cognitive development, and particularly to investigating thought process and changes in cognitive skills with age (Gordon & Browne, 2011; Harasim, 2012). Sharply contrasted with the behaviourists’ position, Piaget’s theory places actions at the heart of learning and believes that children learn through acting on environments (Wood, 1998b). Even though his theory is often considered to be a branch of cognitivism because both view learning as a mental activity, Piaget viewed learning as a process of discovery and knowledge as continuous interactions between the individual and the
environment, which is known as the constructivist approach to learning (Ertmer, 2008; Gordon & Browne, 2011).

He also believed that children’s development goes through a series of stages to reach ability of reasoning, abstract and rational thinking, and intellectual maturity (Piaget, 1955). This theory had significant influence on developmental psychology, sociology, education, and even philosophy. It was widely accepted from the 1950s until the middle 1970s and applied to mathematics, science, EC programs and general cognitive EC curriculum (Gordon & Browne, 2011; Gredler, 1986). Although the popularity of Piaget’s theory waned in the late 1970s, this theory still retains strong presence in ECE (Gray & MacBlain, 2012; Thomas, 2000). For example, Developmentally Appropriate Practices (DAP) (Bredekamp, 1987; Bredekamp & Copple, 1997), was conceptualised within a Piagetian-based theory and widely supported when first introduced by the US National Association for the Education of Young Children (NAEYC) in 1987 (Fleer, 1995b). The NAEYC has provided DAP guidelines for teaching children from birth to eight, which emphasised the child-centred approach (Wen, Hui, & Kay, 2011). The child-centred approach stresses the child’s autonomy and ability to construct knowledge and focuses on the individual children’s needs, the unique characteristics of childhood, their strengths and interests (Bredekamp & Copple, 1997). For many years, child-centredness especially in the form of DAP has been the dominant paradigm and discourse in ECE (Fleer, 1995a; Wen, et al., 2011). However, the usefulness of Developmentally Appropriate Practices for ECE has been challenged and criticised recently by many scholars (e.g. Fleer, 1995b; Langford, 2010) because it plays down teachers’ role and that of others in the children’s learning and offers little scope for considering the complexities of the learning and teaching process.

Piaget’s theoretical arguments about the nature of children’s thinking and their relationship with their environments have significant direct implications for the teachers’ roles and pedagogy (Wood, 1998b). From this theoretical perspective, the teachers’ role is generally interpreted to set up the environment and organise classroom experiences and observe what children can do and help the children reach challenges with minimal intervention (Arthur et al., 2012). Under such circumstance, EC teachers are encouraged to provide rich activity-based learning environments that challenge children to advance
to the next higher level of cognitive development (Copple & Bredekamp, 2009) and structure learning experiences that facilitate children’s learning through play and discovery (Gordon & Browne, 2011). In the implementation of activities, teacher questions can play an important role in provoking children’s thinking so these should be real questions and must be carefully planned (Gredler, 2001). Teachers should not facilitate development by showing or explaining things to children who are not mentally ‘ready’. Attempts to help those children through direction instruction could result in nothing being learnt or meaningless rote learning (Wood, 1998b). Shaped by Piaget’s idea that children construct their knowledge by acting on objects, children as lone scientists learn through independent discovery and teachers’ non-intervention strategies are encouraged in the classroom. For example, Wood (1998b) described a typical image of the classroom in which the teachers’ role is a manager of learning environment, without giving any direct instruction or co-construction.

A teacher can provide appropriate materials and contexts for development, and organize time and space so that children are free to act upon the world with objects and tasks that serve to foster emergence of operations and an understanding of invariance. But the basis for such an understanding is constructed by the child through his [sic] own, self-selected problem-solving; not through any direct efforts of his [sic] teachers (p. 26).

Influenced by Piaget’s theory of stages of cognitive development, some researchers (e.g. Elkind, 2007; Healy, 1998) argued young children below a certain age should not use new technologies as learning resources until they reached a required intellectual stage. This argument is based on a belief that children’s abstract thinking is developed from experiences with concrete materials and that teaching abstract procedures without taking into account practical, concrete problems would fail. As Yelland (2006) pointed out, one reason for the vigorous debate about the role of technology, especially of computers, is that people think computers are too abstract and only provide children with a two dimensional experience: idea and concept. Therefore young children’s learning should be built on natural experience through acting on concrete materials or real-life experiences to develop and reach an appropriate state. However, Piaget’s work has been interpreted in many different ways (Glaserfeld, 1982). For example, Papert (1980) took Piaget’s ideas about children as builders of their own intellectual structures and argued that the computer presence could contribute to the mental process and influence the way children think and learn. Papert used Piaget’s epistemological theory of constructivism as a starting point and theoretical rationale for his own work on constructivism, with
specific reference to children’s use of ICT, wherein he argued that computers “should serve children as instruments to work with and to think with, as the means to carry out projects, the source of concepts to think new ideas” (1993, p. 168).

*Sociocultural Theories*

Although Piaget’s cognitive-developmental view has provided great insights into children’s learning and development, his focus on the lone child, with little consideration of the sociocultural context of learning and the limitations of stage-based development shows incompleteness of his theory for use in education (Dockett, 1995; Fleer, 1995a; Wood, 1998b; Wood, 1988). Lev Vygotsky (1896-1934), a Russian-born psychologist, built on the works of many western psychologists and sociologists such as Gestalt psychologists, Gesell, Freud and Piaget (Berk & Winsler, 1995; Gordon & Browne, 2011; Gredler, 2001) and proposed a theory that takes account of culture and social activities in explaining human development. Vygotsky (1962) believed that all human activities exist within social and cultural contexts. From this perspective, learning is understood as the result of complex interactions between multiple agents within a context where cultures and values are shared with other social members and strengthened by the communities, rather than solely as an internal cognitive process (Rivera et al., 2002; Smagorinsky & Lee, 2000).

In contrast to Piaget, Vygotsky viewed instruction as the key to learning and that the potential for learning lay in interactions with more knowledgeable others (Wood, 1998b). His very different theoretical orientations from Piaget have led to different images of children’s development and teaching strategies, particularly, ‘readiness’ for learning. Vygotsky defined the Zone of Proximal Development (ZPD) as “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more able peers” (Vygotsky, 1978, p. 86). This concept explained that readiness requires not only children’s existing knowledge but also their capacity to learn with others’ help or assistance (Vygotsky, 1962). It also proposes that children’s development requires guidance from an adult or collaboration with more capable peers for challenge and support (Plowman & Stephen, 2005). During the process of interaction and cooperation with adults or more knowledgeable peers,
children gain cultural knowledge and social abilities so that they learn to function at a higher level (Singer, 1996).

Although Piaget and Vygotsky were widely reported to have difference of opinions on intellectual development, they also shared some important agreements on the importance of activity as the basis for learning and development (Wood, 1998b; Wozniak, 1996). Both of them emphasised the active role of the learner, interaction and activities with environments through which children make sense of the world and construct meaning (Harasim, 2012; Wozniak, 1996). Drawn from Piaget’s genetic epistemological stances and Vygotsky’s historical and cultural perspectives, Bruner laid much stress on both social, cultural interaction and biological influences. Wood (1998a) stated Bruner’s theory stands between Piaget and Vygotsky as he gave considerable attention to both the role of culture and evolution in individual’s learning. Bruner developed his theory of instructions in the 1960s and emphasised the importance of cognitive process in learning and teaching strategies in supporting learning (Bruner, 1959). One of the most common ways of describing and presenting provision of assistance to support a learner to achieve potential development is the use of a building metaphor, “scaffolding”, which was developed by Wood, Bruner and Ross (1976). They viewed scaffolding as the “process that enables a child or novice to solve a problem, carry out a task or achieve a goal which would be beyond unassisted efforts” (Wood, et al., 1976, p. 90). This definition suggests if learning is mediated or scaffolded by adults or more capable peers, children are able to accomplish the task at a higher level. With the increase of children’s abilities of problem-solving, the nature and extent of scaffolding would be reduced and finally removed (Rogoff & Wertsch, 1984; Yelland & Masters, 2007). The concept of scaffolding has been widely accepted in educational settings and used to present a number of different pedagogical approaches or ideas that can support learning. For example, instruction needs to gear the needs of the individual child (Wood, et al., 1976) and a learning task should be suitable for children’s abilities and sustain learner’s interest, but yet to be managed (Yelland & Masters, 2007).

Another important sociocultural theorist Rogoff, was described as “the guardian of Vygotsky’s theories”(Pound, 2011). Building on ‘ZPD’, she developed a theory of guided participation which proposes learning occurs as children and adults participate
and engage in culturally valued activities (Rogoff, et al., 1993). She highlighted both guidance and participation in a collaborative process where children could develop an apprenticeship in thinking (Rogoff, 1990). One of the key elements of Rogoff’s guided participation is the concept of intersubjectivity, which refers to “shared understanding based on a common focus of attention and some shared presuppositions that form the ground for communication” between novices and skilled others (Rogoff, 1990, p. 71). This notion indicates that an effective approach to learning not only requires face-to-face interactions, hands-on involvement and shared endeavours, but also needs joint participation, shared communication, and interpersonal engagements between individuals and their social partners (Rogoff, 1995; Rogoff, et al., 1993).

Sociocultural theories have received considerable attention in recent years in the western world such as in the US and Australia (e.g. Cole & Engeström, 1993; Fleer, 1995a). They have been drawn on emphasising the importance of the teachers’ role and teacher-children and peer interactions, as well as in the social context such as in families and communities where children live and learn. In ECE contexts, the importance of EC teachers’ agency and pedagogical support in the process of children’s learning are increasingly emphasised at a time when sociocultural theories have gained greater recognition (Anning, Cullen, & Fleer, 2004; Arthur, et al., 2012; Berk & Winsler, 1995). Notably, this literature is all from western countries.

The role of technologies in the design of early learning environments and construction of knowledge has also been supported by the recognition of sociocultural of human development (Loveless, 2011). Using ICT as a tool for communication and interaction (Luckin et al., 2003; Parette, et al., 2013; Quesenberry et al., 2013) has been widely acknowledged and used as a strategic tool to enable young children and teachers to work together, which provides them with a system to facilitate the construction of their understanding, learning, teaching, and cooperation to solve the authentic tasks in real life situations (Chen & Looi, 1999; Lemon & Finger, 2013).

The successful ICT integration in childhood classrooms relies very heavily on EC teachers as their pedagogical practices have an important influence on young children’s experience, knowledge and skills (Albirini, 2006; Lau et al., 2005; Liang, 2006; Yelland,
In particular, their interaction and the amount of involvement (Grieshaber, 2010) with young children in the process of ICT activities are crucial to learning outcomes. Furthermore, inspired by Vygotsky’s view that learning is embedded in social situations and relationships (Fleer, 1995a), early learning and development through the use of ICT should not only focus on the outcomes, but also specify the conditions and the learning process, which are provided and supported by teachers and surrounding environments. Thus, it is also important to link young children’s families and communities which can be invaluable sources of knowledge and support for enhancing young children’s use of ICT in ECE settings.

**Effective Pedagogical Practices regarding Young Children’s Use of ICT**

In education contexts, pedagogy often refers to teaching strategies, provision of learning environment and opportunities, instructional techniques or approaches that enable learning to take place (Siraj-Blatchford, et al., 2002; Wang, 2008). It can be inferred that exploring effective pedagogy must take these elements into greater account in particular teaching strategies, interactions between teachers and children, and the learning environment.

Regarding young children’s use of ICT, a limited number of researchers (Chen & Chang, 2006; Liang, 2006; Yayli, 2009) have focused on exploring EC teachers’ roles in using a repertoire of teaching methods to enhance children’s learning and play through the use of computers. For example, Chen and Chang (2006) proposed a model of EC teachers’ pedagogy in young children’s computer activities. The teachers are required to play diversified, responsive and supporting roles in scaffolding children’s computer use and to provide assistance if children need it, to help them move to a higher level of development.

These roles include modelling the use of software, answering children’s questions, responding to requests for assistance, scaffolding children’s thinking and learning, facilitating peer interaction, observing children’s computer use, and extending computer activities to other areas of learning (Chen & Chang, 2006, p. 446).

However, such roles may limit teachers to passively react to children’s performance, observe and assess, rather than co-construct meaning and knowledge with children together while children are involved in activities. If teachers’ pedagogical decisions are not consciously made, they possibly have potential to intervene into the learning process.
and act as technique trouble-shooters in a limited way. This way of reactive supervision during the children’s ICT activities was critiqued as “a fairly risky strategy” because young children rarely sought for help and such guidance operated by default without considering pedagogical strategies (Plowman & Stephen, 2003b, p. 18).

According to two large UK projects, the Effective Provision of Pre-School Education (EPPE) Project (Sylva et al., 2004) and the Research Effective Pedagogy in the Early Years (REPEY) (Siraj-Blatchford, et al., 2002), effective practices in ECE are strongly associated with the environment where teachers work with children, explain and clarify concepts, observe and evaluate activities, and discuss problems. These two studies consistently found that adults’ involvement with children’s activities largely determined the quality of ECE services. Siraj-Blatchford et al., (2002) concluded that, when young children had free play within an instructive learning environment, adult interventions might be especially effective because adults could have best opportunities to extend children’s thinking. It is thus critical for EC teachers to actively interact with children and engage in the use of ICT with young children. However, their studies did not address effective practices regarding the use of ICT in ECE settings, which indicates a gap of exploring effective pedagogy in this aspect.

Several years later, Plowman and Stephen (2006a, 2006b, 2007) developed the concept of ‘guided interaction’ to extend sociocultural perspectives to technology-mediated learning. They focused on supporting learning with diverse technologies in the early years. Guided interaction is conceptualised within a sociocultural framework, which is related to other concepts such as scaffolding (Wood, et al., 1976), guided participation (Rogoff, 1990) and sustained shared thinking (Siraj-Blatchford, et al., 2002). Although these approaches can be applied to support technology-mediated learning, there is only a small body of literature so far exploring scaffolding in relation to computer use in classrooms (Wood, et al., 2008; Yelland & Masters, 2007). This work has basically focused on desk computers and does not yet extend the sociocultural approach to a wide range of ICT resources. The concept of guided interaction is specifically developed to support the use of ICT in the context of pre-school education (Plowman & Stephen, 2006b), because of the nature of early learning and development, the authors considered
children’s free play with ICT and focused more on the process and context of learning, rather than outcomes.

The framework of guided interaction has two main dimensions in identifying ways of enhancing children’s use of ICT and understanding both direct and indirect influences of guided interaction: distal and proximal. Distal refers to guided interactions that take place at a distance such as providing resources and ensuring access to ICT. Proximal is about face to face interactions such as prompting and explaining. Because this framework encompasses a wide range of teaching strategies such as planning for the whole setting or for individuals, selecting and providing appropriate ICT resources and creating the user’s environment, it moves beyond immediate interpersonal interactions and broadens the understanding of pedagogy that enhance children’s learning with ICT. The framework has provided a balanced way for EC teachers to develop appropriate practices between child-initiated and adult-led activities in the authentic settings by combining child-centred pedagogy and responsive, reflective sociocultural informed pedagogy (Plowman & Stephen, 2006b). Plowman and Stephen suggested that teachers assume the role of guide or facilitator to promote young children’s use of ICT and developed a range of strategies to support learning with ICT, which enable teachers to see their roles in mediating children’s ICT activities and creating an effective environment for young children. However, teachers’ roles as facilitators can create a distance between children and teachers in building the ‘basis for togetherness’ and limit teachers’ abilities to value and support peer interactions (Singer, 1996). It is important for teachers to play diverse and dynamic roles such as co-operator, co-_constructor, guide and facilitator so that they enhance children’s learning and development with and through ICT use in multiple ways (Langford, 2010; Singer, 1996).

In addition to emphasis on guidance and interaction, creating a natural, safe, playful, curious and creative environment has been considered as an important aspect of effective pedagogy related to ICT use in ECE (Hayes & Whitebread, 2006; Rivera, et al., 2002; Tony, 2008; Turja, et al., 2009), which requires teachers to take children’s interest, potential, experiences, feelings and cognition into conscious account while supporting ICT activities. Adams and Brindley (2006, p. xiv) argued that “working with an ICT application should, like any other experience in any early years setting,
encourage playfulness, present the child with a cognitive challenge, give a sense of control, and encourage creativity and personal expression.” This vision gives clues to move beyond the past heated debate over the role that ICT plays in ECE. That is, ICT in the early years should be viewed as any play or learning materials that can develop positive learning dispositions and promote children’s development. Therefore, EC teachers should provide activities that encourage children to explore a variety of ICT resources and encourage children to apply them playfully for a range of different purposes. But such vision ignores the important role of peers in children’s collaboration in describing features of successful ICT integration. This is consistent with Piaget’s image of early learning that children are solitary explorers in their world, whereas the relationship with peers is valuable from a sociocultural viewpoint as support like peer interaction, peer teaching or tutoring from more capable peers in the learning process can facilitate the child to move another higher level of development (Rogoff & Wertsch, 1984; Vygotsky, 1978; Wood, 1998b).

The emphasis on the nature of learning environment is related to the recognition of the sociocultural context where children’s learning occurs. Based on their review on the curriculum content, Turja et al. (2009) developed a conceptual framework for the curriculum and delivery of technology in ECE and suggested that teachers provide children with the following activities for technology education (2009, p. 358).

- Opportunities to observe with all senses, use, explore, experiment, test, investigate and evaluate objects, and materials;
- Project works to produce and design;
- Experiences of ICT;
- Technological orientation in the context of daily routines;
- Excursions in neighbourhood and working places;
- Playful activities, technological toys;
- Arrangements of environments for child initiated exploration and play;

Within this framework, young children are viewed as active technological agents who can become aware of learning tasks and acquire knowledge and skills through observation and hands-on experiences, as well as utilise their learning in various contexts. It is clear that the framework demonstrates some features of a child-centred approach with an emphasis on playful, spontaneous, explorative, child-initiated,
‘learning by doing’ activities in the absence of learning and teaching role by adults. Conversely, drawing on feminist, postmodernist and post-structural theories, child-centred pedagogy has recently received major critiques, among which concerns about the absence of an authentic, meaningful, equitable and democratic adult-child relationship in a child-centred learning environment have emerged (Fleer, 1995a; Langford, 2010; MacNaughton, 2003). The extreme applications of child-centred approaches are where teachers respond entirely to the individual children’s interests, needs and activities, and place emphasis on their independence, self-expression, open-ended exploration and discovery (Siraj-Blatchford, 2009) making teachers become the “observing outsider,” whose responsibilities in the classroom are mainly concerned with organising, rules, and routines in order to regulate the children’s spontaneity (Singer, 1996, p. 33).

Yelland (2001, p. 11) pointed out that effective integration of ICT occurs “where all participants learn, the relationships between learners are dynamic, and ICT complement engagement in authentic learning tasks.” For the purpose of providing engaged learning tasks, it is important for teachers to take a sociocultural approach to encompass a broad sociocultural context of ECE practices and learning experiences so they can demonstrate sensitivity (Siraj-Blatchford, 2004) to learning tasks, learning content and the environment, children’s lived experiences and knowledge, as well as their ‘ZPD.’ More importantly, effective integration can value both teachers and children’s agency and actions in the learning process with ICT. Drawn upon the international evidence of effective pedagogy in ECE (Arthur, et al., 2012; Siraj-Blatchford, 2004; Siraj-Blatchford, et al., 2002; Sylva, et al., 2004) and sociocultural perspectives, the following teaching strategies are generated from this study of the literature as a summary of effective pedagogy to enhance young children’s use of ICT in the classroom.

- Employ diverse and dynamic roles such as co-operator, co-constructor, guide and facilitator.
- Create rich, authentic and meaningful ICT environment and activities.
- Encourage and scaffold children to play and explore learning with ICT resources within social and cultural environments.
• Examine and extend children’s existing ICT knowledge and experiences obtained outside ECE settings.
• Communicate and collaborate with families and communities to support children’s ICT use.
• Genuinely involve with and actively engage in children’s ICT activities.
• Facilitate peer interaction and collaboration in the process of children’s ICT use.
• Construct or co-construct meaning and knowledge with children in ICT activities through a wide repertoire of teaching strategies.
• Maintain a balance of child-initiated and teacher-led ICT activities.

Thus, effective pedagogy regarding young children’s use of ICT requires teachers to be able to know, understand and employ a wide range of approaches to facilitate learning and development. With these strategies, teachers are required to plan, support, interact, engage and construct or co-construct with young children within a rich, creative and dynamic environment in a meaningful and authentic way.

Summary

In this chapter I have examined literature related to young children’s use of ICT in the early years, their home ICT experiences and EC teachers’ perceptions and pedagogical practices as represented in the literature. I have also discussed learning and teaching theories as they provide a basis for understanding and exploring effective learning and teaching mediated through the use of ICT. The literature revealed the importance of social, historical and cultural contexts in shaping human’s thinking and activities while studies on young children’s ICT use and their teachers’ classroom practices have been predominantly confined to western countries. Thus, this thesis aims to provide an international perspective to view the use of ICT in ECE within different sociocultural backgrounds by studying Chinese EC teachers’ perceptions and pedagogical practices.

The literature review demonstrates that ICT has become a part of many young children’s lives and has shaped their early learning and development. Although the role of ICT has been increasingly recognised and valued in some ECE policies and curriculum, meaningful integration of ICT into childhood classrooms has not been widely found. Reasons for this phenomenon are various and complex, but EC teachers
especially their perceptions and pedagogy, are important factors that influence the successful ICT integration. This study is designed to develop an in-depth understanding of this aspect of EC teachers’ work related to young children’s use of ICT and further explore possibilities for changes.

The next chapter will present the theoretical framework upon which methodology and methods used in the study are chosen to achieve the objectives of this research.
Chapter Three: Methodology

The major focus of this study is to find out how teachers in Shanghai preschools perceive and support young children’s use of ICT in their classrooms. The main research question as raised in chapter one is: What are preschool teachers’ perceptions and pedagogical practices regarding young children’s use of ICT? This chapter provides an overview of the research methodology employed, including the paradigm and methods together with the approach to the study. It also gives details about the research procedure by which data were collected and analysed to address the aims and questions posed at the start of the study. Furthermore, it explains the procedures of the study and ethical processes and implications.

Research Paradigms

Guba and Lincoln (1994) defined an inquiry paradigm as “a set of basic beliefs” or “worldview” (p. 195) combining three interconnected premises: ontology and epistemology as well as methodology, which shapes “how the researcher sees the world and acts in it” (Denzin & Lincoln, 2008, p. 31). The selection of methodologies and the rationale for choosing research methods is linked fundamentally to such beliefs and principles in which the researcher approaches the central questions (Stake, 1995).

Ontology raises basic questions about the nature of reality and the nature of human beings in the world, which gives rise to particular research epistemology and methodology. Epistemology is about the relationship between the researcher and knowledge while the researcher’s epistemology is usually framed by principles relating to the ontology. Inquirers’ ontological positions constrains their understanding of the relationship between themselves as the knower or “would be knower” and the knowledge (Guba & Lincoln, 1994, p. 201). Methodological questions are related to how to acquire knowledge or know the world. Methodology focuses on the best means or approaches for acquiring the knowledge about the world or the reality (Denzin & Lincoln, 2008).

Although researchers may not realise they have their underlying philosophical assumptions about reality (Creswell & Plano Clark, 2006), it is important for
researchers to articulate philosophical positions explicitly to make their way of obtaining knowledge transparent because answering critical questions in research relates fundamentally to their ontology and epistemology (Denzin & Lincoln, 2008). As Bateson (1972) noted, some of these beliefs may be taken for granted, invisible, or only assumed, but researchers are “bound within a net of epistemological and ontological premises” (Bateson, 1972, p. 320). Through addressing the relevant central question, particular methodology and research methods become ‘visible’ in the process of investigation.

There is a dependent relationship between different beliefs in the establishment and implementation of a research project. These beliefs guide researchers to seek the knowledge and select methods to answer specific questions and interpret findings in fundamental ways. The associations among them and elaborations in terms of this study can be presented in the following Figure 3.1.

![Figure 3.1. Research methodology map adapted from ‘Research parameters and corresponding critical research questions’ (Mockler, 2011).](image)

As the researcher of this study, I clarify my own social backgrounds and worldview here to give my position clearly. I spent most of my lifetime and education in mainland China between 1990s and 2010 and this period was marked by fast social and economic development across the whole society. As a consequence of this, I had opportunities to experience tertiary education and overseas studies, which was not common for girls a
generation ago in mainland China. Studying history, culture, geology, economic, political and ideological systems of the rest of the world as general knowledge was required in different stages of my formal schooling and shaped my unique ontological and epistemological positioning. Through this education I have gradually learned about cultural and historical differences, in particular between China and western countries over the years. Influenced by mainstream media, especially TV programs, I became clearly aware of contextual differences in a particular place and time. For example, I realised that people who lived in Chinese imperial times or students in contemporary western societies have quite different life experience to my own. I also noticed significant differences in educational practices between my previous learning and teaching experiences in China and my overseas studies in Australia, such as the teaching methods used and student relationships with teachers.

My cross-cultural educational experiences have shaped my view related to teaching and learning practice. Such experiences have influenced my methodological decision on approaching the knowledge of Chinese classroom practices, which grows out of my particular ontology and epistemology. Therefore I believe that “knowledge is socially constructed through collaborative efforts to achieve shared objectives in cultural surroundings and that information is processed between individuals and tools and artefacts provided by the culture” (Salomon, 1997, p. 3). This view raises the importance of contextual resources for and in learning which provides a vision to consider the use of ICT with young children and their teachers in this study in Shanghai. Drawn upon sociocultural theories and constructivism (Lincoln, Lynham, & Guba, 2011, pp. 105-108, Table 6.5), some assumptions underpin the design of the whole study and can be summarised as follows:

- The “reality” is socially constructed and understood in different ways by different individuals and communities;
- The knowledge is built through interaction in social activities in contexts;

The differences in sociocultural backgrounds and historical traditions impact human perceptions and interactions, which makes human activities in a situated context diversified and unique (Blanck, 1990; Rogoff, 2003). As stated in chapter two, the ‘truth’
revealed in previous research cannot represent realities in another unique situation because the realities at one time in one place are shaped by social, cultural and historical factors (Cohen, et al., 2013). Rogoff (2003, p. 26) argued that “truth” is simply human’s contemporary agreement on “what seems to be useful ways to understand things,” which implies that a continuous progress should be made on revision of understanding with consideration of different backgrounds and perspectives. Thus, the study of Chinese preschool teachers’ perceptions and their pedagogical practice should be connected to their specific sociocultural contexts and history of childhood education and the use of ICT in the educational system.

Drawn from my own understanding about reality and knowledge construction, the present study is located in the interpretive paradigm, which assumes that reality is socially constructed and rejects the idea of an objective reality. According to Merriam (2009), the interpretive paradigm is important and well suited to the educational context and is characterised by a concern for the individual and aims to understand individuals’ perceptions of their realities and subjective world of human experiences (Cohen, et al., 2013). It is because the aim of this study is to investigate preschool teachers’ perceptions and pedagogical practices regarding young children’s use of ICT, that the interpretive paradigm is adopted as the most suitable means to seek understanding, meaning and process of these teachers’ perceptions and classroom practices. Through interpretive approaches, this study can yield insight and understanding of these teachers’ unique perceptions and “multifaceted images” of their behaviours (Cohen, et al., 2013, p. 18). Within the interpretive tradition, this study aims to generate “thick description” (Geertz, 1973) of the participants’ perspectives. Case study is chosen as a research method as it can provide rich information and an in-depth description of the contexts and meaning for those involved (Merriam, 2009).

Due to the multiple diverse aspects of an increasingly pluralistic society and infinite complexities of human activities, to understand the varieties, contexts and contingencies of human activities demands that researchers adopt multiple inquiry perspectives and diverse ways of thinking and knowing, as well as varied ways of studying human phenomena (Greene & Caracelli, 2003). Although an interpretive paradigm assumes that reality is socially constructed, this does not preclude the possibility there can be
systematic patterns and common attributes in the construction of meaning in social and cultural contexts. As a result, quantitative research can also be useful to study social and human issues. Instead of being used to test theory, hypothesise and generalise ‘absolute truth’, the aim of generating quantitative data in the present study was to enhance a description of the findings, particularly important, the identification of salient themes. It can further identify patterns, describe the distribution of attributes and regularities of sample participants (Merriam, 2009), which can be inferred to the study population in the district of this study.

**Mixed Methods Approach**

**Mixed Method Design**

This study deploys a range of interpretive methods to seek “better ways to make more understandable the worlds of experience” studied (Denzin & Lincoln, 2008, p. 29). Denzin and Lincoln (2008, p. 29) further note that, “no single method can grasp all the subtle variations in ongoing human experience.” In the same vein, Tashakkori and Teddlie (2003) argued that it is impossible to fully understand the complexities of social phenomena and human activities by using either purely quantitative or purely qualitative techniques. The utility of mixed methods can provide opportunities for presenting the multifaceted realities by a variety of data resources. It also offers an alternative way to ‘plug a gap’ by putting together procedures and drawing insights from both approaches (Johnson & Onwuebuzie, 2004). Quantitative methods can measure some aspects of the phenomenon while qualitative methods can capture and understand others, thus together they can explore “variations in the construction of meaning of concepts” (Bergman, 2010, p. 172). Therefore, both quantitative and qualitative approaches have been deployed in the present study as they have their own distinct advantages in answering specific research questions.

The selection of research design is determined by “the nature of the research problems and the questions being asked” (Stake, 1995, p. 41). The main purpose of this study is to investigate preschool teachers’ perceptions and pedagogical practices regarding young children’s use of ICT in Shanghai. As far as the research question is concerned, identifying, describing and interpreting preschool teachers' perspectives concerning
young children’s use of ICT in the preschools can only be achieved through questioning them, looking closely at their practices and listening to their perspectives. Thus, the research design consists of varying emphases on data collection by questionnaires, observations and interviews in which triangulation between the data is sought to reduce the likelihood of misinterpretation (Stake, 1995). The combination of those chosen techniques can increase the richness of the data collected as a whole, which “allows inferences or leads drawn from one data source to be corroborated or followed up by another” (Bryman, 1992, p. 47).

Questionnaire, a traditional quantitative source of data generation (Creswell & Plano Clark, 2006), with careful planning, can enable the researcher to obtain broad information from a large and widely distributed population within a relatively short amount of time and resources (Dörnyei & Taguchi, 2010). A questionnaire study can examine current teachers’ attitudes, beliefs, opinions, or practices (Creswell, 2008). In addition, a self-report questionnaire is helpful to answer the research questions like ‘what’, ‘how much’ and ‘how many’ (Yin, 2009) and allows participants to accomplish the questionnaire at their own pace. Therefore, a self-report questionnaire (Appendix 3) is used in this study to address a series of quantitative questions. For example, how many ICT resources are available in the preschools? How often or how much time young children use ICT in the classrooms during a week? How the teachers perceive young children’s use of ICT and how frequently they use a wide range of teaching strategies to support children’s ICT activities? However, quantitative results cannot explain the outcome adequately, whereas further interpretations can help understand meanings and reasons behind observed phenomena. I am particularly interested in how Chinese preschool teachers interpret young children’s use of ICT and construct their understanding in a specific cultural context, and what personal views or professional perspectives they attribute to their experiences and why. Therefore, according to Yin (2009), case study as a complementary to quantitative data can be used to answer ‘how’ and ‘why’ types of questions. In this research, the quantitative method has been first use to investigate teachers’ perceptions and pedagogical practices regarding young children’s use of ICT in the preschools. Based on pre-set criteria in the questionnaire (see the ‘Questionnaire’ section) four exemplary cases were found to explore deeply the
questions ‘Why do these teachers interpret young children’s use of ICT in particular ways?’ and ‘How do they use ICT in their classrooms?’

Thus, this research uses an empirical approach where quantitative and qualitative methods are used to maximise the value of information available (Aiken, 1996). The measurement of teachers’ perceptions and their pedagogical practice helps establish the links between variables and identify the relationship which may not be visible to themselves. Further, the qualitative design provides detailed understandings of the context and process of the events and discovered meanings for those teachers involved in the phenomena of the use of ICT for teaching and learning in classrooms. The combination of quantitative and qualitative methods can capture more information by noting what the trends and general characteristics are as well as providing an in-depth knowledge of participants’ perspectives (Creswell & Plano Clark, 2006).

In terms of combining or integrating methods, some mixed methods writers (Creswell & Plano Clark, 2006; Maxwell & Loomis, 2003) suggest a variety of design models with visual diagrams to present the procedures and explain how mixed methods can be fruitfully and productively combined. A sequential mixed methods design is a common approach which involves different procedures in collecting data. According to the “four typical types” of methods design of Creswell (2008, p. 560), the research design of Model Three is a sequential explanatory one. The purpose of this model is to collect qualitative data to help or elaborate quantitative results. The following Figure 3.2 demonstrates a visual presentation of the explanatory mixed methods design.

![Figure 3.2. Explanatory sequential mixed methods designs (Creswell, 2012, p. 541)](image_url)

This model is modified and adopted to be the research design of this study. The modified design in Figure 3.3 is similar to this model, but differs in the way that the
current study involves using the results of quantitative data and a limited amount of qualitative data for the qualitative case study.

![Figure 3.3. Modified research design](image)

Both quantitative and qualitative data were used in the way that they both investigate the teachers’ perspective and pedagogy and maximise the richness of the data in addressing the research question. In order to achieve the purpose of the research, the study was broken down into three sequential phases, the first Phase of which was a questionnaire pilot study (Appendix 2) and the results were used to develop the final questionnaire instrument (Appendix 3). Phase 2 was directly related to the data gathered from the instrument used. It was analytical and involved consideration of quantitative data and a small amount of qualitative data gathered from the refined questionnaire. Phase 3, based on the analysis of the data in Phase 2, was the qualitative study gained through the descriptive case study. Qualitative data in Phase 3 was to enrich, explain and explore the quantitative data in the words and actions of the participants via interviews and observations. Data types were mixed by connecting the quantitative phase to the qualitative phase. According to the literature and quantitative data result, I identified a list of first-round interview questions (Appendix 6) and then selected cases to answer these questions. Based on the observations, the second-round interview questions (Appendix 7) were developed to further help understand observed practices in the classrooms.

**Research Population and Sample**

The targeted population of participants for the study was preschool teachers who were teaching young children in the preschools in the Pu Tuo district of Shanghai. Taking human resources and time into consideration, only teachers in preschools of one district, Pu Tuo, were involved in the study. The population was sampled using purposive
sampling techniques, due to the need for a relatively large sample and the cost and time constraints for a single researcher.

However, using purposive sampling to select individuals and sites for the study was to seek to focus on cases that can best illuminate, highlight or understand the central phenomenon. The standards used in choosing those participants and sites were whether they were “information rich”, which could provide “useful information” and help develop a detailed understanding of the phenomenon (Creswell, 2008, p. 214). In this study, the research aim is to investigate teachers’ perceptions and pedagogical practices in relation to young children’s use of ICT. There were four criteria for selecting case study teachers based on their response to the questionnaire: the availability of ICT resources; young children’s high access to ICT; teacher’ positive perceptions of young children’s ICT activities and their more frequent pedagogical practices supporting the children’s ICT activities. Through selection, four teachers and their classrooms with rich information in terms of ICT usage in the preschools were chosen to conduct the case studies.

Pu Tuo district is located in the centre of Shanghai, which ranks top in educational achievement in its history in the area of Shanghai (Shanghai Education Commission, 2006c). The Pu Tuo district was chosen for the present study due to the following reasons: (1) It is located in an urban area. The preschools in urban districts generally have relatively more ICT resources in ECE settings than that in suburban and rural places due to social and economic factors (Zhou, Chen, & Jin, 2009; Zhu, 2008a); (2) According to the Shanghai educational official, J. Qu (personal communication, January, 28, 2012), the preschools in this district have been recognised as pioneers in the educational field. The introduction of ICT into these preschools for improving educational practices started relatively early compared to other districts, which may promote the investment of ICT resources and ICT integration in the classrooms; (3) The preschools in this district have actively been taking part in various research programmes both internally and externally. As a result, it was anticipated that the teachers in this district would be willing to actively participate in the study.
Pu Tuo district consists of 80 preschools with approximately 1400 full-time preschool teachers. The district was geographically divided into four zones for the purpose of the sampling such that there were 20 preschools in each zone. The intention was that the sample obtained would represent all zones. Five preschools were randomly chosen from each of the four zones (east, west, north and south zone).

Methods of Data Collection

**Questionnaire**

Development of the Criteria

As noted above, the main purpose of the questionnaire data was to capture a picture of Chinese preschool teachers’ perceptions and pedagogy in relation to young children’s use of ICT in Shanghai and to inform and enrich data for deeper understanding of the phenomenon. According to Dörnyei and Taguchi (2010), using questionnaires “can yield three types of data about the respondents: factual, behavioural, and attitudinal” (p. 5). The questionnaire with a six-point Likert scale to assess different levels and frequency of their attitudes and behaviours was developed on the basis of the literature review to collect respondents’ information about teachers’ views and classroom behaviours related to ICT usage by young children.

To generate an initial pool of items, I identified previous studies that explored teachers’ perceptions and pedagogical practices related to the use of ICT in the early years. Based on the literature and the purpose of this research, I developed four criteria for the questionnaire to investigate the current status of the preschool teachers and then used them to choose potential exemplary cases for the qualitative study:

(a) Availability of ICT resources in the preschool
(b) Young children’s high access to ICT and frequent ICT activities
(c) Positive perceptions of ICT benefits and potential for young children
(d) Teachers’ wide range of pedagogical practices regarding young children’s use of ICT

Criterion One: Availability of ICT resources in the preschool
It is a prerequisite for preschool teachers and young children to use available ICT resources them in early childhood educational settings (Bingigmlas, 2009; Ihmeideh, 2009; Morrow & Mackey, 2008; Welsh, 2009). Infrastructure of ICT resources such as ICT types, numbers, functions and the qualities in educational workplaces are an external factor in influencing teachers’ adoption of ICT for preparing classes and their further ICT integration into education. This study focuses on technological devices and process such as computers, cameras, electronic projectors, CD/DVD players, video recorders, smartphones, iPads, TV and internet connections for teaching and learning in EC classrooms. Since performance of specific behaviours “depends at least to some degree on availability of requisite opportunities and resources,” which to some extent determine the likelihood of behaviours and achievement of actions (Ajzen, 1991, p. 182), the outcomes of implementing ICT into the early years can be strongly impacted by the existence of ICT resources and number for young children and their teachers.

In fact, the selection of this theme in the questionnaire for the investigation of the Chinese preschool teachers and identification of cases in Shanghai preschools has been further justified by several recent studies (Guo, 2011; Hu & Szente, 2009; Zhu, 2008a) conducted in the Chinese context. Their findings showed that the majority of preschools in many areas of China lack basic educational resources and information technologies (IT) infrastructure. They indicated that the access to ICT resources is foundational for early childhood teachers and young children to integrate new technologies into their teaching and learning. In other words, the availability of ICT resources is necessary but not sufficient for users to achieve ICT integration in their classrooms. If ICT resources in a particular preschool are rich and various, they give teachers and young children the potential to have access to them. The section two of the questionnaire includes an ICT resource list for the teachers to report their ICT resources, which obtains a broad picture of ICT resources and helps find out particular preschools with relatively rich ICT resources where potential case study teachers might exist (See section two in Appendix 3).

Criterion Two: Young children’s high access to ICT and frequent ICT activities

To help uncover preschool teachers’ perceptions and pedagogy, young children’s access to ICT is another prerequisite for establishing this research. This criterion includes
closed questions about children’s access to ICT, their time and frequencies of using ICT, and a list of young children’s ICT activities (See section three in Appendix 3).

Criterion Three: Teachers’ positive perceptions of ICT benefits and potential for young children

This criterion was developed on the basis of the review on teachers’ perceptions of ICT (Clayton, 2003; Drenoyianni, 1998; Loveless, 2003; Wozeny, Venkatesh, & Abrami, 2006), but the focus of this study is on teachers’ perceptions of young children’s use of ICT. The aim of developing this criterion was directly related to one sub-question “what are preschool teachers’ perceptions of young children’s use of ICT.” Because one of the research aims is to make a significant contribution to fill a research gap in the review that little knowledge about preschool teachers’ perceptions of young children’s use of ICT, this study intended to find out what were the realities in this sample of Chinese preschools. As a result, the most frequent topics and heated debates in the literature related to young children’s use of ICT such as the role of ICT in ECE and whether young children should have access to it in previous studies (Cook, 2003; House, 2012; Plowman & Stephen, 2003a) were ‘re-examined’ in the context of China (See section four in Appendix 3).

Criterion Four: Teachers’ wide range of pedagogical practices regarding young children’s use of ICT

In past studies, a repertoire of teaching strategies from a sociocultural perspective such as guided interaction, facilitating peer interaction and scaffolding are considered to be effective pedagogy in terms of supporting children’s ICT activities (Chen & Chang, 2006; Hayes & Whitebread, 2006; Sheridan & Samuelsson, 2003; Turja, et al., 2009; Yelland, 2001). The purpose of developing a scale for a range of pedagogical practices was to investigate the extent to which these teaching practices were being employed by Chinese preschool teachers. The questions were designed to examine teachers’ pedagogical practices from social cultural perspectives (See section five in Appendix 3).

Construction of Questionnaire Scales

The main body of the questionnaire consists of five parts, including both closed questions and open questions. Closed questions and rating scales generate an overview
of teachers’ perceptions and pedagogical practices regarding young children’s use of ICT. The open questions provide a further insight into teachers’ perceptions of young children’s use of ICT.

A sequence of items in the questionnaire can significantly “have an impact on its interpretation and the response given to it” (Dörnyei & Taguchi, 2010, p. 48), the factual questions are best put at the beginning of the questionnaire because it may be easy for participants to start with the questions concerning their backgrounds. Therefore, the first part was the demographic information of the participants, including their educational backgrounds and ICT experiences. The second and the third sections investigated the availability of ICT resources, children’s access to ICT, and their ICT activities, respectively. Then the fourth part, using a modified Likert scale of six response categories from “strongly disagree” to “strongly agree,” asked for teachers’ perceptions of young children’s use of ICT. The fifth part of the questionnaire measured the frequencies of teachers’ pedagogical practices in relation to young children’s ICT activities by using a six-point rating scale from “always” to “never.”

The reasons for using an even number of Likert categories are that the respondents are encouraged to think more about their answers, rather than selecting a middle ‘indecisive’ category. This in turn provides better discrimination between respondents and hence higher scale reliabilities (Bourke & Frampton, 1992; Chomeya, 2010). A Likert six-point scale should be preferred for older children and educated adults (Bourke & Frampton, 1992). Both the fourth and the fifth sections were directly related to each other in answering the research question “What are preschool teachers’ perceptions and pedagogical practices regarding young children’s use of ICT?” At the end of the questionnaire, an invitation for further involvement in the study was used to elicit more detailed information for the identification of cases for the next phase.

The total 47 items were selected from the literature to measure four aspects of teachers’ perceptions about young children’s use of ICT, and one aspect measuring pedagogical practices, as described in Table 3.1
Table 3.1

*Scales for Teachers’ Perceptions and Pedagogical Practices*

<table>
<thead>
<tr>
<th>Scale Name</th>
<th>Perceptions and Pedagogical Practices</th>
<th>No of Items</th>
<th>Items No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Benefits</td>
<td>Teachers’ perceptions of ICT benefits and potential</td>
<td>9</td>
<td>1, 5, 7, 15, 17, 21, 27, 29, 35,</td>
</tr>
<tr>
<td>2. Reasons</td>
<td>Reasons for young children using ICT</td>
<td>7</td>
<td>3, 8, 10, 12, 23, 26, 32</td>
</tr>
<tr>
<td>3. Views</td>
<td>Children’s access to ICT and appropriate use of ICT</td>
<td>10</td>
<td>11, 14, 16, 19, 20, 24, 25, 28, 30, 34</td>
</tr>
<tr>
<td>4. Sociocultural perspectives (SCT)</td>
<td>Guidance and importance of children’s peer, families, communities</td>
<td>9</td>
<td>2, 4, 6, 9, 13, 18, 22, 31, 33</td>
</tr>
<tr>
<td>5. Pedagogical Practices</td>
<td>Pedagogical practices in terms of young children’s use of ICT</td>
<td>12</td>
<td>36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47</td>
</tr>
</tbody>
</table>

Scale one was about teachers’ perceptions of ICT benefits and potentials (9 items) and Scale two was about reasons for young children’s use of ICT in preschools (7 items). Both scale three (10 items) and scale four (9 items) were designed to measure teachers’ views on young children’s access to, exploration with ICT and sociocultural contexts for young children’s use of ICT. The pedagogical scale (12 items) was related to a range of teaching strategies that teachers used to support young children’s use of ICT in classrooms.

In order to maximise the accuracy of written transcripts of questionnaire questions, all Chinese translations into the participants’ mother tongue Mandarin were carefully prepared in advance and verified by five PhD students in the education field who are fluent in both Chinese and English to avoid the errors of translation. Additionally, a native Chinese-speaking lecturer in the ECE field in the School of Education at the University of Newcastle was invited to check a few ‘difficult’ translations of the questionnaire.

Administration of the questionnaire

To ensure clarity, the pilot questionnaire (Appendix 4) was sent to the principals of 10 randomly selected preschools for testing prior to the administration of the actual study in the district of Pu Tuo. The principals gave their permission for their preschools to participate in the study and nominated an officer in each preschool to distribute the
Participant Information Statement and the questionnaire. The initial questionnaire for the pilot study was completed anonymously. After responses to the questionnaire returned by the pilot respondents were examined, the list of ICT resources and children’s ICT activities in the classroom were modified and some ICT resources and ICT activities that were rare in the classrooms were removed from the options. The participants were then asked for the frequency of the children’s use of ICT in the classroom over a month, rather than choosing four options (never, monthly, weekly and daily). This is because many children only had few ICT activities over a week. A decision was made to delete four redundant items from the questionnaire because four similar questions generated almost identical results.

Subsequently, the final questionnaire was developed and then loaded onto survey software, surveymonkey.com, as the online mode of administration was recommended by the Shanghai Education Director. According to the Director, it is more convenient and common for preschool teachers in Shanghai to answer questionnaires online because the Shanghai Education Commission often used online surveys to study the local teachers. The respondents were given two weeks to complete the questionnaire (Appendix 5). They were advised that their participation or non-participation were strictly voluntary and they were further invited to express interest in being part of Phase 3 of the study by checking the appropriate boxes at the end of the questionnaire.

**Interview**

The Purpose of Interview

Using a questionnaire as a means of collecting data is limited to a set of question items, whereas an interview complements a questionnaire in obtaining potentially richer and more complete data (Cohen & Manion, 1994; Creswell, 2008; Slavin, 1992). Cohen and Manion (1994), explain that one purpose of conducting interviews as a complement to questionnaires and observations is to validate these methods and “go deeper into the motivation of respondents and their reasons for responding as they do” (p. 273).

Interview is considered to be a popular method among the major types of data collection employed to allow the researcher to gain insight into the experiences of the subjects (Creswell, 2008), their personal understanding, interests, values, concerns and
knowledge. The purpose of qualitative interviews is to derive interpretations from respondent’s talk and “discern meaningful patterns” within thick description (Warren, 2002, p. 87). Merriam (2009, p. 88) notes that interview is the “best technique to use when conducting intensive case studies” of several selected individual cases. As a result, interviews in the current study were used to find out what is ‘in and on four Chinese preschool teachers’ minds’ and ‘what are their interpretations and understandings of young children’s use of ICT’ through open-ended questions. The aim of the interviews was to seek information and knowledge about the meaning of participants’ experiences and perspectives.

The current design includes two rounds of interviews with four participating teachers. The purpose of arranging the first round of interviews (Appendix 6) with four individual teachers after they completed and returned the questionnaires was to further collect teachers’ deeper perspectives on the data obtained via the questionnaires and to elicit teachers’ fuller views on the research topic. The aim of conducting the second, post-lesson round of interviews with these four participants after the classroom observation was to help teachers recall and reflect on their pedagogical practices and explain their reasons for the specific teaching practices they employed in the recorded and observed lessons. The questions for the second-round interviews were triggered by the video recording as a prompt (Appendix 7). This part focused on their unique pedagogical practices in terms of young children’s use of ICT and invited these participants to state/clarify/affirm their intentions and explain/challenge/explore conflicting information or unexpected results collected from those interviewees in the video. Using the video as an interview cue stimulated reflections about pedagogical practices as informants were asked to reflect on and explain these activities.

The first-round interviews were open-ended, and built on the literature review and participants’ responses to the questionnaire. The open-ended question in collecting qualitative data has its unique advantages as identified by many researchers (Cohen & Manion, 1994; Merriam, 2009). First, it is flexible and allows the researcher to probe deeply or “clear up any misunderstandings.” Second, it promotes co-operation and helps establish rapport between the interviewer and interviewees. Last but not least, open-ended questions can work like a “funnel”, leading to unanticipated answers (Cohen &
Manion, 1994, p. 277) and “fresh insights and new information can emerge” (Merriam, 2009, p. 91). In short, open-ended questions can yield more detailed and descriptive data, and are widely considered to be ‘good’ interview questions.

The key to obtaining good data from interviews is to ask good questions, but asking good questions takes practice, as does building rapport with interviewees. Pilot interviews are crucial for improving the quality of questions and interviewing skills (Merriam, 2009). As a result, the interview questions were “piloted” in advance with several members of my personal network who are preschool teachers in Shanghai, and this helped in modification of the questions and honed my interviewing skills so as to avoid asking any leading or ambiguous questions before conducting the main study interviews. To serve the same purpose of improving the quality of interview data, I tried to avoid judging any responses from the interviewees in order to motivate the participants to express and share their opinions about the topic freely, without worrying about being commented on or criticised from any ‘professional’ perspective posed by the researcher (Rubin & Rubin, 1995).

The Conduct of Interview

According to the survey results and teachers’ expression of interest in participating further in the study, four teachers from two preschools were approached and asked if they would be willing to be involved in the case study. Each teacher accepted the invitation and gave their consent for participation. Then I contacted them immediately to discuss and arrange my interviews, and I visited each preschool once for orientation and familiarisation prior to conducting the first interview. During the visit, I met the interviewees to negotiate the place and exact time for their convenience. I explained my interview purpose and process to the participants before proceeding. The participants were assured of confidentiality and strict anonymity. This helped to build a good rapport between the researcher and participants. I also clarified the definition of ‘ICT’ by providing some examples to them, because there are various definitions of ICT in the educational field which may have caused misunderstanding in their interpretation.

The interviews were held in a quiet meeting room in each preschool during the daytime. I conducted all the interviews with each teacher individually. The process of interview
was based on guided conversation (Rubin & Rubin, 1995), with emphasis on asking questions and listening, answering between the researcher and participants so both could respond to the situation at hand; follow through on questions or explore information flexibly (Merriam, 2009). To achieve the flexibility during the interview, the guided interview schedule and the outline of the questions were adopted, but the sequences of questions could be changed to suit the flow of the conversation, allowing for additional questions and prompts for purposes. Therefore, the discussion could be adapted or retuned, even topics changed in light of statements given by participants for the purpose of research. At the same time, interviewees were free to vary their response “around and out the core” without a fixed sequence and relevance (Freebody, 2003, p. 133). Interviews were digitally audio-recorded with the permission of participants for convenience and facilitation of data analysis, then transcribed directly.

Mandarin was used as the language for all interviews. The interview dialogue was then translated from Mandarin to English, involving a process of checks and reviews. Part of this process involved the assistance of a member of staff at the University of Newcastle who is a native Chinese speaker checking interpretations of responses. The transcription of each interview was sent to the respondents to seek verification of the data collected from them in order to achieve “a relatively higher level of accuracy and consensus”, as Cho and Trent (2006, p. 322) discussed the validity of qualitative research by means of “revisiting facts, feelings, experiences, and values or beliefs collected and interpreted,” that is, asking participants to give feedback on researchers’ interview content. It is a research strategy used to reduce or eliminate possibility of misinterpreting participants’ meaning (Merriam, 2009). One of the teachers did not respond to review the transcript of her interviews (reasons are discussed in chapter seven), and another added two sentences to provide more information in describing young children’s use of ICT in her classroom. The other two teachers did not make any changes as they were satisfied with the transcripts of their interviews.

**Observation**

The Purpose of Observation

In qualitative data collection, observation is a major means to gather firsthand, open-ended accounts of the people and settings studied (Creswell, 2008; Stake, 1995).
Observation takes place in the natural field and allows for study of actual behaviour as it is happening. Both Stake (1995) and Merriam (2009) underscored the importance of researchers’ purpose or questions of interest in deciding on the targets and structure of observation. In other words, what is to be observed is determined by the research aims. As far as this study is concerned, the purpose of observations was to probe and analyse deeply the multifarious classroom practices and to identify the current landscape of the use of ICT in the preschool. Thus, the settings, participants, activities and events that were planned to be observed included: ICT resources (e.g. locations, numbers and types); the teachers’ use of ICT with young children; young children’s ICT activities; the teachers’ pedagogies related to the children’s ICT use; children-teacher, children-children and children-ICT interactions; physical environment for ICT use; and any curricular or class schedules related to ICT use, such as a timetable for ICT activities.

As a research tool in addressing specific research questions, observation can produce trustworthy results (Merriam, 2009). Different from interviews held in a designated location, observation is one of the most straightforward ways to gain raw data and get a picture on what is going on (Cohen & Manion, 1994; Slavin, 1992) in the preschools studied, which can be then useful to triangulate with questionnaire data, for a number of reasons now discussed.

First, concerning the authenticity of data collected. Although data collected by a self-reported questionnaire and semi-structured interviews may be considered to be true in the sense that participants can be expected to tell the ‘truth’ to reflect their perspectives at that time, it is also possible that the participant may “have a conscious and deliberate intention” or unconsciously (Chan, 2010, p. 131) to do otherwise. As a complementary technique observation can be used to double check, contrast and compare participants’ responses in questionnaires and interviews through adding another method to triangulate the data. The result of observation can further add, clarify, affirm or challenge the study findings in the questionnaire and interviews.

Second, teachers’ observed pedagogical practices might be found more frequently or be more complex in their classrooms than what was reported in the questionnaire. Teachers may have difficulty articulating the finer points of their pedagogical practices in an
interview, whereas observation, particularly followed by an interview, allows for
discussion of all topics or details to take place. Indeed, video images of classroom
practices can further provide evidence and details to allow teachers to powerfully
explain specific actions or social interactions that take place in a situated setting, which
may be ‘difficult’ to describe fully in words (Walsh et al., 2007). Merriam (2009)
contended that observation is the best technique to use when an activity, event, or
situation can be observed firsthand. As a result, observation is commonly used in
studying classroom activities in educational research because it can yield depth and
breadth and richness of data.

Finally, observation allows reality to be more directly represented and helps to develop
an in-depth understanding of the phenomenon at hand because observation can provide
some knowledge of the context or specific behaviours. For example, what is the
physical environment like? What objects and ICT resources are in the setting? What
kinds of behaviour is the setting designed for? Are all young children engaged in the use
of ICT in the classroom? How do the children interact with ICT resources and with their
peers? Questions like these can be well answered only through systematic and careful
field observation.

The Conduct of Observation

According to the process of observation suggested by scholars such as Merriam (2009)
and Stake (1995), the whole observation was broken into the three stages: entry, data
collection and exit. In each stage, systematic and careful arrangements prior to the
classroom observations in the preschools were carefully made.

The Entry

Based on the participants’ responses and willingness to engage in Phase 3, one class in
each preschool was selected and hence the total of two classrooms were observed to
explore the teachers’ pedagogical practices in relation to young children’s ICT activities.
Before the observation, I explained my classroom observation process for collecting
data to the class teachers to reconfirm what I would do during their everyday activity. I
told them that I needed to know the environment and give young children time to get
familiar with me and understand their contexts as thorough as possible during a very
short period. Concerning the threats to authenticity and trustworthy from my presence in the setting, I spent two hours each day over a week in each case preschool to get familiar with the participating class and establish a rapport with the children and teachers in order to relieve any uncomfortable feelings with my presence. One important purpose was to let young children ‘forget’ the presence of the video camera and become accustomed to my presence within the learning space.

Data Collection

Due to there being “no single best approach to deciding the degree to which the observer should participate in the activity being observed” (Slavin, 1992, p. 68), my role and participation was dependent on the situations and characteristics of the setting. In order to effectively “look at, listen to, [and] document what the participants are doing and saying” (Billman & Sherman, 1997, p. 2) around ICT usage, I had “changing observational roles” as defined by Creswell (2008, p. 223) as “the researchers adapt their roles to the situation.” In this case I was able to shift my roles between participant observer and non-participant observer for different purposes on some occasions. I did walk around in the preschool and show interest in children’s ICT activities sometimes, although I did not take part in their classroom activities. Sometimes, young children were also interested in asking questions of me and some non-verbal communication between the children and me also took place. I participated in the young children’s activities such as having a conversation or interaction with them only when they asked questions to me or sought some help from me. I did not participate in any planned or unplanned learning activities.

Video recordings and field notes were used for finding out as much as possible about the participants. With the permission of both teachers and children’s parents, classroom activities were videorecorded to facilitate data analysis. By using the digital video camera in the settings, the focused events were captured, but some notes about their non-verbal features were captured as well. As a consequence, these teachers’ teaching strategies and interactions were naturally observed. I tried not to alter the classroom in any way by recording whatever happens in the situation. The field notes were used to describe the physical setting and other contextual features with a focus on the teachers’ pedagogical practices with young children. Furthermore, it was useful to get some
general knowledge about the preschool in advance through their documents such as curriculum schedules. The helpful background information and educational documents provided more insights to view the context, such as the features of curriculum and the developmental goals.

In addition, I wrote reflections on each day’s observation including my own thoughts about what happened and why certain practices or issues were emerging. It is important to add more clarification and comments about the observations as well as what is observed for a fuller picture of the reality (Merriam, 2009; Slavin, 1992). Both descriptive field notes and reflective field notes for description of activities and my personal thoughts were made in an effort to promote reflection, interpretation, and analysis (Creswell, 2008). For instance, while observing young children’s ICT activities in the preschools, I also paid attention to the teachers’ ICT use in their staff rooms and wrote down what ICT resources they had in their offices and their own ICT activities in everyday work. This is because, although the focus of this study is the teachers’ perceptions and pedagogy regarding young children’s ICT activities, teachers’ own use of ICT might reflect their attitudes towards ICT or predict their teaching strategies in supporting children’s ICT use to some extent. In the analysis, I took these field notes into account by comparing the teachers’ ICT resources and uses with the children’s ICT activities, which further helped understand the current status of their ICT integration in the classroom.

Exit

Charmaz (2006, p. 113) used the concept of “saturation” to decide the necessary amount of data with less constraint from time and research funding and suggested that researchers can stop collecting data when “gathering fresh data no longer sparks new theoretical insights, nor reveals new properties of your core theoretical categories.” In other words, by the time of research saturation, there are no new information, insights, perspectives or understanding forthcoming (Merriam, 2009). Before conducting the observation, it was planned to spend a week collecting data in the classroom. During a week of observation in each preschool, I noted that no new classroom activities were occurring, in particular, teachers’ pedagogical practices in supporting the children’s use of ICT were almost the same on the fifth day, so classroom observations in the
fieldwork stopped when the data was ‘saturated.’ Before I left the preschools, I explained my leaving to the children and the teachers in advance and sincerely thanked the preschool staff and the children for all the support especially the four participating teachers and their classes.

**Research Procedures**

Three phases to the research were undertaken to achieve the purpose of examining preschool teachers’ perceptions and pedagogies. The first Phase of which was a questionnaire pilot study and the results were used to develop the final questionnaire instrument. Phase 2 was actual study gathered from the refined questionnaire modified after the pilot. Phase 3, based on the analysis of data in the Phase 2, qualitative data was gained through the case studies with four teachers. In this section each phase of the research is described.

**Phase 1: Pilot study**

10 preschools in urban districts of Shanghai were randomly selected to participate in a pilot study with the main purpose of refining the questionnaire. 109 preschool teachers from 10 preschools in urban Shanghai were invited to participate. The Pu Tuo district in Shanghai was not included in the sample, because the actual study was conducted in this region.

**Phase 2: Questionnaire**

Preschool teachers who were directly involved in teaching young children in the Pu Tuo district in Shanghai were invited to participate. Geographical sampling was employed to select 20 preschools. This district is located in the central area of Shanghai and has a good reputation for educational reforms and innovative research and also ranks top in educational achievement according to the Shanghai Municipal Education Committee.

**Phase 3: Case studies**

Upon the completion of the questionnaire, planning for case studies of four teachers commenced. Four case study teachers from two different preschools were invited to take part in a further study, according to the questionnaire results and teachers’ expression of willingness to participate. There were 35 teachers (11.1%) who reported
that young children had used computers in their preschools, and only 13 teachers (4.2%) indicated their willingness to participate for further study. Among these teachers, their responses to the scales were compared for selecting case study teachers who had positive perceptions and a wide range of pedagogical practices in relation to young children’s frequent use of ICT. Based on the result, four case study teachers named Hua, Yan, Fang and Li were chosen for interviews and classroom observations. Teachers were given opportunities to withdraw from the study at any time without giving any reason. If any of these four participants decided not to participate, replacements would be based on the questionnaire result and indication of willingness. Fortunately, none of four teachers withdrew their participation during the research study.

In case studies, I collected data through ‘asking’, ‘listening’ and ‘watching,’ which were done systematically by pre-observation interviews, observations and post-observation interviews in Phase 3. In the first round interviews, each individual teacher was asked to respond freely and honestly to a number of questions (Appendix 6) about their views and pedagogical practices regarding young children’s use of ICT. Subsequently, their classroom practices in relation to young children’s ICT activities were video-taped. Because two teachers were responsible for one class and they shared teaching together, the total of five sessions related to the use of ICT over a week were captured in each preschool, which all took place in the morning. Subsequent to this, a follow-up interview of approximately 40 minutes was conducted with each of the four teachers in which they were asked to further explain their teaching practices, using the video recording as a prompt (Appendix 7). The following table shows the research stages.

Table 3.2

<table>
<thead>
<tr>
<th>Data Collection Phases</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot</td>
<td>Piloted the questionnaire</td>
<td>Step 1: Surveyed 316 teachers</td>
<td>Step1: Interviewed four teachers</td>
</tr>
<tr>
<td>Step 2: Refined the initial questionnaire</td>
<td>Step 2: Data analysis and selected four cases</td>
<td>Step 2: Observed their classroom teaching</td>
<td>Step 3: Follow-up interviews</td>
</tr>
</tbody>
</table>
Data analysis

The preceding sections have explained the rationale of using mixed methods for this study and how to gather data for quantitative and qualitative study through questionnaires, interviews and observations. Data were analysed by different means which are explained below.

Quantitative data

The quantitative data collected from the study were analysed using Statistical Package for Social Sciences (SPSS). Firstly, analyses were undertaken to describe the teachers’ backgrounds and children’s ICT usages. Secondly, scales were developed to measure teachers’ perceptions and pedagogical practices regarding children’s use of ICT. Scale means, standard deviations and reliability were calculated and reported. Finally, relationships and differences between teachers’ demographic backgrounds and their perceptions and practices were presented using cross-tabulations, correlations, t-tests and one-way ANOVAs. When an ANOVA indicated a significant difference between groups, a Scheffe test was used to identify which of the individual groups were significantly different from other groups.

Qualitative data

The qualitative data were generated from open-ended questions in the questionnaire, the interviews and observations. According to Merriam (2009), based on a review of literature and her own research experiences, qualitative analysis is mainly inductive and comparative. Further she notes that qualitative data collection and analysis should occur concurrently. As a result, the analysis process started with data collection, transcribing the recordings, which was then followed by organising descriptive accounts, themes and generating categories.

In the case studies, the massive amounts of qualitative data involved audio and video transcripts, documents and field notes, which were brought together first and then sorted out into organised patterns. Thematic analysis was employed to identify, analyse and report patterns generated from the data. As a foundational method for qualitative analysis (Braun & Clarke, 2008, p. 81), thematic analysis can report experiences,
meanings and the reality of participants, which “acknowledge the ways of individuals make meaning of their experiences, and in turn the ways the broader social context impinges on those meanings.” According to a step-by-step guide provided by Braun and Clarke (2008), the analysis of the qualitative data in this study followed six phases.

1. Familiarise myself with the data

I replayed and listened to audio recordings many times, often repeatedly for the purpose of writing down a detailed transcription of original interview data. After transcribing the recordings of interviews with four teachers into written form, I read and re-read the data, writing down my initial ideas and understandings about the interview data.

The collected video footages were first converted into digital forms and imported into the qualitative analysis software package NVivo. The videos were watched repeatedly and transcribed to gain an understanding about the observed data. The people, settings, activities and interactions in the classrooms related to ICT usage were described in greater detail in order to get a broader and fuller picture of their classroom practices. The classroom observations were analysed with a view to address the following key aspects:

- The types, frequencies and ranges of teaching strategies to support the children’s ICT activities
- The degree of children’s agency, participation, competencies and engagement in ICT activities
- The way ICT was used by the teachers and young children
- The children-teacher, children-children and children-ICT interactions in the process of their ICT activities;
- The nature of physical environment for ICT use;

2. Generate initial codes

The initial codes were mainly descriptive which summarise the data segments and in turn provide the basis for high-order coding and searching for themes and patterns (Punch, 2000). Using NVivo software, the interview data were coded into several meaningful broad groups, based on the interview questions and the participants’ responses. For example, the interview data about the reasons for the children’s and the
teachers’ use of ICT were coded into ‘Reasons for use of ICT in the classroom.’ In total, the interview data across the four case study teachers were coded into following broad categories as represented in chapter 5 and chapter 6: young children’s use of ICT; reasons for the use of ICT in the classroom; teachers’ perceptions of ICT benefits and potential; teacher’s perceived changes and challenges; ICT training for teachers; young children’s ICT home use and teacher’s reported pedagogical belief and practices.

The process of constructing categories and coding the videos was cyclical and iterative, and was continued until all the codes were sufficiently comprehensive to capture all the important features of observed practices took place in the classrooms. For instance, the data about interactions including physical and oral interactions between the teachers and the children in the process of using ICT in their settings were coded as ‘Interactions with young children.’ Later, this code was further categorised into another higher level coding ‘Teachers’ Pedagogy’ The classroom observations collected from two preschools were coded into five groups to provide an overview of their current status of ICT use in the classroom as described in chapter 5 and chapter 6: ICT resources in the classroom; young children’s ICT activities in the classroom; young children’s ICT competencies and experiences; teachers’ use of ICT in the classroom; teachers’ pedagogical practices regarding young children’s ICT activities.

3. Search for themes

I collated and combined the codes into possible themes, which resulted in coding all the data into different themes. The data have been grouped into four main themes. There were: (1) current status of ICT use in the classrooms; (2) enabling factors for ICT integration; (3) barriers for ICT integration (4) potential for changes. For instance, the massive amount of data in several codes at the same level (e.g. Fears and concerns about ICT harm; Inadequate ICT resources; Insufficient ICT skills and ineffective ICT training) indicate different reasons for a limited use of ICT in the classrooms, which had inhibited full ICT integration in the preschools. Therefore, all these codes related to inhibitors were combined together and generated a high level theme of ‘barriers for ICT integration.’

4. Refine and review themes
I reread all the collated extracts for each theme and checked if the current themes reflect the meanings evident in the data as a whole. Taking the theme of ‘enabling factors for ICT integration’ for example, this theme revealed three sub-themes after checking the level of collated extracts: ‘availability of ICT’, ‘awareness of the context for the use of ICT’ and ‘recognition of ICT value.’

5. Define and name the themes

I identified the essence of each theme and organised all themes into coherent and consistent account.

6. Write data report

When all themes were clear and well developed, I started producing a report with sufficient evidence of the themes within the data.

This study is a multiple case study, therefore it also included two levels of analysis: within-case analysis and cross-case analysis (Merriam, 2009). For within-case analysis, data from each case were gathered together so that complete information including any possible contextual factors was captured. Each case study teacher’s questionnaire, interviews and observations were analysed to gain understanding of that entity as she is situated in the particular preschool. Once the analysis of each individual case was completed, cross-case analysis started which involved merging cases and looking for patterns. Due to having two participants from each preschool, analysis took teachers’ working community and institutional culture into account so as to develop an understanding of local contexts and educational traditions. Through comparison across cases, commonalities and differences between the four teachers were identified. Building abstraction and unified description across multiple cases lead to the emergence of meaningful themes and categories.

**Evaluation of the data**

According to Merriam (2009), “all research is concerned with producing valid and reliable knowledge in an ethical manner” (p. 209). Quantitative and qualitative paradigms use different rhetoric to convince their audience of rigor and trustworthiness
in carrying out the study. Firestone (1987) compares and explains these two research approaches:

The quantitative study must convince the reader that procedures have been followed faithfully because very little concrete description of what anyone does is provided. The qualitative study provides the reader with a depiction in enough detail to show that the author’s conclusion ‘make sense’ (p. 19).

As a result, considering the validity and reliability issues in this mixed methods study, careful design and attention has been paid equally to both inquiry approaches.

**Reliability and Validity in Quantitative data**

When designing the questionnaire, efforts were made to ensure the development of each question was well informed by the extensive literature review. As noted above, a pilot study was carried out to assist in maximising the reliability and validity of the information obtained from the questionnaire. The pilot study respondents were not included as part of the study, but their responses were used to indicate which individual questions or sets of items required amendment before inclusion in the final form of the questionnaire. The questionnaire was administered in the participants’ native language, Chinese.

Where appropriate, items were grouped to form scales, each measuring a specific construct. The reliability of each scale developed was calculated using Cronbach’s Alpha coefficient. The criterion of an acceptable scale reliability being at least 0.7 was adopted (Garson, 2012).

**Authenticity and Trustworthiness in Qualitative data**

Qualitative research also uses strategies to help establish credibility and consistency. Merriam (2009) proposed several ways to enhance the internal validity such as triangulation and member checks.

In terms of increasing the credibility of findings, triangulation is the most well-known strategy in which multiple sources of data can be compared and the findings cross-checked to obtain consistent and dependable data. The content of the teachers’ interviews in this study was compared between each case and triangulated with their responses to the questionnaire, as well as their observed classroom practices to establish
validity of the findings. Further, the result of observations was followed up by second round interviews with the same participants to explain, clarify and challenge the classroom practices to achieve a richer and fuller understanding of these teachers’ perspective and practices. By using three methods, questionnaire, interview and observation, triangulation was built into the design of the study and the analysis of the data. Second, the interview transcripts were taken back to the participants and they were asked whether they felt the preliminary interpretation was true or whether there were any additional changes that participants wanted to make. Third, data were collected over more than one day and observations continued until reaching the point of ‘saturation’ to ensure no new or relevant information emerges with respect to the themes.

The classroom observation content was compared back and forth in and between cases. For instance, in the case of one of the case study teachers, Yan, her pedagogical practices in two group teaching lessons were compared with that in the children’s use of e-pens. This comparison has showed multifaceted features of her teaching strategies and inconsistencies between approaches she employed in the classroom and what she said in the interviews and reported in the questionnaire. Additionally, Yan’s pedagogy was contrasted with other three teachers to see if any patterns could be generated. Through comparing similarities and differences between case study teachers, Yan’s overall perceptions and pedagogical practices in terms of young children’s use of ICT were found unique and more complex. In order to further explain this difference, Yan’s own backgrounds such as her ICT experiences, workload, even her concerns about ICT harm during her pregnancy were revealed to be important factors that had shaped her scepticism of ICT use in ECE.

**Ethics Considerations**

According to Merriam (2009), the validity and reliability of research largely depends on researchers’ own ethics. In fact, conducting research in any environment involves ethics, and consequently the investigator should have responsibility give due consideration to any possible ethics issues that may arise.

In this study, ethical clearance was approved (Appendix 1) by Human Research Ethics Committee (HREC) at the University of Newcastle before the research commenced.
This ethics process involved peer review, ethics committee review and approval of application and all research instruments. Prior to the pilot study, an Information Statement and consent forms were distributed to umbrella organisations and all participants. They were informed about the nature of the study, the expectations of them and their involvement during the research period. Participation in this study was voluntary and all participants were also informed at the outset that they could withdraw from the study at any time without giving any reasons. All participants were also invited to contact the researcher to explain and clarify any questions that they may have had.

Teachers’ consent for audiotaping and videotaping interviews and observations was obtained and parents were asked whether their children would be allowed to participate in the classroom observation. The information statement for parents/guardian and consent forms for the observation were sent to teachers and children’s parents and guardians one week in advance. Children were informed about the observation by their teachers and parents before children made their decisions and again on the day. Parents/guardians were asked to gain assent from their children for participation. In this study, the case study teachers and children’s parents gave their consents to the researcher to use their images for the purpose of research.

To ensure confidentiality for each participant, coding of their personal information (e.g. names and addresses) and careful protection were used during the data gathering and analysis. The interview and observation data were treated confidentially and locked in a password-protected computer at the University of Newcastle. Participants were further informed that data collected from them were only for the purpose of data analysis for this project and would only be accessed by the researcher and her supervisors. Case study teachers were asked to choose a pseudonym via which are represented in this thesis report and at no time have any preschools or individuals been identified.

Summary

This chapter has explained and justified the interpretive paradigm and methodology adopted in the study to generate data to examine teachers’ perceptions and pedagogical practices regarding young children’s use of ICT in preschools. The rationale for the mixed methods approach was discussed and explained based on its appropriateness to answer the research question. The selected design was an embedded research model in
the context of a mixed methods study. It includes a quantitative study using a questionnaire and a qualitative case study incorporating open-questions in the questionnaire, two rounds of interviews and classroom observations. Data gathering and analysis procedures were described in detail in relation to the project. Ethical principles and concerns about reliability and validity were also presented. The next three chapters will present the results of the various phases of the research.
Chapter Four: Quantitative Data Analysis

Introduction

This chapter presents the quantitative data from the questionnaire. It describes the demographic characteristics and background of the participants to place the questionnaire in context. The teachers’ perceptions and pedagogical practices in terms of young children’s use of ICT are then identified and the relationship between them is examined. The teachers’ responses were recoded and analysed using the statistical software package SPSS. Question numbers are used throughout the chapter to facilitate reference to the questionnaire found in Appendix 3.

Young children’s use of ICT in ECE settings is influenced by many factors, such as equipment and access. More importantly, teachers play a key role in developing young children’s understanding, knowledge and experiences with ICT. As highlighted in the literature review EC teachers may be quite different from school teachers in terms of their ICT skills, professional development and ICT experiences, therefore the questionnaire in this study was designed to ascertain this relevant information. Chinese preschool teachers in Shanghai were invited to respond to questions which related to a number of important issues in preschools, namely: the availability and access of ICT for young children; children’s ICT activities; and teachers’ perceptions and pedagogical practices. In addition, teachers’ background details were also obtained to examine any potential links of these teachers’ personal characteristics with their perceptions and pedagogy.

Background of the Participants

A total of 316 early childhood teachers from 20 public preschools in Pu Tuo district of Shanghai in China responded to a questionnaire, providing approximately an 87.1% response rate with 98.4% of the participants being female. The number of teachers who answered the questionnaire in each participating preschool ranged from three to 45.

Teachers’ Age Distribution and the Highest Qualification
All the teachers indicated their age level and the majority were defined as young teachers. Nearly half the participants (45.9%) were less than 30 years old, and 29.4% of the teachers were in their 30s, and only 24.7% were over 40.

Participants were asked to indicate their highest educational qualification and any qualification they were currently studying toward (Q1.3). Four teachers (1.3%) did not respond to Q1.3 at all, while 22 teachers (6.9%) provided information about their current study but not about their highest qualification. Slightly more than half of the participants (57.0%) held a bachelor degree (4-year educational program), a third of the teachers (34.8%) had a professional teaching diploma (3-year educational program), and none of the participants had a postgraduate degree. About a quarter of the teachers indicated that they were currently studying further, mainly for a bachelor degree and four teachers for a postgraduate degree. The teachers under 40 were more likely to hold bachelor degrees than the older ones ($X^2(2)=28.32, p=.000$). The age structure and educational background of the responding teachers are summarised in Table 4.1.

Table 4.1

Age Distribution and the Highest Qualification (% within age group)

<table>
<thead>
<tr>
<th>Highest Qualification</th>
<th>Under 30</th>
<th>30-40</th>
<th>Over 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional diploma</td>
<td>36.8</td>
<td>19.5</td>
<td>61.1</td>
</tr>
<tr>
<td>Bachelor degree</td>
<td>63.2</td>
<td>80.5</td>
<td>38.9</td>
</tr>
<tr>
<td>Total (Valid)</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Years of Work Experience and Duration in Current Position

The 310 teachers who answered this question (Q1.4) had worked in the ECE field from one to 35 years. The average time the teachers worked in the ECE field and held their current position was 11.1 years (SD=9.15) and 10.85 (SD=9.08) respectively. The corresponding median was 8.0 and 7.0, which indicates that the distributions of these variables were significantly skewed. Approximately a half of the teachers (51.9%) had worked eight years or less, and 9.7% of the teachers had over 25 years working experience in the early childhood field.
Similarly, about half the respondents (50.6%) had held their current positions for seven years or less, whereas nearly 20% of the participants had been in their current position for more than 20 years. It is interesting to note that most participants’ (94.4%) responses to Q1.4 about how long they worked in ECE fields and how long they held their current position in responding preschools were the same which indicates a high level of job stability.

Teachers’ ICT Professional Development and ICT Experiences

Research outlined in the literature review chapter indicates that teachers’ ICT skills, ICT professional development and ICT experiences are important factors that impact on teachers’ integration of ICT into their classrooms. This questionnaire also sought to examine what the current situation of these participants was and whether these factors influenced their views and classroom practices in relation to young children’s use of ICT in the preschools.

ICT Professional Development or Training

The teachers were asked “Have you attended a professional development or training session related to ICT in education over the past three years?” (Q1.5). There were six teachers (1.9%) who did not respond this question. Most of the remaining teachers (69.0%) had not attended any ICT professional development or training programs in the last three years while nearly a third of teachers (31.0%) reported they had attended ICT training or professional development programs. A small percentage of the teachers (15.1%) responded to the open-ended question (Q1.5) and gave specifics about the types of their ICT training. Their ICT training programs were mainly focusing on learning to use computers and other multimedia tools to design flash and animations for educational programs, program toy robots, design digital imaging and webpage construction.

Teachers’ Knowledge about ICT Research or Policies and ICT Skills

The teachers were asked to answer “How informed do you feel about the ICT policies or research in early childhood education?” (Q1.6). Almost two thirds of the participants (65.7%) indicated that they had little knowledge and information about relevant ICT policies or research in their field whereas only 3.2% of the teachers reported that they
felt well informed about ICT policies or research. There was a small amount of missing data for two questions (Q1.6 and Q1.7) with the highest number being four.

When they were asked to rate their technical skills in terms of using ICT (Q1.7), few teachers (7.6%) indicated that they did not have ICT skills at all but only a small percentage of the teachers (8.3%) viewed themselves as a proficient ICT user. In contrast, almost half of the participants (49.7%) identified their ICT level as emerging. The responses are reported in Table 4.2.

Table 4.2
Proportions of the Teachers’ Reported ICT Skills

<table>
<thead>
<tr>
<th>ICT Skills</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>24</td>
<td>7.6</td>
</tr>
<tr>
<td>Novice</td>
<td>108</td>
<td>34.2</td>
</tr>
<tr>
<td>Emerging</td>
<td>156</td>
<td>49.4</td>
</tr>
<tr>
<td>Proficient</td>
<td>26</td>
<td>8.2</td>
</tr>
<tr>
<td>Total</td>
<td>314</td>
<td>99.4</td>
</tr>
<tr>
<td>Missing</td>
<td>2</td>
<td>.6</td>
</tr>
<tr>
<td>Total</td>
<td>316</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Teachers’ Frequency of Using ICT and Children’s Age

The teachers were asked ‘How often do you use ICT resources with the children in your class?’ (Q1.8). There were four teachers (1.3%) who did not answer this question. Few teachers (5.7%) indicated that they had never used ICT with the children and only a small percentage (4.1%) reported that they always used ICT with the children in the classroom. Frequencies of using ICT resources with the children reported by most participants were rated as sometimes or often as shown in Table 4.3.

Table 4.3
Proportions of the Teachers’ Frequency of Using ICT

<table>
<thead>
<tr>
<th>ICT Use</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>18</td>
<td>5.7</td>
</tr>
<tr>
<td>Sometimes</td>
<td>142</td>
<td>44.9</td>
</tr>
<tr>
<td>Often</td>
<td>139</td>
<td>44.0</td>
</tr>
<tr>
<td>Always</td>
<td>13</td>
<td>4.1</td>
</tr>
<tr>
<td>Total</td>
<td>312</td>
<td>98.7</td>
</tr>
<tr>
<td>Missing</td>
<td>4</td>
<td>1.3</td>
</tr>
<tr>
<td>Total</td>
<td>316</td>
<td>100.0</td>
</tr>
</tbody>
</table>
The teachers were also asked to indicate the children’s age in their classes (Q1.9). Young children in most participants’ (69.0%) classrooms were mainly between three and five years old. Table 4.4 presents the average age of children in the classrooms of the responding teachers.

Table 4.4
Children’s Age in the Teachers’ Classrooms

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 3</td>
<td>51</td>
<td>16.1</td>
</tr>
<tr>
<td>3-4</td>
<td>102</td>
<td>32.3</td>
</tr>
<tr>
<td>5</td>
<td>116</td>
<td>36.7</td>
</tr>
<tr>
<td>6+</td>
<td>44</td>
<td>13.9</td>
</tr>
<tr>
<td>Total</td>
<td>313</td>
<td>99.1</td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>.9</td>
</tr>
<tr>
<td>Total</td>
<td>316</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Relationships between Teachers’ Backgrounds and ICT Experiences

Five Cross-tabulation tests were used to explore whether there was a series of relationships between different variables: teachers’ ages and ICT skills; ICT professional development and ICT skills; ICT skills and frequency of ICT use; teachers’ age and frequency of ICT use. To test for differences in proportions, the chi-squared test of independence was used at the .05 level.

Firstly, there is a significant difference in their reported ICT skills among three age groups ($X^2 (6)=17.12$, $p=.01$). Younger teachers generally felt they had a much higher level of ICT skills than the older ones. While 14% of the teachers under 30 identified themselves as proficient ICT users, only 1.3% of the teachers over 40 felt they were proficient in using ICT. Therefore, younger teachers were more likely to identify themselves as proficient in using ICT than the older teachers. The percentages of the teachers in different levels of ICT skills for the three age groups were shown in Cross-tabulation Table 4.5.

Secondly, teachers’ ICT professional development or training had a significant relationship with their perceptions of their own ICT skills ($X^2 (3)=20.57$, $p=.000$). A much higher percentage of the teachers who had experienced ICT professional development or training rated their ICT skills at emerging level than the teachers
without such experience (64.6% compared to 42.3%) as shown in Table 4.6. Thus, the teachers who had ICT training programs or relevant professional development experiences in the past were more likely to believe they had better ICT skills.

Table 4.5
*Teachers’ Reported ICT skills and Age Groups (% within Age Group)*

<table>
<thead>
<tr>
<th>ICT Skills</th>
<th>Under 30</th>
<th>30-40</th>
<th>Over 40</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>4.2</td>
<td>9.7</td>
<td>11.5</td>
<td>7.6</td>
</tr>
<tr>
<td>Novice</td>
<td>31.5</td>
<td>33.3</td>
<td>41.0</td>
<td>34.4</td>
</tr>
<tr>
<td>Emerging</td>
<td>50.3</td>
<td>51.6</td>
<td>46.2</td>
<td>49.7</td>
</tr>
<tr>
<td>Proficient</td>
<td>14.0</td>
<td>5.4</td>
<td>1.3</td>
<td>8.3</td>
</tr>
</tbody>
</table>

Table 4.6
*ICT Skills and Professional Development or Training (% within ICT professional development or training)*

<table>
<thead>
<tr>
<th>ICT Professional Development/Training</th>
<th>ICT Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have</td>
<td>Don’t Have</td>
</tr>
<tr>
<td>None</td>
<td>2.1</td>
</tr>
<tr>
<td>Novice</td>
<td>21.9</td>
</tr>
<tr>
<td>Emerging</td>
<td>64.6</td>
</tr>
<tr>
<td>Proficient</td>
<td>11.5</td>
</tr>
</tbody>
</table>

Thirdly, the participants’ responses (N=312) indicated that almost all the teachers (94.2%) had used ICT with young children in their classrooms, but this usage was not frequent. In this sample of 312 teachers, there was no significant relationship between the teachers’ age and their frequencies of using ICT with the children in the classrooms ($X^2(6)=9.01, p=.17$). The percentages of the teachers’ frequencies of using ICT with young children in each age group are shown in Table 4.7.

Table 4.7
*Teachers’ Age and Frequency of Using ICT with Young Children (% within Age Group)*

<table>
<thead>
<tr>
<th>Use ICT with young children</th>
<th>Under 30</th>
<th>30-40</th>
<th>Over 40</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>4.3</td>
<td>7.5</td>
<td>6.4</td>
<td>5.7</td>
</tr>
<tr>
<td>Sometimes</td>
<td>41.1</td>
<td>46.2</td>
<td>52.6</td>
<td>45.5</td>
</tr>
<tr>
<td>Often</td>
<td>47.5</td>
<td>45.2</td>
<td>38.5</td>
<td>44.6</td>
</tr>
<tr>
<td>Always</td>
<td>7.1</td>
<td>1.1</td>
<td>2.6</td>
<td>4.2</td>
</tr>
</tbody>
</table>
Fourth, the relationship between the teachers’ reported ICT skills and how often they used ICT were examined. The correlation between teachers’ ICT skills and how frequently they used it with their students was revealed to be statistically significant ($X^2(9)=320.71$, $p=.000$). The teachers with better ICT skills used ICT more frequently with young children in their classrooms.

Finally, these teachers’ ICT professional development or ICT training experiences, and their knowledge about ICT policies or research in the ECE field were found to be significantly related ($X^2(3)=21.37$, $p=.000$). The teachers who attended ICT professional development or training programs in the past three years felt they were more informed about ICT research or policies in early childhood areas. Table 4.8 shows the percentages of the teachers with different levels of knowledge about ICT policies or research in ECE.

<table>
<thead>
<tr>
<th>Informed Level</th>
<th>ICT Professional Development/Training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Have</td>
</tr>
<tr>
<td>I don't know</td>
<td>4.2</td>
</tr>
<tr>
<td>Not well informed</td>
<td>44.2</td>
</tr>
<tr>
<td>Informed</td>
<td>48.4</td>
</tr>
<tr>
<td>Very informed</td>
<td>3.2</td>
</tr>
</tbody>
</table>

In summary, the older teachers with longer working years generally believed that they had a lower level of ICT skills and they used ICT less frequently with children in their classrooms. The teachers with a higher level of ICT skills tended to use ICT with the children more often in their classrooms. This may provide some explanation as to why some experienced EC teachers have more difficulties in integrating ICT into their work and why they are likely to be more sceptical about the value of ICT (Hill & Mulhearn, 2007).

**Availability of ICT Resources in the Classrooms**

Young children’s use of ICT in preschools is initially dependent on the equipment that their settings provide and the level of access to it. The participants were asked to indicate what kinds of ICT resources they had in their own classrooms. The following
figure shows their responses to the question “How many ICT resources does your classroom have?” (Q2.1). The percentage of the teachers who reported each ICT device is illustrated in Figure 4.1.

This bar chart demonstrates the percentage of teachers indicating that the listed ICT resources were available in their classrooms. For this question, approximately 10.0% of the participants did not give any response. The evidence suggests that these 20 preschools studied had various types of ICT resources in their classrooms, but the numbers of each ICT device was quite small, mainly one or two in each classroom. The scarcity of computers, cameras and CD/DVD players in the classrooms perhaps is an important reason why young children were seldom able to access these ICT resources in their preschools, particularly the use of computers as teachers reported in Q2.3. The most common ICT resources reported by the teachers in their classrooms were CD/DVD players (75.6%), TV (74.4%) and computers (60.1%). Cameras and the internet were also made available, but only a few teachers indicated that they had electronic projectors and phones in their classrooms.

<table>
<thead>
<tr>
<th>ICT Resource</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computers</td>
<td>60.1%</td>
</tr>
<tr>
<td>Cameras</td>
<td>58.9%</td>
</tr>
<tr>
<td>CD/DVD players</td>
<td>75.6%</td>
</tr>
<tr>
<td>Internet</td>
<td>57.9%</td>
</tr>
<tr>
<td>TV</td>
<td>74.4%</td>
</tr>
<tr>
<td>Electronic projectors</td>
<td>24.1%</td>
</tr>
<tr>
<td>Phones</td>
<td>30.1%</td>
</tr>
<tr>
<td>Other ICTs</td>
<td>5.1%</td>
</tr>
</tbody>
</table>

*Figure 4.1. Availability of ICT resources in the classrooms*

The teachers’ responses to each item were dichotomised into 0 and 1 and the item scores were summed to form the total for ICT devices. More than a half of the teachers
(58.5%) responded for every type of ICT resources, suggesting that there were seven or more ICT types in those participants’ classrooms. Table 4.9 presents the percentage of the teachers who reported they had computers in the children’s classrooms. There was no significant link between children’s age and the availability of computers in their classrooms ($X^2(3) = 3.07, p = .38$).

The teachers were asked ‘How old are computers in your preschool?’ (Q2.2). In this sample of 304 teachers, more than a half of the teachers (55.9%) reported that the computers in their preschools were generally three to five years old while only 4.3% of the teachers reported that the computers were over 10 years old.

Table 4.9

<table>
<thead>
<tr>
<th>Children’s Age</th>
<th>Teachers (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 3</td>
<td>47.1</td>
</tr>
<tr>
<td>3-4</td>
<td>60.8</td>
</tr>
<tr>
<td>5</td>
<td>66.4</td>
</tr>
<tr>
<td>6+</td>
<td>59.1</td>
</tr>
<tr>
<td>Total</td>
<td>60.4</td>
</tr>
</tbody>
</table>

*Computer Use and Its Locations*

When the teachers were asked “Who used computers in the preschool?” (Q2.3), their responses showed that the principals and the teachers were the two dominant users whereas young children had a much lower level of access to computers. All the participants responded to this question, but only 35 teachers (11.1%) answered that young children used computers in their ECE settings. Administration staff and parents using preschool computers were relatively few. The least usage of computers were others and communities. The percentage of computer usage for each group are summarised as shown in Table 4.10.

Table 4.10

<table>
<thead>
<tr>
<th>Principals</th>
<th>Teachers</th>
<th>Children</th>
<th>Administration Staff</th>
<th>Parents</th>
<th>Communities</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>82.6%</td>
<td>99.4%</td>
<td>11.1%</td>
<td>3.2%</td>
<td>2.2%</td>
<td>0.6%</td>
<td>0.3%</td>
</tr>
</tbody>
</table>
In question Q2.4, the participants were asked to respond to the question “Where are the computers located in your preschool?” Their responses demonstrated that the computers in the participating preschools were mainly located in a teacher-only area (81.1%) (e.g. staffroom and teachers’ offices) and administration area (46.0%). However, more than a third of the participants (37.8%) indicated that computers were placed in the children’s classrooms. Almost a fifth of the teachers reported that they had computer labs in their preschools. The following Table 4.11 shows the percentage of computer locations.

<table>
<thead>
<tr>
<th>Locations of Computers in preschools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration Area</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>46.0%</td>
</tr>
</tbody>
</table>

**Young Children’s Use of ICT in the Classrooms**

The teachers were asked to indicate how often most children engaged in ICT activities in their classrooms over a month (Q3.1). Watching TV/DVD/videos (7.81 times per month) was the most frequent activity that the children engaged in while in their classrooms, followed by taking photos on cameras (4.27 times per month) and using educational software programs (4.05 times per month). The least common ICT activities were playing games and other types of ICT activities. It is interesting to note that the children’s active use of ICT in their classrooms such as making videos and creating their own work or presentations were much less than the above three most frequent ICT activities. About two-thirds of the participants indicated that the children did not engage in five types of ICT activities in their preschools during a month, namely, making videos, searching the internet, creating their own work/presentations and sending and receiving emails, as well as talking on the phones. Table 4.12 presents the frequency of most children’s ICT activities over a month.

The teachers were asked what approximate percentages of children used computers in their classrooms last week (Q3.2). The majority of the participants (71.4%) indicated that less than a quarter of the children in their classrooms used computers in the previous week. On the other hand, 20.3% of the teachers reported that 25% to 50% of the children had used computers in the last week. Overall only a small percentage (3.5%)
of the teachers reported that more than three quarters of the children had used computers in their classrooms in the last week. According to the teachers’ responses, access to computers in the classrooms was only available to relatively a few individuals and most of children did not have equal opportunities to use them.

Further, these respondents were asked to identify children’s frequency of using computers (Q3.3) and time spent on computers (Q3.4) and the internet in the classrooms (Q3.5) in the previous week. The results showed that most of children in responding participants’ classrooms did not use computers (71.7 %) and internet (72.8%) at all in the last week. Notably, their responses to children’s spending time on computers and the internet in the classrooms were nearly the same.

Table 4.12

*Frequency of Most Children’s ICT Activities in a Month*

<table>
<thead>
<tr>
<th>ICT activities</th>
<th>N</th>
<th>Minimum Per Month</th>
<th>Maximum Per Month</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taking photos with a digital camera</td>
<td>286</td>
<td>0</td>
<td>30</td>
<td>4.27</td>
<td>6.30</td>
</tr>
<tr>
<td>Making videos</td>
<td>284</td>
<td>0</td>
<td>15</td>
<td>1.14</td>
<td>2.32</td>
</tr>
<tr>
<td>Searching the internet</td>
<td>282</td>
<td>0</td>
<td>40</td>
<td>3.58</td>
<td>7.77</td>
</tr>
<tr>
<td>Using educational software programs</td>
<td>283</td>
<td>0</td>
<td>30</td>
<td>4.05</td>
<td>6.00</td>
</tr>
<tr>
<td>Watching TV/DVD/videos</td>
<td>274</td>
<td>0</td>
<td>30</td>
<td>7.81</td>
<td>7.80</td>
</tr>
<tr>
<td>Creating their own work/presentation</td>
<td>286</td>
<td>0</td>
<td>20</td>
<td>1.67</td>
<td>3.66</td>
</tr>
<tr>
<td>Playing games on the computer</td>
<td>296</td>
<td>0</td>
<td>20</td>
<td>.63</td>
<td>2.49</td>
</tr>
<tr>
<td>Sending and receiving emails</td>
<td>288</td>
<td>0</td>
<td>50</td>
<td>2.74</td>
<td>7.14</td>
</tr>
<tr>
<td>Talking on phones</td>
<td>282</td>
<td>0</td>
<td>100</td>
<td>3.96</td>
<td>11.56</td>
</tr>
<tr>
<td>Other activities</td>
<td>222</td>
<td>0</td>
<td>30</td>
<td>.61</td>
<td>3.17</td>
</tr>
</tbody>
</table>

About 18.0% of the teachers indicated that the time most children spent on computers and internet was less than one hour. The teachers’ responses to the four questions (Q2.3, Q3.2 and Q.3.4) concerned with young children’s use of computers were not consistent because the percentages related to the children access to and use of ICT resources in the classrooms did not match. A possible explanation is that the teachers did not think of these questions carefully while answering. Another possibility is that the teachers over-
estimated or underestimated the percentage of young children’s access to and use of computers.

**Teachers’ Perceptions and Pedagogical Practices: Young Children’s Use of ICT**

To examine teachers’ perceptions and pedagogical practices in relation to young children’s use of ICT, the participants were asked to indicate their level of agreement and frequency of pedagogical practices with 47 items on a Likert-type scale that comprised six response categories ranging from strongly disagree to strongly agree for measuring perceptions (35 items) and from never to always for the frequency of teaching practices (12 items). Two negative items were subsequently recoded to make the scales read in the ‘positive’ direction, lower scores therefore reflecting negative or less-positive perceptions.

A total of 316 teachers gave their responses to the items constituting these five subscales. For the purpose of analysis, the responses were given a score for each item from one to six: 1=strongly disagree; 2=disagree; 3=tend to disagree; 4=tend to agree; 5=agree; 6=strongly agree. This is similar to teachers’ responses to their frequency of pedagogical practices: 1=never; 2=very rarely; 3=rarely; 4=sometimes; 5=very frequently; 6=always. A mean of 3.5 on the total scale of teachers’ perceptions is the neutral point, indicating neither agreement nor disagreement. But a mean of four on the teacher’s pedagogical practices scale mean the frequency of using these teaching strategies was ‘sometimes.’

The mean scores were calculated for each scale, which provide an overall picture of the participants’ responses. The internal consistency of a set of scale items was measured and overall the reliability for each scale was high, ranging from 0.83 to 0.98. The participants’ responses were varied with standard deviations ranging from 0.61 to 1.34 across the scales. Details for each scale are shown in Table 4.13.
Table 4.13

Mean, SD and Reliability of Teachers’ Perceptions and Pedagogical Practices Scales

<table>
<thead>
<tr>
<th>Scale Name</th>
<th>Perceptions and Pedagogical Practices</th>
<th>No of Items</th>
<th>Mean</th>
<th>SD</th>
<th>Alpha Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Benefits</td>
<td>Teachers’ perceptions of ICT benefits and potential</td>
<td>9</td>
<td>4.31</td>
<td>0.88</td>
<td>0.97</td>
</tr>
<tr>
<td>2. Reasons</td>
<td>Reasons for young children using ICT</td>
<td>7</td>
<td>4.38</td>
<td>0.85</td>
<td>0.96</td>
</tr>
<tr>
<td>3. Views</td>
<td>Children’s access to ICT and appropriate use of ICT</td>
<td>10</td>
<td>3.98</td>
<td>0.61</td>
<td>0.83</td>
</tr>
<tr>
<td>4. Sociocultural perspectives (SCT)</td>
<td>Guidance and importance of children’s peer, families, communities</td>
<td>9</td>
<td>4.44</td>
<td>0.82</td>
<td>0.96</td>
</tr>
<tr>
<td>5. Pedagogical Practices</td>
<td>Pedagogical practices in terms of young children’s use of ICT</td>
<td>12</td>
<td>3.31</td>
<td>1.34</td>
<td>0.98</td>
</tr>
</tbody>
</table>

Proportions of the Teachers’ Response to the Scales

Scale One: Teachers’ Perceptions of ICT Benefits

The mean of Scale One was 4.31 with a moderately high standard deviation of 0.88. The majority of teachers (81.3%) had mean value greater than 3.5 on this scale indicating they believed young children’s use of ICT can benefit their language development, creativity, literacy and problem-solving skills. Only 7.0% of the teachers held strongly negative perceptions of ICT benefits in ECE, whereas slightly more than a third of the participants (35.1%) had moderate positions between tending to disagree and tending to agree. This group perhaps was not certain about the role of ICT in young children’s learning and development.

Considering individual items, developing a foundation for children’s future learning (mean=4.39) was regarded as the most important benefit while the second was ICT value on cognitive development (mean=4.36). These findings indicate that most of the teachers held a belief that ICT is beneficial for young children’s learning and development, especially for their later study and developing cognition. In open-ended comments, about 3.0% of the teachers additionally gave positive comments on the value of ICT. This small percentage of the teachers reported that the use of ICT can assist or enhance teaching and learning.
Scale Two: Teachers’ Perceptions of Reasons for Young Children’s Use of ICT

The mean of Scale Two was 4.38 and its standard deviation was 0.85. A small percentage of the participants (6.6%) did not agree with the reasons listed for young children using ICT in preschools, whereas on average 62.0% of the participants believed that all seven reasons were important for young children to use ICT in their centres as indicated by the mean score between 4 (tended to agree) and 6 (strongly agree). The first two most important aims for using ICT were to meet the requirement of ECE curriculum and to extend traditional play materials in children’s play. Reasons such as future job requirements, preschool market advantage, assisting early learning and familiarity with everyday technologies as well as developing problem-solving skills were ranked at similar levels. The standard deviation of items was reasonably high, ranging from 0.87 to 1.03, indicating that the teachers had a range of views about the driving forces for young children’s use of ICT. Figure 4.2 demonstrates the differences in the teachers’ mean score on these reasons.

Figure 4.2. Reasons for young children’s use of ICT

Scale Three: Teachers’ Views on Young Children’s Use of ICT

Scale Three, about young children’s access to ICT and appropriate use of ICT was relatively lower (mean=3.98, SD=0.61) and had a smaller distribution. This finding indicates that a higher proportion of the teachers (24.4%) held negative views on children’s access to ICT and free exploration with ICT than for the other scales. But a
large number of the teachers (65.5%) held neutral positions in this regard. In contrast, only 2.3% of the participants agreed that young children should be allowed to have ICT access and to explore it freely. No teacher indicated a strong agreement about young children getting access to ICT inside or outside the preschool. Notably, a few teachers gave their comments as to the use of ICT in the end of the questionnaire. Three teachers (0.8%) commented that young children could have some access to ICT appropriately and should be provided with a variety of ICT resources, whereas about 0.5% of the teachers believed that ICT was not appropriate for young children. This very small amount of qualitative data indicates that some teachers held quite divergent views on young children’s access to ICT.

It is important to note that a small percentage of the respondents (about 20.0%) were concerned about the young children’s use of ICT threatening their health and reducing their physical experiences. Further, one participant (0.2%) commented that preschool children were too young and the use of ICT was harmful for their eyes. It reveals that some teachers in the preschools did have fears and worries about the harmful effects of ICT on young children’s health, especially their vision.

Scale Four: Teachers’ Views from Sociocultural Perspectives

Scale Four had a mean 4.44 and a moderately high standard deviation 0.82. A relatively small percentage of the teachers (12.0%) did not consider sociocultural factors as important in young children’s use of ICT. Approximately a third of the teachers’ responses to this scale were between tending to disagree and tending to agree, indicating these teachers’ neutral position. Slightly more than a half of the teachers agreed with the importance of sociocultural elements such as peer interaction and collaboration with parents in supporting young children’s use of ICT. This suggests that a large number of the teachers did not recognise the important role that broad sociocultural contexts such as families and communities play in young children’s ICT use, which might limit their vision to enhance young children’s learning with and through ICT by facilitating peer collaboration or forging a link between children’s ICT home experiences and ICT use in preschools.

Scale Five: Teachers’ Pedagogical Practices
The mean for frequency of pedagogical practices (scale five) in relation to young children’s use of ICT was 3.31, which suggests that the respondents rarely or sometimes used a range of teaching strategies to guide and support young children’s use of ICT in their classrooms. The much higher standard deviation (SD=1.34) further shows that those participants’ classroom practices were quite different from each other and dispersion was much higher than that of teachers’ responses to the perceptions scales. Almost a quarter of the teachers reported that they never or very rarely used a wide range of teaching strategies to guide and support young children’s ICT activities and about a half of the teachers employed these teaching strategies rarely or sometimes. But approximately 20.0% of the teachers always or very frequently had a wide repertoire of teaching strategies to support the children’s use of ICT as shown in Figure 4.3.

![Pie chart showing the percentage of frequencies of using pedagogical strategies](image)

*Figure 4.3. The percentage of frequencies of using pedagogical strategies*

The two most frequent teaching strategies were modelling the use of ICT for children (mean=3.59) and preparing ICT resources and creating ICT using environments for them (mean=3.42). These findings reveal that the teachers lacked a wide range of sociocultural pedagogy in mediating learning as described in the literature. According to the continuum of teaching strategies (Arthur, et al., 2012), these teachers’ strategies, such as providing resources, setting up environments and modelling actions are at the low interaction end of the continuum because they involve low levels of interaction and engagement between teachers and young children. The low interactive teaching strategies might also restrict these teachers to build relationships with young children and extend their learning and thinking.
To sum up, these findings show that the participating teachers generally held positive perceptions about young children using ICT, but pedagogical practices regarding children’s ICT activities were limited in most classrooms.

**Correlations between Teachers’ Perceptions and Pedagogical Practices**

There was a strong positive linear relationship between the teachers’ perceptions of ICT benefits and their views on young children’s use of ICT while there was a moderate strength positive linear relationship between teachers’ perceptions and pedagogical practices. Particularly, the teachers’ perceptions of ICT benefits were strongly related to their reasons for young children using ICT in the preschools (r=0.96). This very high correlation indicates that these teachers had consistent views about ICT potential, reasons for young children’s use of ICT and the importance of sociocultural elements such as families and adult’s role. Teachers’ classroom practices were also significantly correlated with the teachers’ perceptions scales. However, the correlation was less strong (between r=0.41 and r=0.45), indicating that no more than 20.0% of the variance in their pedagogical practices could be accounted for by variances in their perceptions. Table 4.14 summarises correlations between the teachers’ perceptions and pedagogical practices.

Table 4.14

*Correlations between Five Scales*

<table>
<thead>
<tr>
<th></th>
<th>Scale1 Benefits</th>
<th>Scale2 Reasons</th>
<th>Scale3 Views</th>
<th>Scale4 SCT</th>
<th>Scale5 Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale1 Benefits Pearson Correlation</td>
<td>1</td>
<td>.96**</td>
<td>.93**</td>
<td>.93**</td>
<td>.43**</td>
</tr>
<tr>
<td>Scale2 Reasons Pearson Correlation</td>
<td></td>
<td>1</td>
<td>.92**</td>
<td>.96**</td>
<td>.43**</td>
</tr>
<tr>
<td>Scale3 Views Pearson Correlation</td>
<td></td>
<td></td>
<td>1</td>
<td>.90**</td>
<td>.45**</td>
</tr>
<tr>
<td>Scale4 SCT Pearson Correlation</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>.41**</td>
</tr>
<tr>
<td>Scale5 Practices Pearson Correlation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

*Note. **Correlation is significant at the 0.01 level (2-tailed).*

The correlation indicates a level of correspondence between the teacher’s perceptions and pedagogical practices, but there are some inconsistencies between these teachers’ perceptions and their classroom practices regarding young children’s ICT usage.
Although the teachers had moderately positive attitudes towards the children’s use of ICT, teaching strategies (mean=3.31) in relation to the children’s ICT activities were not used as much as might be expected in their classrooms. This finding is consistent with previous research, such as Oldridge (2008) which indicates EC teachers’ perceptions of use of ICT conflicts with their classroom practices. As Yelland (2006) pointed out that EC teachers support the use of ICT in superficial ways, most teachers in the present study did not use a wide range of pedagogies to facilitate the children’s ICT activities. This indicates a lack of awareness of the importance of their pedagogical role in the development of young children’s ICT experiences and competencies.

**Teachers’ Characteristics related to Their Perceptions and Pedagogical Practices**

As stated in the review of literature, teachers’ perceptions about ICT use and their classroom practices are influenced by many factors such as educational backgrounds and professional development. In the next section of this chapter, the relationship between the teachers’ background and their perceptions and pedagogical practices regarding young children’s use of ICT in the preschool environment is examined and compared.

**Teachers’ Age**

Analysis of variance (One-Way ANOVA) was used to determine whether there were significant differences in responses among the teachers in three age groups. There was no significant difference in mean scores for the three age groups in Scale One, Scale Three and Scale Five. However, the age group had a significant relationship with the teachers’ consideration of sociocultural contexts for young children’s use of ICT (F=4.69, df=(2, 313), p=.01) and reasons for young children’s use of ICT (F=3.66, df=(2, 313), p=.03). Table 4.15 presents the mean differences of the teachers’ responses to the five scales in each age group.

The Scheffe test, chosen because this test is exact even when the group sizes are unequal, was then used to examine possible differences between groups Table 4.16 and Table 4.17 show that there were statistically significant differences between two of the age groups in responding to Scale Two and Scale Four. That is, the teachers less than 30 years old indicated a higher agreement on the seven reasons for the children’s use of ICT.
ICT than the teachers more than 40 years old. Younger teachers also tended to consider sociocultural factors as being more important in viewing young children’s use of ICT in the preschools than those aged over 40.

Table 4.15
*Teachers’ Response to Five Scales among Three Age Groups*

<table>
<thead>
<tr>
<th>Scale</th>
<th>Age Groups</th>
<th>Mean</th>
<th>SD</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits</td>
<td>Under 30</td>
<td>4.43</td>
<td>.80</td>
<td>2.45</td>
<td>.09</td>
</tr>
<tr>
<td></td>
<td>30-40</td>
<td>4.25</td>
<td>.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Over 40</td>
<td>4.17</td>
<td>.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reasons</td>
<td>Under 30</td>
<td>4.52</td>
<td>.75</td>
<td>3.66</td>
<td>.03</td>
</tr>
<tr>
<td></td>
<td>30-40</td>
<td>4.31</td>
<td>.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Over 40</td>
<td>4.22</td>
<td>.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Views</td>
<td>Under 30</td>
<td>4.03</td>
<td>.58</td>
<td>1.53</td>
<td>.22</td>
</tr>
<tr>
<td></td>
<td>30-40</td>
<td>3.96</td>
<td>.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Over 40</td>
<td>3.88</td>
<td>.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCT</td>
<td>Under 30</td>
<td>4.59</td>
<td>.69</td>
<td>4.69</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>30-40</td>
<td>4.36</td>
<td>.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Over 40</td>
<td>4.27</td>
<td>.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practices</td>
<td>Under 30</td>
<td>3.47</td>
<td>1.37</td>
<td>2.32</td>
<td>.10</td>
</tr>
<tr>
<td></td>
<td>30-40</td>
<td>3.25</td>
<td>1.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Over 40</td>
<td>3.08</td>
<td>1.33</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.16
*Mean Differences in Scale 2 Reasons for Age Groups*

<table>
<thead>
<tr>
<th>Age Group</th>
<th>N</th>
<th>Mean</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 40</td>
<td>78</td>
<td>4.22</td>
<td></td>
</tr>
<tr>
<td>30-40</td>
<td>93</td>
<td>4.31</td>
<td>4.31</td>
</tr>
<tr>
<td>Under 30</td>
<td>145</td>
<td>4.52</td>
<td></td>
</tr>
<tr>
<td>Sig.</td>
<td>.76</td>
<td>.21</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.17
*Mean Differences in Scale 4 SCT for Age Groups*

<table>
<thead>
<tr>
<th>Age Group</th>
<th>N</th>
<th>Mean</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 40</td>
<td>78</td>
<td>4.27</td>
<td></td>
</tr>
<tr>
<td>30-40</td>
<td>93</td>
<td>4.36</td>
<td>4.36</td>
</tr>
<tr>
<td>Under 30</td>
<td>145</td>
<td>4.59</td>
<td></td>
</tr>
<tr>
<td>Sig.</td>
<td>.76</td>
<td>.21</td>
<td></td>
</tr>
</tbody>
</table>

*Educational Qualifications*

None of the teachers indicated that they held a postgraduate degree, therefore there were only two levels of the highest qualification: professional (EC teaching) diploma and
bachelor degree. Independent sample t-test was used to compare mean differences in the teachers’ responses to five scales. The results show that none of the scales differed between the two educational levels as shown in Table 4.18.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Education Qualifications</th>
<th>Mean</th>
<th>SD</th>
<th>F</th>
<th>t</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale 1 Benefits</td>
<td>Professional Diploma</td>
<td>4.35</td>
<td>.88</td>
<td>.20</td>
<td>.42</td>
<td>.65</td>
</tr>
<tr>
<td></td>
<td>Bachelor Degree</td>
<td>4.30</td>
<td>.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale 2 Reasons</td>
<td>Professional Diploma</td>
<td>4.41</td>
<td>.86</td>
<td>.01</td>
<td>.24</td>
<td>.91</td>
</tr>
<tr>
<td></td>
<td>Bachelor Degree</td>
<td>4.39</td>
<td>.83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale 3 Views</td>
<td>Professional Diploma</td>
<td>3.98</td>
<td>.66</td>
<td>.06</td>
<td>.02</td>
<td>.80</td>
</tr>
<tr>
<td></td>
<td>Bachelor Degree</td>
<td>3.97</td>
<td>.60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale 4 SCT</td>
<td>Professional Diploma</td>
<td>4.49</td>
<td>.82</td>
<td>.40</td>
<td>.50</td>
<td>.53</td>
</tr>
<tr>
<td></td>
<td>Bachelor Degree</td>
<td>4.44</td>
<td>.81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale 5 Practices</td>
<td>Professional Diploma</td>
<td>3.41</td>
<td>1.32</td>
<td>1.27</td>
<td>1.26</td>
<td>.26</td>
</tr>
<tr>
<td></td>
<td>Bachelor Degree</td>
<td>3.21</td>
<td>1.34</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This finding shows that there were no significant differences in perceptions and pedagogies related to young children’s use of ICT in the preschool between the teachers having a 4-year bachelor degree and those with 3-year professional teaching diploma. Such a result seems to conflict with the evidence by the EPPE project that the staff’s qualifications impact the quality and practices in preschool settings (Sylva et al., 2003). According to the EPPE project, settings which have staff with higher qualifications show higher quality and their children make more progress. However, this study has different methodologies and scope so direct comparisons cannot be made.

**Years of Work Experience and Duration in Current Position**

The years teachers worked in the ECE field were not significantly related to their overall perceptions of children’s use of ICT. The years the teachers worked in an ECE had a low but statistically significant correlation with their pedagogy \((r=-0.11, N=310, p=.045)\). The teachers who had worked longer in ECE tended to have a lower frequency of pedagogical practices with young children using ICT in their classrooms. The years the participants held current positions were not significantly linked with their views on young children’s ICT use and classroom practices. Table 4.19 provides the correlations between these variables.
Table 4.19
*Correlations between Years and Teachers’ Responses on Five Scales*

<table>
<thead>
<tr>
<th>Scale 1 Benefits</th>
<th>Scale 2 Reasons</th>
<th>Scale 3 Views</th>
<th>Scale 4 SCT</th>
<th>Scale 5 Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year worked in ECE (N=310) Pearson Correlation</td>
<td>-.06</td>
<td>-.08</td>
<td>-.04</td>
<td>-.01</td>
</tr>
<tr>
<td>Duration in current position (N=308) Pearson Correlation</td>
<td>-.05</td>
<td>-.08</td>
<td>-.04</td>
<td>-.09</td>
</tr>
</tbody>
</table>

*Note. * Correlation is significant at the 0.05 level (2-tailed).

**ICT Professional Development or Training**

An independent sample t-test was used to explore differences in perceptions and pedagogical practices for the teachers with or without ICT professional development or training in the previous three years. The teachers with ICT professional development or training were not statistically different from those without such experience in perceiving young children’s use of ICT and using teaching strategies. This suggests that whether or not the teachers had relevant ICT professional development or training did not strongly affect these teachers’ views and their classroom practices. This indicates that the ICT professional development or training programs probably did not provide effective support in developing teachers’ pedagogy, which will be further explored in the discussion chapter.

**Knowledge about ICT Policies or Research in the ECE Field**

Analysis of variance (One-Way ANOVA) was used to determine whether there were significant differences in responses to the scales among the teachers with different levels of knowledge and information about ICT policies or research in ECE, namely, ‘I do not know’; ‘Not well informed’; ‘Informed’ and ‘Very informed’. Although there was overall statistically significant differences in the teachers’ perceptions of young children’s ICT in the preschools as shown in Table 4.20, Scheffe tests indicated that no one group was significantly different from any other. This finding indicates that there is no evidence within the data that the level of these teachers’ knowledge about ECE ICT policies or research influenced their perceptions of young children’s use of ICT.
Table 4.20

*Teachers’ Knowledge about ICT Policies or Research in ECE Fields*

<table>
<thead>
<tr>
<th>Informed Levels</th>
<th>Mean</th>
<th>SD</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I don't know</td>
<td>4.30</td>
<td>0.89</td>
<td>6.74</td>
<td>.00</td>
</tr>
<tr>
<td>Not well informed</td>
<td>4.13</td>
<td>0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Informed</td>
<td>4.59</td>
<td>0.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Informed</td>
<td>4.70</td>
<td>0.91</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scale1 Benefits

| I don't know         | 4.36 | 0.87| 6.20| .00  |
| Not well informed    | 4.21 | 0.89|     |      |
| Informed             | 4.65 | 0.70|     |      |
| Very Informed        | 4.73 | 0.87|     |      |

Scale2 Reasons

| I don't know         | 3.97 | 0.74| 5.08| .00  |
| Not well informed    | 3.86 | 0.62|     |      |
| Informed             | 4.15 | 0.53|     |      |
| Very Informed        | 4.19 | 0.68|     |      |

Scale3 Views

| I don't know         | 4.40 | 0.87| 6.41| .00  |
| Not well informed    | 4.28 | 0.86|     |      |
| Informed             | 4.71 | 0.66|     |      |
| Very Informed        | 4.73 | 0.88|     |      |

Scale4 SCT

| I don't know         | 2.54 | 1.53| 6.20| .00  |
| Not well informed    | 3.26 | 1.30|     |      |
| Informed             | 3.63 | 1.23|     |      |
| Very Informed        | 3.55 | 1.51|     |      |

Despite the significant ANOVAs for all five scales, only Scale5 showed significant differences between individual groups. Table 4.21 shows the result of the Scheffe test for Scale Five. The teachers who felt informed or well-informed about ICT relevant policies or research reported a higher frequency of pedagogical practices than those who did not have any knowledge about ICT policies or research.

Table 4.21

*Mean Differences in Scale 5 Practices for Informed Level*

<table>
<thead>
<tr>
<th>Informed Level</th>
<th>N</th>
<th>Mean</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>I don't know</td>
<td>35</td>
<td>2.54</td>
<td></td>
</tr>
<tr>
<td>Not well informed</td>
<td>170</td>
<td>3.26</td>
<td>3.26</td>
</tr>
<tr>
<td>Very Informed</td>
<td>10</td>
<td>3.55</td>
<td></td>
</tr>
<tr>
<td>Informed</td>
<td>97</td>
<td>3.63</td>
<td></td>
</tr>
<tr>
<td>Sig.</td>
<td></td>
<td>.24</td>
<td>.77</td>
</tr>
</tbody>
</table>

This finding suggests that teachers’ knowledge and information about ICT policies or research in the ECE field play an important role in developing their teaching strategies.
in supporting young children’s ICT activities. Therefore, EC teachers should be equipped with the relevant knowledge about the use of ICT, especially current ECE ICT policies and international research to facilitate them to integrate ICT in a meaningful way.

**Teachers’ Reported ICT Skills**

There were four levels of ICT skills: none, novice, emerging and proficient. The teachers with different levels of ICT skills were not significantly different from each other in perceiving young children’s use of ICT (Scale One, Scale Two, Scale Three and Scale Four). However, an analysis of variance revealed a significant difference in the teachers’ frequency of pedagogical practices in the classrooms.

Table 4.22

<table>
<thead>
<tr>
<th>Scale1 Benefits</th>
<th>ICT Skills</th>
<th>Mean</th>
<th>SD</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>4.20</td>
<td>1.03</td>
<td>.20</td>
<td>.20</td>
<td></td>
</tr>
<tr>
<td>Novice</td>
<td>4.30</td>
<td>0.95</td>
<td>.05</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>Emerging</td>
<td>4.33</td>
<td>0.81</td>
<td>.20</td>
<td>.20</td>
<td></td>
</tr>
<tr>
<td>Proficient</td>
<td>4.36</td>
<td>0.80</td>
<td>.05</td>
<td>.05</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scale2 Reasons</th>
<th>ICT Skills</th>
<th>Mean</th>
<th>SD</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>4.23</td>
<td>1.02</td>
<td>.42</td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>Novice</td>
<td>4.36</td>
<td>0.92</td>
<td>.20</td>
<td>.20</td>
<td></td>
</tr>
<tr>
<td>Emerging</td>
<td>4.41</td>
<td>0.78</td>
<td>.05</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>Proficient</td>
<td>4.45</td>
<td>0.83</td>
<td>.05</td>
<td>.05</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scale3 Views</th>
<th>ICT Skills</th>
<th>Mean</th>
<th>SD</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>4.00</td>
<td>0.79</td>
<td>.04</td>
<td>.99</td>
<td></td>
</tr>
<tr>
<td>Novice</td>
<td>3.96</td>
<td>0.64</td>
<td>.05</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>Emerging</td>
<td>3.98</td>
<td>0.59</td>
<td>.05</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>Proficient</td>
<td>3.97</td>
<td>0.58</td>
<td>.05</td>
<td>.05</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scale4 SCT</th>
<th>ICT Skills</th>
<th>Mean</th>
<th>SD</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>4.22</td>
<td>1.04</td>
<td>1.56</td>
<td>.20</td>
<td></td>
</tr>
<tr>
<td>Novice</td>
<td>4.36</td>
<td>0.90</td>
<td>.05</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>Emerging</td>
<td>4.52</td>
<td>0.74</td>
<td>.05</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>Proficient</td>
<td>4.56</td>
<td>0.73</td>
<td>.05</td>
<td>.05</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scale5 Practices</th>
<th>ICT Skills</th>
<th>Mean</th>
<th>SD</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>2.64</td>
<td>1.71</td>
<td>2.92</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>Novice</td>
<td>3.35</td>
<td>1.34</td>
<td>.05</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>Emerging</td>
<td>3.29</td>
<td>1.28</td>
<td>.05</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>Proficient</td>
<td>3.73</td>
<td>1.22</td>
<td>.05</td>
<td>.05</td>
<td></td>
</tr>
</tbody>
</table>

A Scheffe test shows that the teachers who believed they were able to use ICT proficiently reported a higher use of pedagogical practices than those who believed they did not have any ICT skills. The differences in the mean scores of the five scales are presented in Table 4.22, and the results of the Scheffe test are shown in Table 4.23.
Table 4.23

*Mean Differences in Scale5 Practices for the Teachers’ ICT Skills*

<table>
<thead>
<tr>
<th>ICT skills</th>
<th>N</th>
<th>Mean</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>24</td>
<td>2.64</td>
<td>3.29</td>
</tr>
<tr>
<td>Novice</td>
<td>156</td>
<td>3.29</td>
<td>3.29</td>
</tr>
<tr>
<td>Emerging</td>
<td>108</td>
<td>3.35</td>
<td>3.35</td>
</tr>
<tr>
<td>Proficient</td>
<td>26</td>
<td>3.73</td>
<td></td>
</tr>
<tr>
<td>Sig.</td>
<td>.12</td>
<td>.52</td>
<td></td>
</tr>
</tbody>
</table>

*Frequencies of Using ICT with Young Children in the Classrooms*

How often the teachers used ICT with young children in their classrooms had no significant relationship with their overall perceptions of the children’s use of ICT. However, the teachers with different frequencies of using ICT with the children had statistically significant differences in how frequently they used pedagogical strategies to guide and scaffold the children’s ICT usage in the classrooms (F=5.55, df=(3, 308), p=.001). Table 4.24 demonstrates the mean differences, SD, F-ratio and P value in terms of the teachers’ responses to the five scales.

Table 4.24

*Mean Differences in the Teachers’ Frequencies of Using ICT with Young Children*

<table>
<thead>
<tr>
<th>Using ICT</th>
<th>Mean</th>
<th>SD</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale1 Benefits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>4.20</td>
<td>1.20</td>
<td>.38</td>
<td>.77</td>
</tr>
<tr>
<td>Often</td>
<td>4.34</td>
<td>0.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>4.29</td>
<td>0.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>4.50</td>
<td>0.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale2 Reasons</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>4.16</td>
<td>1.20</td>
<td>.91</td>
<td>.44</td>
</tr>
<tr>
<td>Often</td>
<td>4.38</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>4.39</td>
<td>0.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>4.67</td>
<td>0.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale3 Views</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>3.94</td>
<td>0.90</td>
<td>.41</td>
<td>.75</td>
</tr>
<tr>
<td>Often</td>
<td>3.99</td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>3.95</td>
<td>0.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>4.14</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale4 SCT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>4.19</td>
<td>1.24</td>
<td>.95</td>
<td>.42</td>
</tr>
<tr>
<td>Often</td>
<td>4.41</td>
<td>0.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>4.50</td>
<td>0.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>4.58</td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale5 Practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>2.47</td>
<td>1.83</td>
<td>6.55</td>
<td>.000</td>
</tr>
<tr>
<td>Often</td>
<td>3.15</td>
<td>1.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>3.53</td>
<td>1.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>3.98</td>
<td>0.80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A Sheffe test in Table 4.25 shows that the teachers who often or always used ICT with the children had a significantly higher frequency of pedagogical practices on average than those who never used ICT with the children in classrooms.

Table 4.25

*Mean Differences in Scale 5 Practices for the Frequency of Using ICT*

<table>
<thead>
<tr>
<th>Using ICT</th>
<th>N</th>
<th>Mean</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>18</td>
<td>2.47</td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>142</td>
<td>3.15</td>
<td>3.15</td>
</tr>
<tr>
<td>Often</td>
<td>139</td>
<td>3.53</td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>13</td>
<td>3.98</td>
<td></td>
</tr>
<tr>
<td>Sig.</td>
<td></td>
<td>.30</td>
<td>.14</td>
</tr>
</tbody>
</table>

*Young Children’s Use of Computers in the Preschools*

The teachers who indicated that the children used computers in their preschools had no significant differences in their perceptions of young children’s use of ICT from those who responded that children did not use it. However, an independent sample t-test shows that differences between these groups of teachers in terms of their classroom practices were significantly different ($t=4.67$, df=51.22, $p=.001$). In general, the teachers from the preschools where the young children used computers had a higher frequency of using a wide repertoire of teaching strategies to facilitate children’s ICT activities (mean=4.07) than those from the preschools in which the children did not use computers (mean=3.21).

Further, although there were overall statistically significant differences between group means in terms of how often most children used computers in the classrooms, no one group was significantly different from any other regarding their perceptions of young children’s ICT use. However, there were significant differences between these teachers’ pedagogical practices ($F=18.16$, df=(3, 309), $p=.000$). A Scheffe test shows that the teachers whose students used computers weekly used a wide range of teaching strategies that support children’s ICT activities more frequently (mean=4.49, N=31, SD=1.03) than the teachers whose students did not use computers at all (mean=2.99, N=224, SD=1.34).
As a result, whether or not the children used computers in the preschools had a significant relationship with their teachers’ pedagogical practices. The more frequently the children used computers in the classrooms, their teachers tended to have a greater frequency of teaching practices to support them. Therefore, the provision of computers for young children to explore could be helpful in developing teachers’ wide repertoire of pedagogical strategies that can enhance early learning and development with and through the use of ICT.

Summary of Findings

This chapter presented the results obtained from the survey. It identified teachers’ reports of their perceptions and pedagogical practices regarding young children’s use of ICT and the links between them were examined. In addition, it also obtained demographic characteristics and the background of the respondents who provided background information regarding the use of ICT in their preschools. The most important findings included the following:

- A total of 316 early childhood teachers from 20 public preschools provided an 87% response rate with 98.4% of the participants being female and the majority being young teachers. The very high response rate provides strong support for a claim that the survey responses of the sample were representative of the survey population.

- The children in most participants’ (69.0%) classrooms were mainly between three and five years old.

- Most of the teachers (69.0%) had not attended any ICT-related professional development or training programs in the last three years. And about two thirds of the participants (65.7%) indicated that they had little knowledge and information about ICT policies or research in ECE. These teachers’ ICT professional development or ICT training experiences and their knowledge about ICT policies or research in the ECE field were found to be significantly related, highlighting the importance of providing ICT professional development to equip the teachers’ with knowledge about current ECE ICT policies and research.
Participating preschools had various types of ICT resources in the children’s classrooms, but the number of each ICT device was quite small, mainly one or two devices in each classroom.

The principals and the teachers used computers most whereas the children had a much lower level of access and usage. This could indicate that young children’s learning and development with or through the use of ICT was not fully recognised or highly valued by the teachers.

The children’s active, individual, creative and group use of ICT in the classrooms such as making videos and creating their own work were very rare. This reveals that the children’s engaged use of ICT and hands-on experiences with ICT in most classrooms were minimal or non-existent.

Access to computers in the classrooms was only available to relatively a few individuals and most of children could not have equal opportunities to use it.

The participating teachers generally held positive perceptions about young children using ICT, but a range of teaching strategies regarding children’s ICT activities were not evident in the classrooms.

The teachers with more positive perceptions about the benefits and potential of ICT in learning and development tended to report a greater frequency of a wide range of pedagogical strategies. Thus, it is crucial for the teachers to more strongly recognise the role of ICT in ECE and build more positive perceptions so they could employ a wider range of pedagogical strategies to support young children’s ICT activities for learning and development.

Although there was a level of correspondence between perceptions and pedagogical practices, there were some inconsistencies particularly between the teachers’ high positive perceptions of ICT benefits for young children and their low frequencies of using teaching strategies to facilitate the children’s ICT use.

Factors such as the level of ICT skills, frequencies of using ICT with young children in the classrooms and knowledge about ICT policies or research in the ECE field influenced how frequent the teachers used a range of pedagogical practices with young children when using ICT resources.
These key findings revealed that different types of ICT resources have been introduced in the children’s classrooms in a very limited manner. The children’s overall access to computers and equal use of ICT was limited. The children’s active use of ICT in the preschools was not common and their time spent on using ICT was very minimal. The two most important aims of using ICT were to meet the requirement of ECE curriculum and to extend traditional play materials in children’s play. Although the majority of their teachers’ held positive positions on the children’s use of ICT in ECE and ICT potential in early learning and development on the whole, pedagogical strategies such as encouragement, facilitation and guidance on children’s ICT activities in classrooms were rarely used. The findings indicate that great efforts should be put on developing these teachers’ technical and pedagogical knowledge and skills that can maximise ICT potential in the early years. This requires systematic and specific professional learning and development programs for all the teachers so they can have opportunities to learn and develop a wide repertoire of knowledge based and articulated ICT supporting and mediating strategies.

Three other issues are worth mentioning. First, the teachers’ ICT experiences such as professional development, reported ICT skills and knowledge about ICT policies or research in the ECE field had no significant link with how they perceived young children’s use of ICT, however, these factors had a significant relationship with their pedagogical practices. Therefore, it is important to provide sufficient and effective ICT professional development or training programs to develop these teachers’ pedagogies to bring fundamental changes in integrating ICT into classrooms. Second, the availability of computers in the classroom had no significant relationship with children’s age, but whether or not the children used computers had a statistically significant relationship with their teachers’ teaching strategies in relation to supporting their ICT usage in the classrooms. Last but not least, there was a diverse range of responses to some of the questions in the survey. For instance, in relation to the years the teachers worked in the ECE field, how often children engaged in ICT activities, the teachers’ perceptions of children’s ICT use and their pedagogical practices. This shows that the results obtained from the questionnaire indicate that there is a range of views and practices of the teachers concerning the use of ICT in preschools in Shanghai.
The next phase of the research was designed to explore how the children’s use of ICT is perceived in greater detail, through the introduction of case studies with four teachers. The case studies investigated those teachers’ perceptions and pedagogical practices in relation to young children’s ICT use in two Shanghai preschools.
Chapter Five: A Case Study of the Hongqi Preschool

This chapter reports the findings of a case study of two teachers in the Hongqi preschool. This chapter constitutes part of Phase Three of this research, along with the next case study chapter (Chapter Six). The case studies involved pre-observation interviews, classroom observations and post-observation interviews. The purpose of Phase Three was to ascertain rich and more complete information to further explore, enrich and deepen understanding about the teachers’ perceptions and their multifarious classroom practices in relation to young children’s use of ICT in the preschool.

From the wider population involved in the survey a purposive sample of two EC teachers from this preschool were selected on the basis of pre-set criteria with respect to the questionnaire and their willingness for further participation. These criteria were availability of ICT resources; positive perceptions of ICT benefits; young children’s high access to ICT; and a wide range of pedagogical strategies. Overall, the four teachers selected were more positive about the use of ICT in ECE and the children had higher access to ICT resources in their classrooms in comparison to the rest of the teachers surveyed. Because two teachers in each preschool were responsible for a class, the total of two classrooms was recruited for classroom observations.

Illustrations in this chapter are based on the data on how the two teachers from the same institution perceive and support young children’s ICT activities. The teachers, their preschool and relevant EC organisations were made anonymous through the use of pseudonyms. It was my intention in the construction of a powerful narrative to create portrayals which make primary use of these teachers’ voices and activities, and to this end much use is made of selective illustrative original quotations and detailed descriptions of teaching practices. The data for this narrative were derived from a number of data sources including two rounds of interviews, classroom observations, informal conversations with staff, observation of preschool environments, and follow-up discussions with the teachers for clarification after the fieldwork.
Background of the Preschool

The Hongqi preschool is a public organisation established in the 1980s and located in the centre of Shanghai city. In 2007, it was ranked as a Level One Preschool, which is just below the highest “Model Level”. It offers five full-day education and care services from 9 am to 3 pm for young children who are mainly from local communities in the Pu Tuo district. In 2012, the preschool had 29 registered full-time teachers and 15 classes with about 472 young children in three grades: Xiao Ban (lower grade), Zhong Ban (middle grade) and Da Ban (upper grade). It currently consists of two campuses in different geographical areas in the same district and their staff called them headquarters and branch. Both campuses were surrounded by high residential buildings that developed over a decade ago.

According to the results of the questionnaire and teachers’ willingness to participate, both Hua and Yan were selected from the preschool branch campus, which was opened in 2009. This newly built campus had 17 registered full-time teachers and nine classes with 278 young children. The case study in this preschool used one class. Both of the EC teachers also had the role of information administrators, responsible for the preschool informatisation (this refers to educational practices such as administration and management based on the use of ICT) such as sharing and providing information online for education authorities and families.

During my first visit to the preschool, the preschool principal and a vice principal introduced the basic characteristics of the preschool, but they specifically stated that the preschool focused on developing young children’s ability in literacy, particularly reading. This focus was evident in their learning environment and everyday educational practices. They had schedules of daily reading activities for every class and a wide range of reading materials including interactive books for young children in almost every corner of the classroom. In addition, there were many recommended booklists hung on the wall for young children and their parents to read at home. According to the preschool online education reports, the teachers held public literacy competition events for young children and their parents, as well as staff members every month (Shanghai Early Childhood Education ICT Centre, 2013a).
Developing literacy abilities for young children was incorporated into the educational goals of the preschool. As written on the preschool website, “reading is life, play and learning; …. Reading inspires young children’s interest in literature and lays the foundation for life-long development.” Due to this specific feature, this preschool aims to cultivate children’s “curiosity, critical thinking, and in particular, the joy of reading (Shanghai Early Childhood Education ICT Centre, 2013b).”

**Pre-observation Interview with Hua**

Hua was in her late thirties and had worked as an EC teacher for 17 years with a bachelor degree in education. She had been employed at Hongqi preschool for three years and was teaching young children aged 4-5, in a level called Zhong Ban Three (The 3rd class in the middle grade). Because of her working experiences as an information administrator in the previous workplace and ICT skills, Hua was nominated as an information administrator in the Hongqi preschool.

In the pre-observation interview, Hua was asked to talk about her opinions and teaching practices as related to young children’s use of ICT in the preschool. (Trigger questions are available in Appendix 6). Follow-up and probing questions were also asked where clarification was needed. The topics for discussion and questions were organised around the following issues: young children’s use of ICT; reasons for young children’s use of ICT; teachers’ perceptions of ICT benefits and potential; teacher’s perceived changes and challenges; communication and cooperation through using ICT; ICT training for EC teachers; young children’s ICT home use and teacher’s reported pedagogical practices.

**Young Children’s Use of ICT in the Preschool**

Hua said that there were various types of ICT resources in her classroom such as TV, DVD players, tape recorders, cameras, internet connections and desk computers. She also brought her own printer and laptop into the classroom for her convenience in the classroom, instead of using them in the staff room. However, overall the number of each device was quite limited. According to her, because there were approximately 30 children in her class, their access to these ICT on average was low.
In the preschool, young children’s access to computers is not high. There are not many computers after all. We have more than 30 young children in a class so it is probably not realistic for every child to get access to use them.

Hua briefly mentioned that the headquarters campus used to have a computer lab where computers were donated by local schools. The teachers found it difficult for young children to use the old computers therefore the lab was converted into a play room. Unfortunately, Hua said that she did not know the reason for this change because it happened before she started working in this preschool. On my first visit to the preschool, the vice principal said that these computers were scrapped because they were obsolete and already had some problems before they were sent to the preschool.

Hua said that young children were very interested in using ICT in the classroom, but their use of ICT was limited due to a lack of ICT. She explained that the preschool had thought about other ways to provide some low cost electronic products. Hua indicated that they could program and input learning content into some electronic toys with a programming chip and e-pens by connecting them to computers.

For a preschool like ours, it is probably not possible to have enough computers [for the children] to use. But we bought some electronic reading pens and electronic interactive books for the children.

Hua said that most of the children were able to use e-pens and interactive books and she encouraged them to use these ICT resources in the classroom. For example, she gave the children opportunities to press buttons or do mouse clicks.

Now the children can use them [e-pens] skilfully to listen to music and read stories…. Sometimes we played reading software on computers or played tapes on the tape recorder, which requires us to proceed to the next task. I tried to let the children do mouse clicks or press buttons.

However, she later said that the children made errors in using touchscreens so their opportunities of using these in the classroom were limited. This reflects that Hua seemed to limit young children’s ICT usage because they made mistakes. Further, this also implies that operational difficulties were a reason for the children’s restricted use of ICT in the classroom.

**Reasons for Young children’s Use of ICT in the Preschool**

Hua did not give a direct response to the question “Do young children need to use ICT in the preschool?” But she illustrated three reasons for her advocating the children’s
ICT activities. First, ICT was very useful for cultivating the children’s interest in early learning

Personally I think ICT can significantly develop young children’s interest in learning. To be honest, I strongly advocate it [young children’s use of ICT].

Second, Hua indicated that young children enjoyed interacting with ICT. According to her personal experiences of bringing up her own daughter, Hua found that young children were more accepting of interactions with ICT than those of teacher-directed teaching. This indicates that Hua learned from her own daughter’s use of ICT, which has influenced her views on the value of ICT in the early years.

As a Mum, I found that young children are more accepting ICT interactive operations than their teachers’ direct teaching.

Third, Hua noted that using ICT to teach in the classroom could attract the children’s attention.

With electronic teaching resources, our teaching can be enriched so that we would be able to entice young children’s attention.

Hua explained two reasons why ICT could attract from young children. One was that young children had a strong interest in it so they were much more focused on learning when ICT was used in teaching. The other was that the children experienced joy by interacting with computers and their peers in the process of using ICT.

Young children’s interest in learning [with ICT] is very high…Let the children interact with the multimedia and they feel very happy through their hands-on operations. Secondly, it creates interactions between young children and computers, and peer interactions. If a child gets opportunities to use ICT in front of the class, the rest pay more attention to watching what the child is doing.

Hua further provided an explanation that the children’s strong attention to other children’s use of ICT was because they were eager to obtain their chances to use it.

**Perceptions of ICT Benefits and Potential**

When Hua earlier explained reasons for young children’s use of ICT, she indicated that ICT could develop young children’s interest in learning and help them experience positive feelings. In her view, the use of ICT not only created interactions for the children with their peers and technological artefacts, but also enhanced social interaction and cooperation between young children and their peers, which could develop their problem-solving ability.
Communication and cooperation between peers in this process [interactions with ICT and their peers] can develop their problem-solving abilities.

Hua indicated, due to young children’s increasing access to ICT, their knowledge and information were broadened. Therefore she believed that today’s young children were cleverer than previous children she taught because they had more knowledge of the world. Hua also mentioned the benefits and conveniences brought by modern technologies with which she displayed teaching content in multiple ways and made her teaching methods varied.

**Perceived Changes and Challenges**

Hua experienced many beneficial changes in her work due to the use of ICT. Firstly, she indicated it enhanced her relationship with young children. She said that the children were more like her friends while communicating about the use of ICT. She gave an example to elaborate this point.

I sometimes found my relationship with the children becomes closer. For example, when we had a new iPad and I discussed how to use it with parents, some children came to me and told me they also had one at home. I asked them some questions such as, ‘Do they like games on the iPad’ or ‘Can they play it?’ At that moment, I felt my relationship with the children is not students and teachers, but friends.

In her opinion, conversation and interactions with the children about using a specific ICT device had promoted an equal and closer relationship. Hua found that young children were more relaxed and less hesitant to explore or discuss with her about topics related to ICT. Hua enjoyed and valued this process of communication and cooperation as a collaborative learning process through which young children were able to talk about their opinions and share ICT experiences and knowledge comfortably.

We discussed how to play some game software together…. I feel the children communicate with me as my friends, not pupils. It is a very equal friendship. I enjoy this process. It is a complete friendship. The children would tell me anything in their mind immediately without any hesitation.

Interestingly, Hua considered her interactions with the children in the use of ICT as a friendship from a personal perspective, rather than from a pedagogical view such as co-constructing of learning. Hua indicated that she had not experienced challenges caused by the children’s ICT activities. However, the children’s increasing knowledge obtained through their access to ICT had led to some pressure on teachers as it challenged their knowledge and pedagogies. Challenges for her meant that she had to find out children’s existing knowledge and then prepare and adjust her teaching. This reflects that Hua was
probably not sure about the role of ICT in early learning and development as her views about the benefits of young children’s use of ICT were not consistent.

Regarding young children’s use of ICT, I haven’t experienced any challenges. It has no influence on my teaching. For young children, it broadens their knowledge of the world. If we mean challenges, I think it has some challenges, but not about working with computers.

Young children acquiring more knowledge through their access to ICT actually puts pressure on us. When young children already know a lot, I have to think about what knowledge I can offer to them. I must have a clear goal. I have to know how much they already know and then I should plan my teaching and modify my teaching progress or design teaching content based on their existing knowledge.

On the other hand, Hua saw positive effects of young children’s increasing knowledge, which motivated her to learn more in dealing with challenges. In addition, it helped teachers enrich more children’s experience through transferring individual experiences into collective experiences.

Sometimes young children have more knowledge than us, which is also a kind of motivation to us. It urges us to learn more knowledge rather than not moving forward or believing we know everything. Besides, we can take advantages of their experience and knowledge. We discuss with some parents about it. We can exchange individual knowledge with other young children and turn individual experiences into all children’s experiences. Let all the children learn more.

However, using ICT for teaching sometimes was not easy for her because she encountered barriers to using ICT. She felt using ICT to prepare lessons and design good electronic teaching materials was really time-consuming and demanded a lot of effort for her.

To be honest, using ICT to design lessons really costs time and efforts. If I want to design good materials for teaching, it requires a lot of preparation. If I am not satisfied with it, I have to keep refining. However, when my design adds good effects to teaching, as a designer, I feel very happy and experience a sense of success.

Hua generally gave only a few words about challenges and difficulties in relation to ICT usage. She left a deep impression in the researcher that she had a passion of learning and using ICT in her work and she felt confident about adopting it in teaching and management, although she sometimes met difficulties in using ICT for teaching.

**Communication and Collaboration through the Use of ICT**

Hua believed that ICT provided more convenient and efficient ways to communicate and cooperate with others. Because teachers and parents frequently exchanged information through ICT devices, they could easily and instantly find out what young children did at home or in the preschool.
Parents told us what the children did at home, including information on their use of ICT….We communicated with families through the website forum. Sometimes we chatted on QQ [Online communication software] or used FeiXin [messages sent from computers to mobile phones]. We also have face-to-face communication with parents.

ICT also created more opportunities for communication among families. Parents were actively involved in online communication and cooperation about their children’s education. Parents sought her opinions on selecting appropriate educational software for their children to use at home. As a result, she drew upon her personal experiences and knowledge to provide recommendations for them. Hua was interested in communicating with parents, particularly on the topic of young children’s learning software.

When some parents bought an iPad, they discussed with me which types of game software they should install. Because my own daughter was using an iPad too, I told them which software was beneficial for the children such as number calculations, stories and English language learning software.

To be honest, I am interested in it [talking with parents]. I am not just communicating with the parents about young children’s use of ICT, but I also like recommending software…. I recommended some software or copied some disks for them, which I have used and found useful.

The reason for her recommending the provision of the learning software for the children to use at home was related to her belief that young children could learn while playing with it. Notably, Hua did not refer to the development of the children’s creativity or following their interests while she suggested providing the software for them. It seems that Hua informed parents and acted as a kind of authority or expert in selecting young children’s educational software, rather than drawing on their funds of knowledge in supporting the children’s learning through ICT.

I told parents it is better for the children to play with some learning software rather than just let them play with computers, because the children can learn from playing with the software.

Hua believed that good learning resources could be shared and used together. Consequently, she encouraged parents to communicate and share their educational software. In this process, she was like a facilitator in promoting shared learning resources across young children’s families.

Some parents had some good educational software, so I enquired and borrowed it from them. I checked it, if it was really good, I would recommend it to other parents. I also suggested the parents exchange information and discuss about it. As a result, resources were shared.

A sense of pleasure was associated with her communication and collaboration with parents, which promoted their friendship and facilitated sharing ICT resources. Her discussion with families also developed her ICT competencies as she learned some ICT...
skills from children’s parents who were more knowledgeable and proficient in using ICT, which seems that she recognised some expertise of parents for her own learning.

Sometimes we were not sure how to use some ICT. For instance, we found some parents made better videos than us. We communicated with the parents and discussed about issues. As a result, the relationship between us is closer and we are like friends. Actually communication with parents is not just discussing about young children’s issues, but also about hardware and software. I feel very good about it.

Hua collaborated with colleagues in planning lessons and teaching with ICT. According to her, the teachers supported each other with their expertise and collaboratively learned to use ICT for teaching. Hua acknowledged the trust and opportunities given by her colleagues while helping them design electronic teaching resources because she benefited from this process. She mastered new ICT skills and acquired knowledge through inquiry and learning. Due to her strong interest in ICT, she mentioned that she enjoyed the process of learning and helping other teachers. This reflects that her ICT skills have allowed her to take up a pedagogical leadership role.

Among colleagues we discuss designing electronic teaching resources. They think that I am better in using ICT so they trust me and ask me to help them design electronic teaching resources. I knew that I would also meet difficulties, but they told me that they would provide ideas to me and my task was to implement their ideas into computer programs. I learned a lot and acquired more knowledge. Because I searched online or enquired of others if I did not have solutions, I mastered new skills and learned from others. After I knew how to solve the problems, I taught them.

Through collaboration, she said that the teachers all made progress together in terms of using ICT for their work. Consequently, she believed that the collaboration created a friendly relationship and a good learning environment in the preschool.

I taught them how to do it and all of us made progress together. The relationship between colleagues is friendly and it is a very good learning environment.

Hua explained that her help to other colleagues was from friendship, rather than her role as an information administrator. When the colleagues obtained knowledge and ICT skills from her, they also liked teaching others. These findings show that ICT as a sociocultural tool has mediated these teachers’ and parents’ communication and collaboration. It facilitated a learning community of colleagues through which educational resources and technical and pedagogical knowledge and skills were mobilised and utilised to enhance their teaching practices, although Hua did not recognise this as a pedagogical leadership process.

Young Children’s ICT Home Experiences
According to Hua, the children’s home ICT resources and experiences impacted on their preschool activities. She found that young children paid more attention to some ICT devices in the classroom such as an iPad or game software if these were also available at home. They were more interested and excited in talking about their familiar ICT devices and sharing their home ICT experiences and knowledge with the teachers and other children.

The children also told their teachers [about their home ICT activities]….The children sometimes told us what they did with ICT at home…. Some children came to me and told me they also had an iPad at home….Some children told me they also used it at home.

Hua also chatted with the parents about the children’s ICT home experiences and obtained some information about the children’s home ICT usage.

**Teachers’ ICT Training**

Hua indicated the importance of ICT training for teachers to improve their ICT competences. She was not satisfied with the ICT training programs run by the Local Education Authority because the very limited number of ICT training programs was available to meet the teachers’ specific needs. She said that current training projects were narrowly focusing on teaching ICT techniques and instructing procedures of mechanically using multimedia. Such ICT training courses were quite simple and not very relevant to her because she had already acquired this knowledge and these skills.

I found very few really useful ICT training programs for teachers. The Local Education Authority provided lessons of using flash and designing websites. Actually I had already learned that and knew some skills before. I think this type of training was quite simple. I found the teaching content in the training was relatively simple and very mechanic. That is, telling us how to do it…. In the past, training was about teaching us to use Microsoft Word and Excel.

When Hua encountered barriers to using ICT, she had to overcome difficulties by independent learning or inquiry. Her request for advanced ICT professional support such as in editing digital images or animation were not addressed because few specific and high levels of ICT training programs were available. Sometimes she had to give up exploring the use of ICT.

When I use ICT to prepare electronic teaching resources, I cannot find people I can consult about it or learn from. As a result, I have to give up sometimes. Currently there are not many ICT training courses.

Hua indicated that she probably would search for ICT commercial training programs to meet her needs and pay fees to learn on her own. However, she indicated that ICT
training was not mandatory for the teachers. From her point of view, this was why some teachers had a lack of ICT training and in turn a shortage of ICT skills.

*Pedagogical Beliefs and Practices Regarding Young children’s Use of ICT*

Hua indicated three conditions were required to achieve more effective classroom practices in relation to the use of ICT. The first prerequisite is less children in the classroom. She explained that, due to a high student-teacher ratio in the classroom, she could not spend sufficient time and effort on individual children. Second, if the preschool could provide a computer room for the children to use, she would choose and provide some software programs for them to use and encourage them to learn from playing games on the computers. Hua hoped to have a separate lab with more computers providing each of children with equal opportunities to use it. She believed that if every child could have the same opportunities to use a piece of equipment in the class, it would be more effective for her to guide the young children, rather than just watching her using it. It is interesting to see that she did not see alternatives such as designing the classroom for children to rotate activities and take turns in using the limited resources.

If we can have a smaller class and a computer room, the teachers can guide and search some software for them to use, which I think will be more effective. If young children in the preschool can have equal opportunities to use one piece of ICT equipment, it would be more effective for the teachers to guide them.

Third, Hua held a belief that the appropriateness of learning software matters. She stressed the importance of teachers’ familiarity with the software content and pedagogical knowledge of using the software.

It [enhancing learning] depends on appropriate learning software….Teachers themselves have to be familiar with the learning software and know what young children should do [with the software]. We have to fully understand the learning software and know what young children can learn from it.

As far as her pedagogy is concerned, Hua said that her role in young children’s ICT activities was more like that of an observer, whereas she emphasised that she was not a direct instructor. Only when technological issues occurred that the children could not solve, would she immediately intervene and help. Through observation, Hua found problems in the process of learning with ICT. She then encouraged the children to collaborate with their peers to find solutions. From her point of view, peers were important in developing problems-solving skills therefore she promoted the children to interact with peers, particularly learning from the more able ones. Hua’s reports of her
teaching strategies reflect her recognition of some sociocultural elements in scaffolding children’s ICT activities such as peer interactions and more capable others. She facilitated peer discussion and peer teaching to move less capable children’s actual development to their potential level.

Through my observations I find out what problems the young children have in their use of ICT. For some problems, if I know other children can solve them, I tend to be more like an observer. I probably discuss the problems at the end of play and let the other children help them solve the problems while we are sharing experience.

[I]Lead other young children to help their peers. When technological problems occur and the children cannot solve them completely, I would intervene directly and help them. For some learning problems, although the children were not able to address these by themselves, I observed them and found they asked for help from their peers. It is a way of communication and cooperation between peers in this process which can develop their problem-solving ability.

Hua believed that young children’s ICT use in collective activities should be guided by specific teaching aims. From her perspective, the teachers should clearly understand young children’s learning aims with ICT and ensure that their ICT activities were learning-oriented. However, in free or individual activities, she said young children’s ICT activities should not be restricted by any specific learning objectives.

In whole group teaching, we have to know what young children can learn through using ICT. However, in a free play with ICT or individual ICT activities, I think it’s not necessary to restrict young children because they can learn through play. Teaching strategies depend on the children’s activities.

Hua regarded young children’s use of technological artefacts as a play so that young children could learn through playing with ICT resources without teachers setting learning goals. This explains why young children’s use of ICT in play received little guidance and attention from her.

Pre-observation Interview with Yan

Yan was in her twenties and had worked in the preschool for six years. She already held a professional teaching diploma for this job, but she was studying part-time for a bachelor degree in education at the time of her participation in this study. In the pre-observation interview, Yan was asked to talk about her views and pedagogical practices in relation to young children’s use of ICT. The interview data are presented in a similar order to that of Hua.

Young Children's Use of ICT in the Preschool
Yan indicated that young children were able to simply use many ICT resources such as TV, tape-recorders, cameras, computers and e-pens for play and learning in the preschool, but their overall access to ICT was low. The children’s free exploration with ICT in group teaching was limited as the teachers mainly initiated the use of ICT. However, Yan said that young children used some relatively small-sized and portable ICT, such as MP3 players very often during play and physical exercises on their own. She provided further examples to illustrate the children’s ICT activities, which basically were clicking the mouse to play computers games, listening to stories on electronic players, watching TV/DVD, and reading interactive books with e-pens. Yan said that young children very much enjoyed learning with ICT as she found they were active and engaged in the process of learning. She said that the use of ICT in early childhood classrooms was a new way of developing learning.

We can make pictures and animated flash on computers and then show it to the children, which is a new way of enhancing learning. Young children like this way of learning… Usually young children like listening to stories or watching TV after lunch… The children are excited and active while they are engaging into physical exercise instructed by music software programs.

However, Yan noted that a scarcity of ICT resources in the classroom had led to relatively limited opportunities for every child to use it. She stated that the preschool originally had a computer lab where most of the children in a class could use the computer at one time. In her opinion, the complex funding system was one reason for the scarcity of computers. Additionally, old computers donated from local schools, which were used instead of buying new ones when funding was available, turned out to be difficult for young children to use because they were outdated or broken. She considered updating new technological products in the preschool to be difficult due in part to the fast advance of new technologies.

There was a computer lab with about 20 computers where every child could get access to a computer. Because computers update so fast, they become out-dated just in a few years. Our preschool actually has a procedure to apply for funding to buy the equipment and we may not get funding support while applying. One day funding was available, but local schools updated their computers and sent their old computers to the preschool. We found it was difficult for young children to use old computers. Moreover, [due to limited funding] updating technological products and the amount of new equipment in the preschool are limited.

Yan further explained a reason for less use of computers for the children was the inconveniences in planning lessons and organising the class. The number of children in each class was far more than the quantity of computers. As a result, young children in a class had to be separated into two different activities if the class used the computer lab.
It seems that Yan viewed young children’s use of computers as an individual activity so the provision of sufficient equipment mattered. In this sense, young children sharing ICT resources and working together in the process of collaborative learning were not recognised.

We currently have about 30 children in each class therefore about 10 computers are not sufficient and we cannot use them together. As a result, we have to divide the whole class into halves for group teaching. For example, half plays with sand while the other half goes to the computer lab. They have to take turns to play. It is not very convenient for teachers to organise a class and design activities.

Yan’s accounts about organising computer activities reveal that young children’s use of computers was initiated by the teachers. Though Yan mentioned that young children ‘play’ with computers, her emphasis on designing this activity reflects that she viewed it more like formal learning. She seemed to assume that the same learning events for the class at the same time were a better organisation of teaching. It is interesting to point out that Hua earlier talked about the benefits of learning together in ICT activities and thus there could easily be three children per computer. Perhaps Yan did not share the same view with Hua on the children’s group ICT activities.

Another factor for the children’s limited use of ICT in the classroom was the risk of breaking expensive ICT equipment. The cost of ICT resources was a concern for her in allowing young children to use them. The problem of damage would bring inconvenience or difficulties for the teachers in using ICT. Therefore, the teachers basically dominated the use of computers. Yan believed that young children could observe their teachers’ ICT usage.

 ICT like computers are mainly used by teachers, but young children can observe teachers using it…We cannot afford for young children to use them. If the children break it and then it will be difficult to use. It’s not easy to make a decision between repairing it and accepting the damage as an unavoidable loss.

From her point of view, observation may be a ‘good’ way of learning the use of ICT for young children as she later stated young children could learn through observation. It is worth noting that this is not consistent with Hua’s view as Hua tended to encourage the children to have hands-on experiences with ICT, rather than just observing her use of ICT in the classroom.

*Reasons for Young Children’s Use of ICT*
Yan said that young children need to use ICT, but her rationale was limited to the existence of current technological artefacts. She explained that this need was related to contemporary young children’s living environment, especially their ICT home culture. In her view, young children’s interest in ICT was aroused by the existence of ICT products at home because many families had owned a range of new technologies. Young children’s interest in ICT appeared to be highly valued by her as she believed her decision on whether or not to use ICT in class relied on the young children’s interest in and attention to it. In this sense, Yan was concerned to base the learning on young children’s interest, which reflects a child-centred approach to teaching and learning that considers children’s ideas, preferences and interests in implementing practices (Morrison, 2012).

Many young children’s families have an iPad at home and they are very interested in it. If we still teach these children with a blackboard and books, they may not have interest or have low interest and a short attention span. Whether or not to use ICT depends on the young children’s interest. If ICT can entice young children’s attention, I think we need it.

Yan further stated that many changes in today’s technological environments had influenced teachers’ adoption of ICT. She felt great changes in terms of what to learn and how to teach compared to past education. In response to such changes, she believed that ICT had improved teaching efficiency and methods. Therefore, she mentioned that teachers needed ICT to teach, and young children also like it being used in teaching.

Today’s education is different from the past because old education relied on very much instruction. For contemporary young children, a lot of curriculum content needs to be taught, and it is very difficult to do this efficiently with only verbal instructions. Therefore we need multimedia to help teachers to express or present information. Today’s education is also different from the past. Young children like us using ICT to teach and we teachers also need it.

However, Yan held quite contradictory views on young children’s use of ICT. She did not see the necessity of using computers for young children, in particular for those less than five years old. She indicated that computers were too difficult for children aged 3-5 to use because they encountered operational difficulties. She had a critical view on young children using computers and questioned the learning goals. It is worth noting that her previous responses to whether young children need to use ICT were at times contradictory because, as previously quoted, she said that it was essential for young children to use ICT because they were interested in it.

I think that young children do not have to use computers for learning because they can also learn things such as drawing and arithmetic with our traditional methods. We have a lesson about programming toys on the computer, but it is too difficult for young children aged 3-5. What are
the aims of young children’s use of computers? Searching for information? However, searching information online requires some language basis. In fact, I think probably children over five years old in the preschool can use computers. But for younger children, what are the purposes of using computers? I think the main aim for children aged 3-5 is to watch and observe. Therefore we do not need every child to use it… It is sufficient to have a big computer for teachers’ use while young children can watch and observe it. I don’t think that young children need to click a mouse and use it. I feel it causes difficulties for teachers to design activities.

A possible explanation for her doubts is that she might not see the value of using computers for early learning. Due to her belief that young children learn through watching and observing, she justified the teacher’s dominant use of ICT and potentially unequal access to computers for every child. Indeed, a key reason for not giving ICT to the children to use was her own difficulties in designing ICT activities. Notably, she expressed more about her own concerns and doubts, rather than anything related to the children. Similar to her earlier narratives of inconveniences in organising ICT activities, Yan seemed to hold a view that young children’s use of ICT should be taught only through formal activities which teachers must plan and design, rather than seeing it as a tool for creativity or free play. In general, her views on the children’s competencies of using computers were consistent with her concern about the risk of the young children damaging the ICT resources, because she did not see the children being able to learn to look after the ICT equipment. This does not reflect the contemporary views of children as competent and capable as depicted in the literature (see Chapter 2, ‘New Technologies and Young Children’).

**Perceptions of ICT Benefits and Potential**

Yan said that ICT facilitated young children to learn independently and conveniently. Such independence and conveniences also benefited teachers because it saved their intervention and guidance. Yan also indicated that small and portable electronic literacy resources (e.g. interactive books and e-paper) were also useful for young children to read alone when adults had no time to read for them. She gave an example to illustrate benefits that ICT brought for the children:

For instance, a tape-recorder was used in the music stage. At that time, young children had to know how to play tapes such as forwarding and pause, and they could not select songs freely. It was difficult for them and they were likely to damage tapes. However, ICT like the e-pen which music was already programmed into so that it’s easy for young children to use. Their teachers do not need to intervene while they were using it. They can conveniently use it on their own….Now younger children [3 to 4 years old] are also able to play music for their play by themselves.
However, Yan still seemed very uncertain about the value of ICT for young children. When she talked about the value of ICT for early learning and development, she used the word “probably” twice in her description.

The preschool is equipped with ICT, which probably promotes young children’s learning...When young children’s use of computers reaches a certain level, it probably develops their ability of independent exploration and practices in their activities.

This uncertainty about ICT potential may help understand why she earlier said that young children did not necessarily need to use ICT in the classroom. Her following opinion that ICT was only an auxiliary tool for learning could also explain the children’s less use of ICT.

ICT can only play a supplementary role in preschools, but it is not the most important tool in young children’s learning.

In contrast to her perceptions of ICT benefits for early learning, Yan found ICT very useful in teachers’ work and expressed the benefits of ICT based on her own convenience. It seems that ICT helped her to make the children busy while she was not available for their activities.

In the past, some children who finished their lunch earlier went to free play. For children who did not finish eating, I had to spend time looking after them. As a result, I probably did not have enough time to pay attention to the children who were playing elsewhere, but I had to consider their safety and watch out for them. Nowadays they watch children’s software programs after lunch and they can quietly sit watching and they also can think about programs, as well as stay in the room for a longer time.

Yan did however consider the issue of children’s passively sitting and watching programs, so she said that some software design took young children’s health into consideration. That is, the software program encourages young children to do physical exercises and to engage into peer interactions.

Yan used ICT to prepare lessons and make electronic teaching resources dynamic and various to improve teaching effects. Yan said that ICT provided better ways of expressing and presenting teaching content. Therefore, she acknowledged the invention of ICT in that she believed that teachers’ ideas and practices were broadened.

Without the invention [of ICT devices], teachers would not think of some technological functions. The development of electronic products and new technologies promote teachers to think and explore how to maximise the advantages of ICT.
In addition, she indicated that a heavy workload sometimes limited teachers’ available time for preparing and making electronic teaching materials. As a result, they recorded colleague’s lessons, borrowed teaching ideas and shared electronic teaching resources.

Every teacher has designed some electronic and digital teaching materials with ICT. We record these lessons and then establish a database… I record my teaching and then add it to the database, which can be shared by other teachers who may teach the same grade in the future. The teachers can watch my lessons and borrow some ideas if they think my work is suitable.

The collaboration between colleagues was promoted through creating and sharing digital teaching resources together. According to Yan, the teachers shared and learned from each other about the use of ICT for teaching. To some extent, such collaboration in sharing ICT resources reduced their pressure and work burden. This finding further shows that Yan’s positive perceptions of the value of ICT were mainly related to teachers, but not young children.

Perceived Changes and Challenges

Yan indicated that contemporary young children became knowledgeable because they were able to use some ICT resources in the early years. This change had led challenges to teachers in terms of teaching these children. In her view, the only solution for teachers was to keep learning and be smarter than the children. This indicates that she was not recognising the sociocultural possibilities of co-constructing knowledge with the children or learning from the children.

I think young children [today] develop better in using ICT than those in the past… Young children in the contemporary time are very smart in ICT… They are more clever and bright than children in the past generations. Teachers have no other ways to deal with current young children except keeping thinking of strategies and we have to be smarter than children.

According to Yan, the children had acquired more knowledge due to widespread use of ICT resources in children’s living environment. She exemplified a challenge to traditional play materials, which was about children’s ability to differentiate real and pretend toys and tools. Interestingly, she did not think that the children could play with fake ICT toys through their imagination, which again reflects that she did not see the children as competent and capable in constructing their world.

There are challenges. There are computers and cameras in the children’s home. In the past young children engaged into playing with pretend ICT toys, but nowadays they probably would not play with these toy ICTs because they have already played with real ones. In the past young children seldom could tell pretend play materials so that they were happy to play with cameras made from paper cards. As a result, teachers cannot use some fake materials to design play. Teachers have to
provide a real camera or cancel that play activity because no children play with a toy camera. We pretend to ring their parents on toy phones in order to discipline and manage them, but young children can tell the differences from a real one and they know how to dial numbers on the phone, so they won’t believe teachers’ words on the toy phone. Therefore we put two real telephones in their play corners.

However, such challenge did lead her to rethink her teaching strategies. In response to the children’s increasing knowledge, she recognised some children’s competences and realised that a requirement for better curriculum designing abilities and new teaching methods was apparent.

Young children know a lot about ICT, which requires a very high level of lesson design and teaching strategies for teachers. Think about new strategies. Teachers are keeping on thinking and they do not use old methods.

For instance, Yan found strategies like positive behaviour guidance and encouragement were probably more effective in managing the children’s behaviours. But she used the word ‘probably’ to describe the necessity of using new teaching strategies, which indicates she might not use them in reality.

Since young children really have extensive use of ICT, we cannot use the old ways of managing the children such as using a toy phone to ring their parents and report misbehaviours. I probably need to use some methods such as encouragement or collaborative learning.

Yan noted that another change was that today’s teachers often used new technologies in classrooms, which was rare in the past. In such a changing context, she felt difficulties in implementing ICT into her work because of her lack of ICT skills and knowledge. Yan believed that teaching with ICT requires relatively higher skills and more technological knowledge. Yan even felt frustrated when some of her teaching ideas could not be achieved with her current ICT skills, such as making an animated flash to display curriculum. In her view, using ICT to prepare lessons demanded a lot of effort and time. She spent leisure time to learn and prepare teaching with ICT in order to improve her teaching result, but she might give up using ICT to prepare teaching material if she could find solutions.

I have ideas, but I cannot implement them into lessons. A lot of frustrations. Using ICT to make one lesson can take a half day on weekends. I am young and I can do it in order to make the lesson better. Not all teachers want to use their weekend time to do it. I will probably give up or use other simple alternatives if I cannot work it out.

**Communication and Collaboration through the Use of ICT**

Yan’s communication and collaboration with the children’s families were enhanced by the use of ICT. Yan said that the teachers communicated and shared childhood
educational information through many communication technologies, such as the internet, FeiXin (short messages sent from computers to mobile phones), class internet forum and QQ (online communication). In this way, teachers and parents obtained feedback conveniently. She also mentioned that ICT was used for recording young children’s learning through which early learning in the preschool could be viewed, assessed, shared by others such as teachers, children and their parents.

We videotaped our lessons and uploaded them online for sharing with parents. Therefore parents can know what their children learn in the preschool….Sometimes we recorded the children’s play and replay it to the children with multimedia, and then we discuss it.

In the preschool, there were assessments of teaching and learning. For teachers, their lessons were recorded in the class, and then replayed to other teachers for comments and improvements. For young children, their activities were documented for the whole class to share and discuss learning experiences.

Yan further said that many parents discussed and shared educational information and experiences on the class internet forum. She acknowledged that parents created a good online learning atmosphere, which benefited teachers’ work. She believed that information exchanged among families were valuable for them to improve their education at home.

With the help of such information, parents can compare young children’s growth and learning. It helps them find out their child’s developmental delays by comparing them with other children so that they can spend more efforts in educating their children. Parents organise the children’s social activities voluntarily and they enjoy online discussion about young children’s education together.

Through communicating with parents, Yan found that the harmful effects of ICT on young children’s physical health and social interactions were the main reasons for parents being against the children’s use of ICT in the preschool. Nevertheless, parents did not have strong opposition to the children’s ICT activities, which might be because they were using it at home.

Currently there are not many parents against young children’s use of ICT in the preschool perhaps because they are using it at home. The main reason for parents opposing young children's use of ICT are its negative effects on children's eyesight and the lack of social communications and physical exercises….If young children wear earphones to learn every week, it would probably raise parents’ concerns about their children’s hearing.

Parents’ concerns about the effects of ICT had impacted teaching practices as the teachers took most parents’ views into account and modified classroom practices in a
compromised position. Both parties discussed possible ICT harm and their concerns about young children’s physical health, especially eyesight problems. Parents talked with Yan over issues and sought her intervention into the children’s watching too much screen-based media at home. Yan valued parents’ opinions and drew on relevant research to improve classroom practices.

The use of any ICT requires us to think about advantages and disadvantages…. Regarding young children’s education, teachers cannot decide the best way of teaching on their own. They also consider parents’ opinions. The majority of parents’ views matter.

We use a compromised way to reduce parents’ concerns about using ICT. In reality, we may not notice harm or issues, but parents may point out problems to us. If we find their concerns are reasonable and research has reported negative effects, then we may modify or change classroom practices.

According to Yan, the teachers’ communication and collaboration with parents was an informal chat, mainly about the negative effects caused by TV and computers. Yan indicated that young children’s excessive ICT use at home was not good as vision issues occurred, but she did not provide evidence for this statement.

We did not have any children wearing glasses in a lower grade [3-4 years old] in the past and only one or two in an upper grade [5-6 years old]. Once we examined the children’s eyesight, we found nine children with short-sighted vision. Suddenly we realised this was caused by watching too much TV and computers at home.

**Young Children’s Home ICT Experiences**

Yan said that many families currently had varieties of ICT resources so the children had a lot of ICT access at home. She listed a few examples of young children’s ICT activities such as playing on computers, using iPads, and taking photos on cameras. She explained, because of the fast development of new technologies, many parents could afford home access for their children to use ICT.

Although electronic products are expensive, parents allow the children to use it without worrying about damage. Since ICT products are not so expensive compared their cost in the past, young children use them extensively.

**ICT Training for EC teachers**

Yan expressed a strong need for the systematic ICT training for all the teachers because there was a big gap in ICT skills among the teachers. She had attended ICT training programs such as ‘Intel Future Education’ over last three years and rated her ICT skills at emerging level. However, she said that there were few opportunities for training.
I think it [the use of ICT] needs to have systematic training. Teachers have to be well trained. There are big gaps among the teachers in using multimedia and making electronic teaching resources.... Not many [ICT training programs] are available.

Yan did not find current ICT training useful for her due to inappropriate training programs, which were basic content about computer usage so her specific needs could not be addressed.

The current training is about computers, which is very basic. It does not meet my needs. For instance, if I want to learn animation design or picture editing, I would find few training courses for it. The training does not meet my requirements and probably cannot help me. This training is basic and opens to many teachers, so it is not specific.

Yan further said that she did not have special expertise in the ICT field as her profession was childhood education. As an information administrator, she said that she might have better ICT skills than colleagues, but her ICT competencies to solve problems for other teachers were challenged.

Comparing with other teachers, we as information administrators may be better in ICT skills, but we also meet difficult problems and few people can help us. We only can search for solutions online and enquire of others or give up.

Yan was not satisfied with limited training opportunities for only one or two teachers in each preschool. She experienced challenges in helping all her colleagues. Consequently, she called for ICT training for all the teachers, with an aim to facilitate all of them to use ICT skilfully.

It is not enough for a preschool to have only one or two information administrators because the whole preschool is really big. All the teachers ask for help from us, but who we can seek for help? I think it is necessary to have such training....Teachers need systematic training to help them to use these ICT resources skilfully.

**Pedagogical Practices Regarding Young Children’s Use of ICT**

Yan indicated that young children’s ICT activities should be guided due to their very young age. She explained such guidance should make the children feel that they learned independently.

Young children are too young, so it requires teachers’ guidance.... We lead these young children’s thinking, but in this process we have to make them feel they are exploring by themselves.

Yan described her role as an observer in young children’s play, including ICT activities. She indicated that teachers intervened in the children’s activities only when trouble or problems occurred.
I think teachers should observe their ICT activities…There are reasons for no guidance sometimes. It may be because they do not have problems in play, so we do not intervene. If we find that young children quarrel or make a mess of play materials, we would discuss the issues. It depends on teachers’ focus and attention.

Based on her narration, the teachers held a power in determining young children’s ICT use in the classroom. For instance, they provided ICT equipment and organised young children’s ICT activities. The teachers also determined whether young children could get access to ICT and what they did with ICT.

Every time teachers have to make decisions on whether or not to use ICT…It depends on what teachers think of the need for children to use ICT.

**Observations of Classroom Practices**

In the following section, both Hua and Yan’s classroom practices are described and analysed with a focus on their pedagogy regarding young children’s use of ICT. Because two teachers were responsible for the same class in the preschool, Hua and Yan worked together in the classroom which was observed approximately two hours per day over five days to gain greater insights into their classroom practices. Sometimes both teachers appeared in the children’s classroom at the same time, but usually they worked in different shifts in a day. For example, Hua taught group learning and play in the morning while Yan would teach young children physical games in the afternoon. I videotaped all of their teaching sessions which related to young children’s use of ICT to increase accuracy of data analysis in this chapter.

In general, the overall use of ICT in the classroom was very limited. In particular, due to the children’s relatively minor access to ICT in the preschool, the teachers’ pedagogies that support the children’s ICT activities were not common in their daily activities. In order to provide a fuller picture of young children’s ICT usage, young children’s ICT activities in play zones where the teachers rarely visited were also captured. The purpose was to help understand what young children could do with ICT and explore why little pedagogical attention was given to young children’s free play with ICT. Further, the teachers’ use of ICT to teach the children during lessons was also illustrated as this was part of their daily routine and more importantly, the most common way of the use of ICT in their classroom. This would provide a better understanding of the reality of their classroom practices. A total of five observed sessions are fully transcribed and provided in Appendix 8. Notably, that the teachers’ and the children’s
ICT activities took place in the morning during one week because their afternoon time was scheduled for two hours noon nap followed by eating afternoon meals.

Based on observations of their classroom practices, the data were coded into the following five categories: ICT resources in the classroom; young children’s ICT activities in the classroom; young children’s ICT competencies and experiences; teachers’ use of ICT in the classroom; teachers’ pedagogical practices regarding young children’s use of ICT.

**ICT Resources in the Classroom**

There were some ICT resources available for teaching and learning in the children’s classroom. There was a computer with big digital screen, a phone, a video camera, earphones, educational software, some e-pens, e-paper and interactive books. E-pens, interactive books and e-paper were generally located in several reading corners inside and outside the classroom. According to the vice principal, the children could choose these electronic reading materials to play freely for a while if they came to the preschool early before their class started. On the wall of the classroom, many pieces of interactive e-paper were pasted and the instructions for using e-pens and interactive books with earphones were also demonstrated step by step with pictures. In the preschool library, there was a wide variety of interactive books, which consisted of different content, such as pictures, stories, music and numbers. These books were programmed to read stories and provide learning tasks for the children with built-in feedback. Each class in the preschool was required to take turns to use the library during a week. The provision of these electronic literacy materials seems consistent with the preschool aim of developing young children’s literacy, especially their reading abilities. However, the small number of e-pens in the classroom and the library restricted the children’s access to them.

**Young Children’s ICT Activities in the Classroom**

The children’s access to ICT in the classroom was low and their ICT activities were simple and passive. The children basically watched their teachers’ use of ICT during lessons and their hands-on experiences were limited to the use of e-pens, earphones and to drag on-screen icons to play games. Moreover, the children had limited opportunities
to use their e-pens and play computer games. A common feature of both Hua’s (session 2) and Yan’s group teaching (session 3 and 4) was that the children sat and watched programs on the screen passively. The teachers played the programs or displayed teaching content (e.g. pictures, videos and animated cartoon stories). In Hua’s lesson (session 2), several children were called to drag icons to targeted areas on the touchscreen and most of them could succeed in completing the task quickly. The observation shows that all the children selected could easily achieve learning tasks by clicking and dragging icons on the screen. For example, it was observed that that some pairs took turns to use e-pens and cooperated in connecting earphones to their e-pens without the presence of the teachers. They communicated about the use of e-pens and collaborated to solve problems. Sometimes they pointed to their interactive books and talked about the content as well as helped their peers wear earphone for a turn (session 3). This indicates that Hua probably did not provide appropriate challenges in the task that could help the children to move a higher level of development.

Young Children’s ICT Competencies and Experiences

Although the children had a low access to ICT and simple ICT activities, a considerable amount of observation data shows that they were very excited about using ICT and they were joyful and active in seeking chances to use it. There were several occasions when Hua planned to choose some children to select icons and play computer games, many children raised their hands high to gain the teacher’s attention so they could be selected to do next task. In session 2, while Hua was explaining the rules of dragging icons on the touchscreen, most children became impatient and could not sit quietly to wait for their use. When the children achieved the task, they were excited with big smiles on their faces. The whole class also enthusiastically gave a loud applause to their peers who successfully completed the task each time. In Yan’s class, the children actively sought their chances to read in electronic reading zone. It was observed that many children ran to the e-pen reading zone during exchanging reading materials and four of them grabbed e-pens quickly to gain their opportunities.

Most of the children were able to use some ICT resources for play and learning and they had acquired some ICT competencies. They could use e-pens to read interactive books, click and drag on-screen icons to play music, games or stories. In the free play activity
session, a girl skilfully used her e-pen to select songs and adjust the sound volume by clicking icons on the e-paper. In the library, the children could quickly put on earphones and plug them to e-pens skilfully. Then they used e-pens to click and read interactive books. It seems that most children had few operational difficulties in these activities, but it was observed that there were several children who could not complete the task of dragging icons the first time. To some extent, the children had their autonomy in deciding what to do if their requests were in the teacher’s plan. For instance, a few children insisted on playing more games before the end of this class, so Hua agreed and called more children to do similar tasks.

There were frequent peer interactions and cooperation during the children’s ICT activities which facilitated peer learning with the use of ICT. For example, in session 5, some children communicated about their e-pens and exchanged their interactive books and used e-pens to click their peer’s interactive book to share reading. It was observed that some children also supported their peers by giving their advices and instructions in clicking and dragging icons. Some spoke out their answers directly to help the children who were doing their tasks. In another case, many children reminded Hua to move the chair closer to the touchscreen so their peers could stand comfortably to reach the icon.

**Teachers’ Use of ICT in the classroom**

The teachers dominated the use of ICT in the classroom for their purpose of teaching most of the time. Both teachers had used the computer or the touchscreen to present their curriculum and give lessons in the classroom. In session 2, Hua first introduced the story with several still images shown on the screen and played an animated cartoon story to the whole class. In particular, Yan had often used the computer to show pictures and videos to the class. This way of using the computer made it appear only as a presentation tool for teaching. During her group teaching, Yan did not give the children any chance to use ICT. For example, Yan played a short video to the class before she started telling the story. She later also presented a still image on the screen for two minutes or so to show details of the story.

Although Hua had allowed the children to use the touchscreen and select their answers to play games, she held power to decide when to use it and who could use it in the
classroom. In one instance, Hua led the whole class to a room where a computer with a large digital touchscreen installed. She organised the class to sit in two rows facing the screen and then opened software programs to play a short video. Another example is that Yan determined how many children could read in the electronic zone. These examples demonstrate that the teachers controlled the access of ICT resources and initiated ICT activities for the children, which reflects a tradition of teacher-led teaching in the Chinese ECE system.

**Teachers’ Pedagogical Practices Regarding Young Children’s Use of ICT**

Both teachers had used a range of teaching strategies to support young children’s learning with the use of ICT. These strategies were providing resources and solving technical problems, modelling, interacting, explaining, instructing, managing discipline, and facilitating peer teaching. The two teachers had also employed different approaches to the children’s use of ICT. For instance, Hua had scaffolded the children’s use of the touchscreen by providing physical support and working together, but Yan spent much time observing the children’s reading with e-pens to help with problems. Yan also seemed to attach more importance to peer interactions than Hua in the process of ICT use.

**Providing ICT resources and solving technical problems**

Both the teachers set up the environment for the children’s use of ICT as they provided ICT resources and organising spaces. During the use of e-pens in the library, Yan tried several times to help a girl find a working earphone so that this girl could wear it to listen to the content of the interactive book. Yan searched for earphones and helped this girl to put on and tested the sound. Notably, Yan lent direct help to solve issues related to ICT functions too. In another case, two children could not untie a cord knot of e-pens and earphones. One of the children looked at Yan to indicate they had this problem. Yan immediately went to untie the knot for them (See session 5, appendix 8).

**Modelling**

Modelling is one of most frequent teaching strategies that the teachers used to teach the children how to use ICT in the classroom. The two teachers not only demonstrated methods of using e-pens or the touchscreen with their rich body languages, but also
invited some children to model the process of using ICT in the front of the class. For instance, Yan invited a girl to show how to use e-pens and interactive books at the end of their reading. In Hua’s lesson, she told the class to watch a girl’s operation on the computer (See session 2, appendix 8).

**Interacting**

There were frequent interactions between the teachers and the children, especially oral interactions. Their interactions mainly include conversations, providing feedback and asking-answering dialogues. For instance, while playing a story on the computer, Hua frequently interrupted and prompted the class with many questions. The dialogues between her and the children were active and engaged because most children loudly spoke out their answers to respond to her questions. She also discussed with them and provided feedback to their responses. Hua was like a facilitator whose role was to stimulate the children to think, respond and rethink. Her questions like ‘what’, “how” and ‘why’ seem not very challenging to many children so asking and answering between them were short and quick. But she used closed questions first and then added open questions to ask the children to explain why, but her discussion with them did not go in-depth.

In session 5, Yan often had many conversations with individual children who were reading interactive books. Yan sometimes bent towards the children to watch what they were reading and talked with them quietly. For example, one boy pointed to the book to show the teacher his reading. Yan smiled and gently patted the boy's head. Then this boy started explaining his reading to the teacher. Yan listened to his accounts and nodded with smiles.

In another case, Hua provided positive feedback and encouragement to the children’s successful performance with the use of the touchscreen to play games. She demonstrated a gesture of applause to the class. Following her, the rest class warmly applauded to give encouragement for a child’s success in dragging the icon to complete a task.

**Instructing**
The most common teaching strategy was instructing. The two teachers’ teaching was involved a lot of direct instructions in particular verbal instructions. There were many observations recorded of teachers telling the children how to use ICT. Taking Yan’s class in the library for example, she told the children to connect e-pens to earphones and pointed to what to read on interactive books. In Hua’s teaching, she often pointed to the screen to remind the children to concentrate on watching the programs or listening to instructions given by the software (See session 2, appendix 8).

Notably, both of them had emphasised the development of children’s language as they often instructed the children to speak a clear and full sentence while they were talking about video content or answering questions. It was observed that Yan had frequently asked the children to imitate her actions and repeat stories.

**Explaining**

Explaining was another frequent teaching strategy in their practices. Both of the teachers had often illustrated the content presented on the screen to the class. In particular, Hua spent much effort in describing game rules and the way of succeeding in the games. Yan usually gave short background information of the content of the programs before she presented pictures or played a video. During the teaching, Yan illustrated the story presented on the screen with frequent body gestures (See session 3, appendix 8).

**Managing discipline**

There were many occasions that both teachers spent much effort on managing the class and supervising the class to take turns in the process of using ICT. Notably, the teachers’ sitting position in the classroom seems convenient for the teachers to use the computer and hold discipline of the class. They often told the children to be quiet while watching the program or listening to some instructions about game rules provided by the software. For one boy, who kept talking and moved himself on the chair. Hua quietly walked to this boy and spoke a few words with him. Similarly, Yan told the children to exchange reading materials and take turns to use e-pens. It was observed that some children also spontaneously took turns to use e-pens and interactive books without the presence of their teachers (see session 5, appendix 8).
Scaffolding

Hua had provided some assistance to scaffold the children’s ICT activities, but this level of support was not evident in Yan’s teaching practices. It was observed that, in order to help the children reach on-screen icons, Hua helped a girl get on the chair and stood close to her to give her safety and emotional support. When this girl failed to drag an icon, Hua held the girl’s right hand and they dragged the icon together.

Observing

Yan had spent much time on observing the children’s ICT activities. For instance, in the library, she bent and closely watched what the children read with e-pens. While the children put on earphones after finishing connecting the e-pens to earphones, Yan watched their preparation for one or two minutes until they started reading.

Facilitating peer interactions

Yan had an intention to support peer teaching and cooperation in learning how to use ICT. She encouraged other children to ask questions to a girl who had used the e-pen to read. Yan organised the children to gather together in a whole group and encouraged them to share their experiences with the use of e-pens and interactive books through different methods, such as retelling reading stories, modelling adjusting volumes, asking questions to peers, and discussing the functions of interactive books.

Post-observation Interview with Hua

In this section, Hua’s classroom practices were further investigated and explored by asking her to give more details of her pedagogy, especially her aims and reasons for certain teaching strategies. A post-observation interview also explored consistencies and contrasts between what Hua did and what she said she did, which can provide a fuller understanding of her classroom practices.

Hua was asked if the observed lessons were typical events or something unusual happening in the classroom. She explained that she knew the present research in her classroom was to focus on young children’s use of ICT, which did not take place often during the week. Thus, she decided to give a lesson in which the children could interact with ICT. It was surprising to know that Hua prepared a ‘special’ lesson as she was
informed that the observation was focusing on usual practices in advance. This arrangement was because she wanted to demonstrate a lesson of the children’s use of ICT as they had in the past. The children’s operations on the screen were not very typical in the preschool as the teachers usually used Power Points or Flash to teach and the children did not have many opportunities to use ICT during teaching. However, she said that the children’s reactions and performances in the observed class were common since they had experienced this type of lesson before.

Hua explained three reasons why she did not often visit and guide the children’s use of e-pens during free play. Firstly, the children had used e-pens for a long time and they were already able to use them. Secondly, there was ‘invisible’ guidance, which was integrated in the classroom environment. Notably, Hua did not think about scaffolding.

Teachers guided them. In fact, a lot of guidance was invisible. For instance, when young children use a tape recorder, we already put signs or labels on the recorder to give instructions. We do not tell the children how to use them because they only need to read the icons. Much guidance by teachers was not oral instruction. We use pictures, labels and hints to help them and let them use these electronic devices. Our guidance is built in the process of creating the environment.

Thirdly, less supervision and guidance in young children’s ICT activities was due to the nature of play. She said that young children could learn and acquire knowledge on their own in the process of playing with software. Therefore she argued that the teachers did not need to give young children specific or direct instructions. Because of the children’s operational errors, she often repeated the method of dragging on-screen icons and demonstrated this method a few times.

Although most of the children are familiar with the touchscreen, there is a problem with their use of it in the beginning. Young children are more likely to use two hands to drag icons. They are not used to use one hand so they used the other hand to help, which actually affects their operations on the screen.

It was observed that Hua often stopped playing the video and asked questions to the children and then she discussed with them. She said that her purpose was not only to make the young children have a sense of differences in sizes (the theme of the lesson), but also expected them to reflect on reasons. For this purpose she prepared questions with different difficulties to challenge their cognition. She gave examples of her questions as follows:

I asked the young children why a big bear used a big umbrella and a small bear used a small one. Could the big bear and the small bear exchange their umbrellas? When the young children gave
their answers, I asked them for reasons in order to further help them understand the difference between the big and the small.

Her intention to discuss with the children arose from her consideration of the potential differences in young children’s learning abilities. She said that some children had difficulties in understanding the content and doing the task, but she believed that if the children further communicated and discussed with her and their peers it would help them learn.

It seems that all the children understood the size comparison between the big and the small, but it is not true. Some of them did not. However, they could have a better understanding after we had discussed and talked about it.

I showed her a part of the video where she helped a girl to drag an icon by holding her right hand and doing the task together. Hua was asked to explain why she helped the girl immediately rather than letting her try out solutions. She said:

I knew this child understood the task as she had already chose the right answer. Some young children could do it skilfully, but this girl did not use the touchscreen for a while. I was worried that she would only drag the icon with a little strength and then she would try again and again. I was worried that the rest of the class would create a disturbance.

Her concerns about potential disturbance caused by the remaining children seemed reasonable at that time because it was observed that some children spoke loudly and moved around in the classroom while the girl failed to do the task. Hua further elaborated her purpose of holding the girl’s hand to do the task together. She wanted to assist the child in obtaining hands-on experiences and to help her feel that she was able to do the task. Besides, Hua took this chance to demonstrate a modelling example to the class. Hua’s worries about the discipline of the class reflect that she was thinking about group control.

I wanted to help her experience success. If I did the task alone for her, she would feel different. I held her hand doing the task and she experienced the process. This child could experience it and feel that she dragged the icon. It also had a modelling effect to the rest children.

In the end, Hua said that she would not use a whole teaching time for the young children to use ICT, but as an extension of play, she hoped every child could have an opportunity to try once. Hua pointed out the current status of using ICT in her classroom and paucity of ICT resources, which reflects that ICT was mainly used for displaying curriculum and documenting teaching and learning. She indicated that the teachers did not give much attention to using ICT.
In fact, to be honest, we do not think much of using ICT in classrooms. We mainly use the computers, and its basic functions… It’s mainly used to display information and activities…. It is not because we do not want to use ICT, but the reasons are a shortage of ICT resources and too many young children in each class.

Interestingly, when Hua was asked to clarify why the use of ICT was not obtained much attention, she gave ‘contradictory’ information five months later when I had a follow-up conversation with her. She said ICT was gradually integrated into their work as the teachers talked about it, particularly young teachers. Because young teachers with higher ICT skills joined the preschool and they used ICT more often and discussed relevant topics with old staff teachers.

Teachers discussed the use of ICT with a focus on its implementation in the new semester and the teachers gradually considered using it, including the old ones. Young teachers joined the teaching staff and they had more ICT skills. All the teachers including the old ones are increasingly thinking about ICT and integrating it into the curriculum.

For this change she said that the teachers had a discussion about this research after the researcher left her preschool. It seems that the research had promoted them to think more about the use of ICT in early childhood classroom.

Our teachers did not have many opinions about using ICT when you [the researcher] were here, but we had a big discussion about the use of ICT this semester.

**Post-observation Interview with Yan**

Yan was asked to talk about anything particular in relation to her classroom being observed. She said that the children in the classroom had started to use the e-pens and interactive books recently. She felt the children were a bit quiet during the observation as she earlier told them a guest teacher (the researcher) came to the class. Yan explained another reason was that she told them to keep quiet in the library and not to disturb others’ reading. Usually the children would talk loudly and change their reading materials very often when no visitors appeared in the class.

Yan was asked to explain why she helped a child to prepare the e-pens and earphones. She said that the reading activity took place in the library so she hoped that the children could use earphones. She believed that some children might have forgotten how to use earphones and e-pens as they did not use them for a while. When Yan heard a child reporting a problem with the earphone, she directly connected their earphones to e-pens
and helped them put on. Yan indicated that she reflected on this lesson after watching the video recording.

Some children have not used them for a long time or do not know how to use them. Therefore I chose to help them and I did not think why I helped. Thinking back, I should let them prepare their reading. At that time a child said: ‘my earphone does not work’ and my first response was that I should check it and change it if it really does not work. I did not think too much at that time, but on reflection, I think I should let them prepare [the e-pens and earphones]. If they have problems, I can help the children solve them.

Because of less frequent use of e-pens and earphones, Yan’s concern about the children’s competencies in using them led her to lend such support. In the first interview, she indicated that the children’s limited use of ICT like e-pens was mainly due to lack of adequate resources.

In contrast to Yan’s accounts about the children seeking help, there were no children observed directly asking for her assistance. Thus, Yan was asked to explain how she knew that the children might not know how to use e-pens and earphones. She indicated that her decision to assist the children was based on her judgement on the situation, but she reflected on her appropriateness of intervention into the children’s activities, which seems that she was learning from the interview.

In the beginning of the class, I observed their preparation process and I guessed some children had problems. They should insert the cord into the right socket on the e-pen. I thought some children did not know how to do it and they were not familiar with this process. For this reason, I intervened into their preparation. [Yan smiles] Perhaps my intervention is not very appropriate. It’s alright. I am also reflecting on it.

In the video it is seen that she talked with the children frequently, but the communication was too quiet to be heard. Therefore she was asked to explain what she talked with the children during their reading. Her main aim of communicating and observing with the children was to acquire knowledge about the children’s learning process and experiences.

Actually I was preparing for discussion and sharing experience at the end of the lesson, so I had to know what problems they had or what they learned. I had to know information such as their reading content and how they used the e-pen. I was trying to communicate with the children and find out what valuable points could be discussed and shared with them later.

For instance, questions such as ‘Are there any issues with their [e-pen] usage?’ Do they understand what they read? Through asking questions, I could give them some encouragement and praise if they did very well. My observation was about the process of their use. Well [she paused]. Probably was about experiences, their accumulated experience and existing issues.

Yan had used different strategies such as dialogues, praise and observations to
encourage young children’s experiences and identify learning problems. However, she seemed to focus on assessing the children’s learning and addressing their issues, rather than engaging in learning conversation to facilitate sustained shared thinking.

It was observed that Yan frequently pointed to some children’s interactive books when she talked with them. Then the children followed her and used the e-pen to click where she pointed to. She was asked to clarify her aims of such instruction. Yan indicated that she was guiding the children to learn how to prepare questions for their peers. She encouraged the children to ask questions to peers, aiming to encourage all the children to think further about the learning content.

We teach children not only to answer questions, but we also teach them to ask questions of their peers. When the children share their experiences, I hope they can ask questions of their peers. For this purpose, I talked with the children who were using e-pens and asked if they understood their reading content. They told me they understood it, so I further asked if they could retell their reading to others. They said they could, but I wanted to know if these children have any questions after retelling the story. They told me they wanted to ask questions, but they did not have questions or did not know how to ask. I told them there was a column of prepared questions in the end of their books for them to think and choose, so they could select questions they preferred to ask their peers.

Yan frequently mentioned the words ‘guide’ and ‘guidance’ in young children’s learning when she talked about her role and teaching strategies that support the children’s use of ICT. For example, she stressed her role only as a guide and argued that immediate guidance could occur when the children were stuck with problems. It is observed that her guidance was various, ranging from direct assistance to solve problems for the children to facilitating peer teaching.

I guide them. When they do not know how to find out solutions, I can provide appropriate guidance for them…. They are older now, so my guidance is mainly using oral language. I communicate with them in children’s ways to guide them. I can only be a guide…. If they do not have any solutions, I think I should guide them immediately.

There were limited ICT e-pens and earphones in the classroom so many children did not gain opportunities to use them. Yan was asked if there were any rules for distributing these resources for access in their daily routines. She explained that the children’s great interest in using these electronic resources had led her to supervising their turns in order to ensure equity of access for more children. It seems that the children were more enthusiastic about using e-pens to read interactive books than reading paper-based ones.

Young children’s reading activities are relatively autonomous. Usually the children take turns only when they want to change reading zones. Because the children are very interested in e-pens and only limited numbers are available, my main purpose is to meet more children’s needs. If we let the first four children keep using e-pens, they would not stop because there are too many
interactive books. They are very interested in these books and some maths interactive books are like games. As a result, they would not feel tired and they probably prefer to spend a whole day in the electronic reading zone.

Besides, Yan wanted other children to learn from observing their peers’ modelling. Using peer modelling, Yan intended to turn individual learning knowledge into collective experiences for all the children. She attached high importance to the role of peers in the children’s learning and considered peer teaching more effective than hers. In her view, young children’s interactions with their peers could develop valuable thoughts so that she created opportunities for the children to share, discuss and communicate, as well as teach each other. These teaching strategies indicate that Yan was recognising children’s competencies in acquiring ICT experiences and skills.

I wanted to spread children’s individual learning experiences to all the children and turned individual experiences into collective experiences. One girl described her experiences of using e-pens and interactive books and I asked her to model her actions in front of the class. This process was encouraging other children to learn. In my opinion, young children teaching their peers are probably quicker and more effective than teachers. I think my teaching cannot be as receptive as their peers’ teaching. After the modelling, I asked other children if they had any questions for this girl. Some children are afraid of asking their teachers questions, but they will ask their peers.

Young children can produce some conflicting arguments about some problems. They will argue. These conflicting views are very valuable. Therefore, I invited some children to talk about their valuable gains and experiences in their reading activities. Then all the children communicate, share and discuss together in order to help other children learn.

The role of peers, especially more able ones in modelling and scaffolding was highly valued. It was observed that Yan chose a girl to do the demonstration, so she was further asked was the girl a particularly selected in terms of capability. She said that she already thought of selecting the children whose capabilities were above average level. She believed that young children with different capabilities should be given different learning tasks. Yan chose the more capable children to perform this modelling for the whole class, but she also gave less able children an opportunity to model simple tasks.

In my plan I already knew whom to choose. Usually I will choose relatively able children. For some simple tasks, I would also ask less capable children to do it. Different tasks are for different children with different abilities.

Not choosing less capable children to do ‘challenging’ tasks was linked to her consciousness of these children’s self-esteem. For less able children, Yan tended to protect them from being laughed at or having their self-esteem hurt by their peers. She encouraged these children to imitate from more capable children’s modelling. Meanwhile, she gave positive comments on less capable children’s performance to facilitate their learning progress. However, less capable children were likely to have less
access in using ICT, especially opportunities of exploring them.

If less capable children do a simpler task, they would not feel frustrated. Some children…. they like making fun of others…. Once a task is not done very well, they would laugh at their peers, which would probably hurt the child who is sharing experience with the rest of the class. When competent children finished modelling, I can ask less capable children to repeat it. I can tell them “they are excellent and learn very fast.” In this way, I think I can help less able children make progress….My main purpose is to protect the self-esteem of less capable children.

In general, Yan left the researcher an impression that she seriously considered the children’s feelings so she tended to carefully provide opportunities for less capable children to use ICT. But it seems that she did not think of using other teaching strategies such as guided interaction and co-construction to support the less capable children.

Summary

This chapter detailed the data collected from Hua and Yan in the preschool. The case study with them reveals that different types of ICT resources were available in the classroom. The emphasis of the preschool on developing young children’s literacy, especially reading abilities, had influenced the children’s learning and play, and the teachers’ classroom practices. This emphasis not only impacted the provision of e-pens and interactive books, but also the purposes of using them in the classroom. More importantly, it shaped the way the children used electronic reading materials and the teachers’ perceptions of the children’s learning with the use of these resources.

Hua had highly positive perceptions of the use of ICT for young children and teachers themselves, which were associated with her ICT competencies, joyful working experiences with and support from her colleagues and the children’s parents. She also learned from her daughter’s use of ICT at home and this knowledge had helped her to understand young children’s interest in using ICT, indicating her willingness to learn from children. Her efforts on leading the whole preschool to make progress in using ICT were acknowledged by the principal and colleagues. Her personal interest and expertise in ICT were recognised and valued in the preschool so she was probably motivated to learn and achieve further success and live up to expectations.

In contrast to Hua, Yan did not see much potential of ICT for young children. She seemed sceptical about the value of ICT in ECE and young children’s ICT competencies, although there were tensions and contradictions in her reports about the
role of ICT. She was concerned about the negative effects of ICT on children’s health and the balance of the curriculum in learning. Therefore, Yan was unsure about educational aims in terms of the children’s ICT use. She also felt big challenges to her classroom practices and her personal ICT skills because of the children’s increasing knowledge acquired from their access to ICT. Yan’s perceived challenges caused by young children’s increasing knowledge reveals her traditional teacher-centred belief in that she tended to emphasise her own expert role and knowledge, even control, without considering the children’s own creativity and autonomy, individual strengths, and the capabilities of the group. Yan’s concerns about inconveniences in designing ICT activities for the children restrained the children’s opportunities to explore ICT and limited possibilities of incorporating ICT into the classrooms. This reflects that she viewed early learning as a directed process in which the teachers are responsible for providing the context of the experience and the content to be learned.

In general, there are many similarities between the two teachers. Both teachers shared the same attitude towards their ICT training. That is, they were not satisfied with the content and the way of current ICT training and demanded more specific and advanced training programs for all teachers. They mainly used ICT for displaying curriculum and sharing information and resources among colleagues and parents. It is worth pointing out, although ICT was used as a valuable tool to enable the teachers and their colleagues to work together and develop their cooperation and understanding in the process of learning and teaching, this was not extended to support the children’s learning and development.

The ‘two ways’ information regarding young children’s use of ICT flowed through families and the teachers was mainly about parents seeking advice and teachers’ recommendations of educational software. Their reported and observed young children’s ICT activities were mainly simple, passive and limited, but received with high interest and enthusiasm. The data about the children’s ICT activities provide support to the survey result that the most common ICT activities for young children were watching TV/DVD/programs. These findings reveal that young children’s use of ICT for developing their learning are similar to those of Clements and Sarama (2003), where early experiences and competencies were not highly valued in the preschool
In a very similar way, Hua and Yan had consistent views on their role as an observer and guide, and tended to resist direct instruction in the children’s ICT activities. They valued and facilitated peer interactions and peer-teaching in the ICT activities, although this was not very evident in Hua’s teaching strategies. Hua and Yan had different approaches to the children’s use of ICT. Their pedagogical strategies were modelling, instructing, interacting, explaining, providing resources and solving technical problems, providing feedback and managing discipline. There were also some differences in their pedagogy in terms of facilitating the children’s ICT activities. Hua seemed to use more sociocultural pedagogies such as scaffolding to support the children’s ICT activities, whereas Yan focused more on facilitating peer teaching and modelling.

However, the observations reveal that both of the teachers had frequently used teacher-centred instructions and they were lacking a wide repertoire of sociocultural pedagogy in mediating learning such as co-construction or developing sustained shared thinking. Their teaching strategies involved a lot of physical and oral instructions in a direct way. With the approach of direct instruction, they decided on the children’s access and ICT use, as well as explained and demonstrated the way of using ICT. According to the continuum of teaching strategies (Arthur, et al., 2012), their pedagogical strategies, such as providing ICT resources, planning learning environment and modelling are at the low interaction end of continuum because they involve low levels of interaction and engagement between teachers and young children. The low interactive teaching strategies actually had restricted them in building genuine and cooperative relationships and constructing or co-constructing meaning and knowledge with the children in ICT activities.

It is worth noting that the children’s free play had received relatively little supervision and attention from Hua. During one observation, Hua passed the children’s activities with e-pens in free play, but did not stop or visit them until a boy sought her help. This method of guidance indicates that Hua did not consciously plan and actively employ her pedagogy that can support and extend this child’s learning with the use of ICT. The reactive supervision was critiqued as “a fairly risky strategy” because the children...
observed had rarely sought help and such guidance operated by default without considering pedagogical strategies (Plowman & Stephen, 2003b, p. 18).

The next chapter will continue to provide accounts and analysis about two case study teachers from the Zhihui preschool.
Chapter Six: A Case Study of the Zhihui Preschool

This chapter reports the findings of a case study of two of a sample of four teachers, who both worked at the Zhihui preschool. From the wider population involved in the survey two teachers from this preschool were selected on the basis of pre-set criteria with respect to the questionnaire as outlined in Chapter Four. These criteria are the availability of ICT resources; teachers’ positive perceptions of ICT benefits; young children’s high access to ICT; and teachers’ wide range of pedagogical practices.

Both Fang and Li worked in the same class and taught the children aged 4-5. Fang had worked as a preschool teacher for 28 years with a professional teaching diploma in ECE. She was the head teacher and took more responsibility for the class. Li held a bachelor degree in education and had four years working experiences in the preschool.

Background of the Preschool

The Zhihui preschool used to be affiliated with the BaiYu preschool founded in 1991. In 2009, the BaiYu preschool was ranked as a Level One Preschool which is just below the highest “Model level”. Due to an administration arrangement with the Local Education Authority, the Zhihui preschool campus became an independent public preschool in April 2012. After its autonomy, the Zhihui preschool had two campuses located in the Pu Tuo district. In total, the preschool had about 400 children in 12 classes and 51 staff members, with 41% of them registered professional teachers. Most of these teachers had a bachelor degree in education and a few held a professional teaching diploma in childhood education. Fang and Li worked in the campus called the Head preschool which was established in 2005. Most children lived nearby in the local communities. The preschool building is three storeys tall, surrounded and dwarfed by residential high rises. According to the principal, most children were from the middle level of social economic families and their parents were highly educated.

The Zhihui preschool specialises in music, dance and arts with the aim of helping young children experience the beauty of arts and develop their creativity and imagination (Shanghai Education Commission, 2012). This preschool has been involved in research on literacy and the use of multimedia with a local university. Since 2007, the teachers
have conducted research projects such as ‘Teaching strategies for using multimedia in the new curriculum’ and ‘Effective use of ICT in early literacy.’ The research-orientated feature perhaps shapes the teachers’ adoption of new technologies and the way ICT is used in the classroom. For instance, an article on the preschool website written by one teacher stated the multiple benefits of using multimedia and strongly recommended using it to facilitate teaching and learning.

In the pre-observation interview, the two teachers were separately asked to talk about their opinions and teaching practices related to young children’s use of ICT. Follow-up questions were also asked where clarification was needed. The following section reports the result of the pre-observation interview with Fang.

**Pre-observation Interview with Fang**

*Young Children’s Use of ICT in the Preschool*

Fang was asked to describe how young children used ICT in the preschool, but she only referred to the availability of some ICT resources and the teachers’ use of ICT, despite probing to encourage her for more information about the children. Fang explained that the preschool had used the multimedia and electronic resources for many years and they had relatively rich ICT resources.

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Each class has a TV, computers, multimedia, CD/DVD players, tape recorders and cameras.
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Fang indicated that the teachers used ICT to document the children’s learning and share the information with families and educational organisations. Notably, the teachers determined when to use ICT and what to do with it in the classroom, whereas the young children passively watched and listened to digital presentations and computer programs.

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The teachers decide whether to use ICT resources based on their teaching needs. The teachers can capture children’s learning by taking photos or recording videos, then upload and share them online....In each classroom, the computer was installed with two types of curriculum software for the teachers to choose. Taking a music lesson for example, young children can imagine and learn abstract ideas because the digital presentation [on the computer] is vivid and intuitive.
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Fang indicated that the children were able to use some software. She said that the children encountered few operational difficulties and they could play on computers on their own with feedback provided by the software.

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The children in our class can read some Chinese characters on the software. Signs on the software also provide instructions so they are able to play computer programs by themselves....It
seems that the children have little trouble with mouse clicks while they are using computers.

Fang described the children’s strong interest and enthusiasm in using ICT as they were actively seeking opportunities to use it and excited about using ICT. The children were more willing to take part in playing games while they were participating in ICT activities.

When the children are in computer activities, their interest and attention are very high. They are very active and they all want to have a try....In the computer play, their enthusiasm, initiative and willingness to participate in the game are stronger.... They are very happy about their success in the game.

The young children’s ICT activities she described were associated with positive feelings, strong interest and pleasure. The children’s active use of ICT gave them a sense of success in doing the task and helped them experience joy and motivation.

**Reasons for Young Children’s Use of ICT in the Preschool**

In her view, there were three main reasons for the use of ICT in the preschool: contextual changes in social and technological environments; preschool leadership; and the benefits of ICT for teaching and learning. Firstly, Fang believed that the rapid development of ICT has made it available in many families so young children have access to it. ICT has also infiltrated into educational practices as a teaching and learning tool, which was very different from her past schooling time.

As time goes on, ICT is developing and updating. Many families have an iPad and young children are using it. A few years ago, we did not use ICT often....I think the reasons for using ICT in the preschool are related to social environments. The multimedia has infiltrated into teaching and learning. Classrooms are different from what we attended in the past and nowadays we use TV and computers as screens [to display teaching information].

It seems that Fang was more aware of the impacts of social and technological background on the use of ICT in her classroom practices than the changes in educational policies and curriculum as she did not mention any requirements of using ICT in their policies or curriculum. Secondly, Fang said that the support from the preschool leaders had promoted the use of ICT in the setting. This reflects that the preschool leadership could play an important role in the provision of ICT infrastructure and incorporating it into classrooms.

The reasons for using ICT in the preschool are related to preschool leaders’ emphasis on developing and using multimedia.

Thirdly, the benefit of ICT for learning and teaching was another important reason for
the teachers adopting it in classrooms. Fang believed that using software to teach was more effective than hand-made teaching materials due to its better teaching effects.

We found some digital learning resources are relatively good…. When the teachers use the software, they think it is better than using ordinary hand-made teaching materials…. Only using a single picture to teach them cannot produce better effects than that on the multimedia.

Fang explained that using ICT to teach was to draw young children’s attention to learning. She believed that teaching with ICT could better help the children concentrate on learning because of multiple and dynamic effects such as animation and cartoons.

Just a single picture cannot attract the children whereas an animated presentation can. The children’s attention and concentration are higher if we use the multimedia devices to show animations.

Fang also indicated that the children’s use of ICT in the classroom was to create engagement. She valued the children’s hands-on experiences with technological artefacts because she believed such experiences could foster young children’s thinking. However, she did not give any evidence and examples to illustrate her views.

One reason why the children use the multimedia in the class is that it makes them engage in the activities…. If we let the children use their hands to work on the multimedia, it stimulates their thinking and the use of their brains.

Fang did not provide any answer to the question ‘Whether young children need to use ICT in the preschool?’ Interestingly, she immediately moved to explain about teachers’ use of ICT in the classroom and her own research experiences. Fang was involved in a research project on using multimedia in the past, which shaped her views on when ICT could be adopted to teach young children. She said that using ICT to teach the children with too much and fancy information would distract their attention, which reveals that she was cautious about the potential negative effects of ICT on the children’s development.

Whether young children need to use ICT depends. For some teaching it is better not to use ICT whereas for some it is necessary. We had a research project about when multimedia should be used. In some teaching, it needs animation and dynamic pictures because teachers cannot use drawn pictures to present information. Therefore teachers need to use multimedia and give young children a deeper visual impression…. If we always use ICT to teach them and provide too much and too fancy information for the children, it would distract their attention.

Notably, Fang quickly shifted to talk about using ICT to teach young children each time when she was asked to describe young children’s ICT activities. It seems that she viewed using ICT to teach young children as the same as the children using it.
**Teachers’ Perceptions of ICT Benefits and Potential**

Fang gave little information about the benefits and potential of ICT for young children, despite further probing questions by the researcher to draw this out. Her first response was short and ended up with her laugh. Her facial expressions at that moment seemed the question “What potential does ICT hold for influencing young children’s learning and development” was difficult for her to answer.

One benefit is that the children can concentrate [Laugh and pause].

Then she thought for a short while and briefly said that ICT could develop the children’s attention, reading and cognition. However, she did not give any evidence.

The use of electronic teaching resources is beneficial for developing the children’s attention span, reading ability and cognition.

It seems that Fang did not see many beneficial effects of ICT from the point of view of young children. This may explain her low emphasis on the children playing with ICT. From her perspective, the use of ICT in young children’s activities was to supplement the traditional play in the preschool, but it was not the main activity.

In the preschool, we do not advocate that the children always play computer games and we balance their activities with various kinds of plays. We have computer games once a week as an auxiliary play. We do not organise it in the curriculum teaching, but in the extracurricular activities.

Fang appeared to consider young children’s ICT activities as playing ‘computer games’ and separated from other types of play. It reveals that ICT in the preschool was not integrated into every aspect of the children’s activities to maximise learning and development.

**Perceived Changes and Challenges**

Fang indicated that contemporary young children became cleverer and their ideas and knowledge were broadened, and their abilities were enhanced because of their use of ICT. She stressed that the teachers were able to deal with the children’s increasing broad knowledge through keeping learning. She seemed to see children’s increasing knowledge and capabilities as a positive change.

Young children become cleverer because of their use of ICT, but we teachers are also advancing with the time. We are always using it and keep learning. For the children’s problems and increasing capabilities, we also continue to improve ourselves.... The children’s ideas and knowledge become broader and comprehensive, and their abilities of understanding the
knowledge increase…. The children in our classroom, they have active thinking and broad knowledge.

Fang only briefly mentioned the existence of challenges brought by the children’s increasing knowledge. Then she moved to explain her own interests in learning to use ICT.

It has challenges. Although I am an old teacher, I also like these new technologies and enjoy using them.

**Communication and Collaboration through the Use of ICT**

Fang mentioned two ways of finding out about young children’s ICT use outside the preschool. One was parents’ reporting to the teachers in their daily communication, while the other was her observation on the children’s behaviours.

Young children use ICT a lot at home…. Parents tell us that their children use ICT in our common communication. Some children get addicted to e-games. They think of playing computer games or imitating characters in game software every day in the preschool.

Regarding excessive use of computer games at home, Fang stressed the importance of collaboration between families and preschools, particularly with respect to parents’ guidance. As a result, Fang provided advice for the parents to limit the children’s time spent on watching screens.

Cooperation between families and preschools is very important. Guidance from parents is also of great importance…. Parents told us that their children watched too much TV or DVD at home. We guide parents and suggest them to allow the children to spend a little time on watching each time.

Fang’s emphasis on parents’ guidance at home is associated with her concerns about young children’s over exposure to screen-based media. When issues related to the use of ICT occurred, she said that the teachers communicated with parents and the children to intervene. Communication with parents over the issues was informal chatting, which was mainly to reduce potential harm caused by ICT, particularly to eyesight.

Some children watch cartoon programs every morning which are attractive to them so they do not want to go to preschool. They come very late with unhappy faces. We talk with parents and chat with the children. We gave them some requirements and suggestions such as doing exercises. We told them it is harmful for their eyes.

Fang further noted that many parents also had concerns about young children’s vision so they opposed too much exposure to screen-based media. In fact, parents’ attitudes towards young children’s ICT activities had impacted on the use of ICT in the classroom practices. Teachers needed to take parents’ concerns about the harmful effect
of ICT into consideration while they were using ICT to teach young children. Moreover, the teachers had to ensure that the parents understood why computers and TV were often used in the classrooms.

Young children play e-games at home whereas some parents do not advocate it, because they think their eyes will go bad. If the children always play computer games in classrooms, parents would question it. Some parents think that teachers always play programs on the screen, so we need to help those parents understand our practices.

Fang was generally satisfied with her communication with parents and she believed that the current parents understood the teachers’ use of ICT in classrooms because it was widely used in a variety of preschool activities such as drawing and art. However, the use of ICT for drawing and art did not take place during the week of observation in her class.

**Pedagogical Practices Regarding Young Children’s Use of ICT**

Fang was asked to express her views on “What is ‘effective’ pedagogy regarding young children’s use of ICT”, but she did not respond to the question. Instead, she briefly said that young children encountered few operational difficulties. Perhaps she did not think deeply about her pedagogy to enhance learning with ICT while answering this question. However, Fang expected learning software to meet the specific and different needs of the children.

While the children use multimedia, it seems that they do not have many difficulties. I think that differences and levels should be reflected in software design.

With regard to the software, Fang indicated three prerequisites for improving the use of ICT in the classroom. First, she stressed the great importance of selecting appropriate teaching software. Fang believed that teachers had critical roles in making decisions, based on their professional knowledge and experience. In this sense, it shows that the teachers could significantly influence young children’s use of ICT because they determined which ICT, how, and when ICT could be used.

Teachers must choose [software] and they cannot use any resource without selection…. I have to see whether the software is suitable for the curriculum…. If the software program does not match the teaching content, I cannot adopt it… Not all the software suits, so we cannot use it without selection.

Second, Fang pointed out ICT activities for young children should be organised and balanced with other learning areas. She also reflected her own use of ICT to teach the
children and concluded that teaching should not solely rely on technological resources such as software.

Weekly teaching has to include these four areas: language, music, knowledge of the world and arithmetic. While planning the activities, we think that the children should learn all these areas. When I use multimedia and software to teach them, I think we cannot completely depend on these technological resources.

Third, Fang expressed her wishes to have more appropriate software resources so that teachers and young children could have options to select. From her point of view, software design should consider individual differences in different children, such as their ages and intellectual levels.

Personally I think more development of software and more electronic teaching resources for selecting would be better…. I think the software should include different difficulties in the learning task such as primary and advanced levels. The children can choose games according to their ages and intellectual characteristics for their plays.

Fang believed that her role in young children’s ICT activities was an observer and then a guide. She resisted giving solutions to the children directly as she maintained that the children should explore problems with their peers. Fang also valued collaboration between the children and their peers. Thus, she guided them through dividing labour among the children and encouraged them to work out problems together.

I think teachers should observe and then guide. In children’s play, we cannot give answers to the children directly. We develop their spirits of cooperation in their play. With teachers’ guidance, individual tasks are distributed by the teachers. Several children can cooperate in a team to achieve these tasks.

These strategies were characterised by sociocultural pedagogies as Fang facilitated the children’s learning taking place in interaction with others and provided scaffolding by creating a collaborative environment.

Pre-observation Interview with Li

Li was under 30 years old and had worked in the preschool for four years since she graduated from a local university. She worked together with Fang in teaching the same class for two years.

Young Children’s Use of ICT

Li indicated that young children’s overall access to ICT was low and their ICT activities were simple. The children had weekly opportunities to play software games in groups.
for approximately 20 minutes in the computer lab. The children also often used e-pens and interactive books for reading in their classroom during the week. ICT was not used for developing the preschool speciality areas (music, dance and art), but tended to focus on the children’s reading and play.

During group teaching, young children only have a few opportunities to use ICT, which are also relatively simple things such as clicking to play programs.

Li said that young children were able to use ICT in a simple way and they could skilfully switch on/off computers and the TV and play DVDs. In her opinion, the children at 4-5 in her classroom had already acquired skills of using some ICT resources.

Young children can play game software on computers and they can turn devices on and off by themselves. They know how to use them and find out solutions…. We think that young children can use ICT skilfully at home.

Li explained that young children were active and joyful in their ICT activities. They had fun in the process of simple use of ICT during play.

The children have great fun in the process of doing mouse clicks and touching media-based screens. They are very eager to gain chances to play computer games.

However, she said that young children’s time spent on ICT in the preschool was not much in comparison to their home ICT use and that of children at school.

Their home ICT use is quite extensive, but their time of using ICT in the preschool is little…. Young children gain relatively little access to ICT in the preschool, compared with children in schools.

Li gave two reasons for the limited use of ICT for young children in the preschool. One was the teachers believed that young children had sufficient access to ICT at home while the other was their curriculum arrangement. She indicated that young children’s learning subjects in classrooms should be balanced.

Young children have access to ICT at home therefore their ICT activities in the preschool are only for a short time. We cannot allow them to play with ICT every day because we have a weekly curriculum schedule and learning areas should be balanced.

Li assumed that every child could gain access to new technologies at home. She stressed the importance of following the curriculum to organise the children’s everyday activities in a balanced way. According to her, the curriculum had left little time for young children to use ICT, which reflects a low emphasis of ICT in the current curriculum.
Reasons for Young Children’s Use of ICT

Li did not indicate her opinions on whether young children need to use ICT in the preschool. She shifted to talk about today’s young children’s home ICT environment and their abilities of using these technological products, which she viewed as reasons for the preschool to give the children opportunities to use ICT.

Contemporary young children have a very high access to computers at home. Many children’s families have new technologies such as iPads. They know how to use it… Their home ICT use is quite extensive, but they do not frequently use ICT in the preschool. We give them some opportunities to try and get access to it.

Though Li did not indicate her position on the necessity of young children’s use of ICT in the preschool, she said that the teachers did not intend to encourage that the children play with ICT.

However, we do not encourage them to use these ICT. No encouragement.

Li explained that using software to teach young children originated from a commercial initiative as the preschool got product recommendations from software designers. But she clarified that the teachers believed that digital teaching resources and software were useful in fostering young children’s thinking. In fact, the selection of educational software was based on their professional experience and personal judgement about the quality of the software because the teachers did not have any standards or specific criteria for adopting it.

One reason is that commercial software designers came to recommend their products and then we experienced their products. We used their digital teaching resources and found they are beneficial to develop the young children’s thinking. What we value is the content of the software, not children’s simple mouse clicks.

Li also said that their research projects had influenced their use of ICT. She believed that the integration of ICT into classrooms was consistent with their research goals. An important purpose of their previous research was to promote the use of ICT for teaching and learning.

Some software content is close our recent research on the application of the informatisation and the use of multimedia. The use of ICT in the preschool matches our research projects.

Perceptions of ICT Benefits and Potential

Li believed that ICT resources provided advantages for young children to learn independently. She illustrated it with the example of the children using ICT. Namely,
young children could read stories on their own while adults did not have time to read for them. In this process, she believed that young children could acquire knowledge gradually.

ICT, like an e-pen is very good because young children can learn by themselves. For instance, when teachers or parents are busy and do not have time to read stories for them, the children can use e-pens to click interactive books and listen to the story if they know how to use it. Perhaps the children do not know how to use the e-pens or cannot read a specific Chinese character today, but they can probably use it or learn this word tomorrow.

Li also indicated that the use of ICT enhanced cooperation among the children during their ICT activities.

Young children will think about strategies like cooperation to play computer games. For example, one child acts as a team leader and distributes tasks for his group members.

In her view, the benefit of using ICT was different for individual children. Li believed that ICT was more valuable for capable children who knew how to use it.

In my opinion, for the competent children the use of ICT is Jin Shang Tian Hua [icing on the cake]. However, for the less competent children who do not know how to use the e-pen, it is actually difficult [for them to learn more with it]. For the competent children it is a way to learn more.

Li further indicated that young children’s access to ICT at home helped them to gain more information so their thinking and imagination were relatively better developed compared with the children who had less access to it.

Young children who have more ICT use at home are active and quick to respond. When teachers asked questions to the class, those children may already have some relevant information, which was obtained from the computer or digital photos. Their access to ICT can provide the children with some experiences.

For teachers, Li said that ICT had brought conveniences for teachers’ work. She acknowledged that the creation of new technological products broadened teachers’ knowledge and promoted them to think.

ICT is convenient for teachers to use. Some designs and features are beyond our imagination and we cannot create them, but ICT probably can give us more inspiration.

*Perceived Changes and Challenges*

Li said that ICT created big challenges for teachers, especially for the less experienced ones. Li indicated that it was not easy to deal with young children’s increasing knowledge and rich ideas. In her view, young teachers’ control of children’s learning was challenged. She explained that teachers’ classroom practices were mainly based on
preparation so their abilities to deal with unexpected learning issues raised by young children created challenges.

We do have challenges. Once the children’s thinking is divergent, our control is relatively difficult, especially for us new teachers. Our thinking in teaching is based on our prepared teaching materials and teaching plans, which we are already familiar with. Young children suddenly come up with some relevant learning questions, so how to deal with it probably challenges us.

Li also said that the development of advanced ICT challenged teachers because they needed to understand how to use it with more knowledge and higher ICT skills.

I think the more advanced the ICT, the higher the requirements for teachers…. Teachers have to master ICT skills and clearly know how to use it.

Though Li reported herself with proficient ICT skills in the questionnaire, she had doubts in making decisions when and how to guide young children’s ICT activities. She was not sure about her teaching practices regarding young children’s use of ICT.

Questions like how to guide and when to intervene are not clear. Should we let children play with it continuously or not?

**Young Children’s Home Use of ICT**

With regard to young children’s home ICT use, Li viewed it in both positive and negative ways. Li earlier stated that more access to ICT could help young children gain information which could broaden their thinking. On the other hand, Li expressed her concerns about the negative effects of ICT at home, such as health issues. She did not advocate too much exposure to screens and she maintained that young children’s time spent on screen-based media should be minimised.

Too much time on screens causes pain for cervical vertebrae and eyes. For us, we have to use computers because we have a lot of work that needs to be done on the computer, but for young children, they should watch as little as possible.

Li further explained a reason for the children’s use of TV or computers at home. It is because the children knew how to use these resources so they could watch programs at home. She disagreed with some parents’ ways of allowing the children to spend too much time on programs. In reality, she understood some of the difficulties in bringing up young children in the current family culture.

Sometimes parents have their own difficulties [in guiding appropriate use of ICT] because they have to go to work. As a result, grandparents looked after young children. Young children display tantrum-like behaviours if they are not allowed to watch programs. Grandparents who are
usually busy with housework have to let them watch. Some young children are able to switch on computers and they sit watching CD/DVDs stored by their parents.

Communication and Collaboration through the Use of ICT

Through talking with the children, Li obtained information about their home ICT use. She used two approaches to gain such information. For outgoing children, they told her what they did with ICT at home or she enquired about their home ICT use. For shy children, she waited them to speak out.

Young children sometimes tell us their experiences with ICT. For some outgoing and active children, I would ask them if they had played with it. But for introverted children, I would not directly ask them and enquire about information regarding their home ICT use. Probably I would give them more opportunities to speak out about it.

Li also asked parents about ICT resources in the children’s families and the children’s ICT access outside the preschool.

I enquire whether their families have a specific ICT resource…I ask parents if their children have used it at home or outside home before.

However, Li said the teachers did not particularly intend to find out young children’s home ICT experiences. The information about young children’s home ICT use was collected from their everyday activities.

We do not search for the information related to ICT home use on purpose, but we know about it in daily routines. For instance, when the teachers are using smartphones, some children said their Mums are also using the same type of phone.

Li also said that parents reported their children’s home access to ICT to the teachers. Particularly, when parents found difficulties in educating their children’s use of ICT, they sought advices from the teachers in order to intervene and restrict too much exposure to screen-based media.

Parents also give feedback to us about their children’s home ICT experiences…. Usually parents seek teachers’ help for talking with their children. They told teachers that their children had watched a lot of TV yesterday and required teachers to educate the children. Parents sometimes cannot manage the children and only teachers’ words have deterrent effects on them.

Li viewed such communication between teachers and parents as cooperation. As a young teacher, Li said that she communicated with parents very well and she was satisfied with her collaboration with parents. She acknowledged parents’ honest feedback, which made her job easier.

Regarding the children’s home experiences, parents give feedback to us too. Parents are very honest, so it is easier to cooperate in this respect. Although I am a young teacher, I can
communicate with the parents very well.

As for the appropriate use of ICT, Li’s focus seemed limited to preventing the negative effects of ICT on children’s vision. Li explained that the teachers had spent some efforts on reducing harm caused by screen-based media. She further expressed her concerns that too much time spent on screens caused the children’s eyesight problems.

We talk about harm to eyes due to watching TV and computers. During our medical check of children’s eyesight, we give more education about it. I talked with some children and compared their eyesight, and then asked them about reasons for bad eyes. The reason is too much time on the screens.

Li said that the teachers did not have further collaboration in terms of improving young children’s ICT activities for early learning. She gave detailed explanations for their minimal concern in this respect. One reason was a lack of emphasis on the use of ICT in their current educational goals. Li said that their childhood education was centred on young children’s lives and carried out in the routine culture of teaching and learning. It seems that Li’s educational practice was guided by only what is mandatory in their educational policies and curriculum.

Our education is mainly centred on Shenghuo [life]. Basically we educate the children in the routine culture. In the second year of the preschool, we probably pay more attention to young children’s psychological development and social rules. In the final year, we focus on the transition to schools…. Our focus is still on young children’s education and care.

Second, Li said that the teachers were not required to teach young children how to use ICT in the curriculum. It can be inferred that young children’s use of ICT was not important in early learning as it was not stated in their curriculum.

Teaching young children to use ICT is not included in our curriculum. Our teaching goal has not required that young children must learn to use it.

Third, Li summarised in relation to parents:

With regard to the appropriate use of ICT for young children, parents probably do not have much interest or a strong desire to listen to specific lectures and obtain knowledge in this field.

Fourth, Li also indicated that the little educational focus on improving young children’s use of ICT was partly because of young children’s lack of access to ICT in the preschool.

After all, young children gain relatively less access to ICT in preschools, compared with children in schools.
Thus, from Li’s perspective, there was a relatively low access to ICT in the preschool and a low emphasis on young children’s ICT activities in their ECE policies and curriculum, therefore the teachers and children’s parents gave little attention to it.

**Pedagogical Practices Regarding Young Children’s Use of ICT**

Li did not give her opinions on “What is ‘effective’ pedagogy in terms of young children’s use of ICT?” despite being asked. But she indicated that the teachers did not teach much content related to the children’s use of ICT as the curriculum did not prescribe it.

> We do not teach too much and too deep because teaching young children to use ICT is not included in our curriculum.

However, Li mentioned that she created a safe ICT using environment for the children, where she encouraged them to freely explore with ICT.

> Some children wanted to help me turn off the electric power, but I told them it is my job and their tasks are switching off their computers. When the environment is safe, we encourage them to explore and use [ICT] as much as they can.

However, her encouragement of the children’s exploration with ICT was differentiated. Li gave more opportunities to competent children than less able ones in using ICT. She encouraged the children who had less hands-on experiences or knowledge in using ICT to observe their competent peers’ use because she believed the children were able to learn through their observation. Another reason for this ‘unequal’ opportunity for less able children was her belief about the differences of young children’s abilities in learning.

> Some children have not seen some high technological products, so what should we do with them? We encourage them to watch others using ICT and to learn from their observation. We let young children learn with more competent peers imperceptibly.

Li said that she used different teaching strategies to guide young children with different capabilities. She indicated that instruction was used to teach less able ones, while she also used peer teaching strategies to facilitate their learning and development.

> I encourage competent children to explore and give hints to help them explore different methods. For less competent children, they do not understand some content, so I need to instruct them. Different teaching strategies are used for different children.

In the process of learning, Li said that she was an observer and guide who mainly watched children’s ICT activities and facilitated more capable children to help their
peers.

Teachers mainly act as observers and give guidance or intervention. For example, if some children are relatively competent, we let those children teach others. As a result, the children can interact with other children and learn from their peers. Teachers are mainly observers.

Furthermore, Li explained her non-intervention strategy was based on her child-centred belief. She believed that teachers should not strictly control and direct children’s ICT activities as teachers should play a supporting role.

We don’t need to instruct the children and they are the centre [in education]. Because young children are the centre and dominant in the contemporary age, teachers play a supporting role. This is our concept. Teachers do not strictly control and teach them.

Less guidance and supervision on young children’s use of ICT were also related to her belief that young children’s activities with ICT were play so young children could learn from their games.

Our children are now learning from play. Taking ‘Yi Zhi’ game software and ‘TongYi’ curriculum software for example, young children are learning from their plays. Our focus is on play and games.

It is worth noting that her child-centred belief and pedagogy were not consistently extended to young children’s ICT activities as teacher-centred methods still dominated in her teaching. For instance, she described her pedagogical practices as following:

We actually still have a high degree of control on our teaching content and we do not let the children use these ICT resources very freely.

Li indicated that the teachers initiated young children’s ICT activities and set up the environment for using ICT in the preschool, such as preparing ICT resources for young children to use.

We arrange that every class goes to the Computer Lab in a different time period every day. We organise the children to play in the Computer Lab.

According to Li, the teachers not only held the power to decide when to use ICT resources and who could use it, but also determined what to learn with ICT. She indicated that the teachers selected the learning software for young children based on their current curriculum.

The principal examines the software first and we only use the products which fits our Second Curriculum Reform. When the teachers choose, they have to be more careful. We only use appropriate software for our lessons.

The teachers also determined the aims of young children’s ICT activities. While Li
probed with questions to the children and encouraged them to learn from peers, she intended to teach them to memorise the learning content in the process of using ICT.

Many children want to use the mouse to click icons on computers so I let them tell me what the learning content is. They focus on clicking, not the purpose of the clicks. In fact, teachers have to let them learn how to clearly state their learning content. Listen to other children’s explanation and then the children who do not know answers should repeat.

In the end of the interview, Li expressed her ideas of designing the ECE software for teaching and learning in the future. For young children, she hoped more play and game software could be developed because she believed play and games are main activities for them.

Perhaps it is better to develop more play and games for young children to use in the future. After all, young children’s lives are playing.

For teachers, Li wished that they could gain more software resources and that software content could be more authentic and closer to their curriculum.

More software should be developed. The software should have more nature of play, and be more authentic and closer to our curriculum…. The software design has to be close to our curriculum.

For the purpose of designing better software, Li suggested that software designers could collaborate with the education authority and teachers to get advices so the designers could better meet teachers’ needs.

The software designer can communicate with teachers or the local education office to find out which area of children’s ability the software should develop…. and seek teachers’ advice and ask our opinions about how to design it.

In general, Li shared the same view with Fang on the teacher’s role as an observer and a guide in young children’s ICT activities. Both of them valued peer collaboration and peer teaching, especially in supporting less capable children to learn. They also had a high requirement for better software to facilitate teaching and learning in terms of its design and content.

**Observations of Classroom Practices**

In the following section, both Fang and Li’s classroom practices are described and analysed with a focus on their pedagogy regarding young children’s use of ICT. Because two teachers were responsible for the same class in the preschool, Fang and Li worked together in the classroom which was observed for approximately two hours per day over five days to gain greater insights into their classroom practices. Both teachers
appeared in the children’s classroom at the same time during the children’s ICT activities. Sometimes one teacher was teaching while the other was sitting behind the class and watching the whole lesson without any intervention. Sometimes one teacher was assisting the other one, such as setting up the environment for using ICT during teaching. In order to provide a fuller picture of the use of ICT in the classroom, their use of ICT to teach the children was also described as this was part of their daily routine and more importantly, a common way of the use of ICT in their classroom. I videotaped all of their teaching sessions which related to young children’s use of ICT to increase the accuracy of data analysis in this chapter. A total of five observed sessions are fully transcribed and provided in Appendix 9.

The aim of classroom observation in this study was to examine the current status of the use of ICT in the classroom, with a focus on the teachers’ teaching strategies in relation to young children’s use of ICT in the classroom. Therefore, the observation data are organised into the following categories: ICT resources in the classroom; young children’s ICT activities in the classroom; young children’s ICT competencies and experiences; teachers’ use of ICT in the classroom; and teachers’ pedagogical practices regarding young children’s ICT activities.

**ICT Resources in the Classroom**

The children’s classroom contained a variety of ICT resources such as a TV, a computer, a CD and a DVD player, educational software and a phone, but the numbers of each device were small, with only one or two of each device. However, compared with the Hongqi preschool there were many more earphones, e-pens and interactive books, and this preschool had a computer lab for the children to use. In the computer lab, four desktops computers were located close to windows in a row while the rest of the room was full of a display of hand-made robots models. According to the class schedule, the children could use the lab twice during the week. These computers were installed with two types of educational game software for the children to play. The teachers referred to children’s activity of using the software as ‘Yi Zhi’ play. ‘Yi Zhi’ means it is beneficial for intelligence.

**Young Children’s ICT Activities in the Classroom**
The children had some access to ICT resources for reading and computer games, but their time spent actually using ICT was short. Moreover, most of ICT activities during group teaching were simple as they passively sat, listened to and watched the programs. Their main ICT activities were clicking icons to select answers and pressing buttons on e-pens to read interactive books. Although the children had opportunities to develop hands-on experiences with the use of computers in the lab, these chances were only available to a few children in the class. There were only four computers for a class with approximately 28 children, thus seven children had to share one computer in each group. In the group, it was observed that the children, especially boys who sat closer to the screen in the first row had many more chances to click on-screen icons that those in the second row. In general, an average use of computers for each individual child was not high and they used ICT in a simple and limited way.

**Young Children’s ICT Competencies and Experiences**

While most children did not have many direct uses of ICT resources in the classroom, they were enthusiastic and actively seeking opportunities to use them and they experienced success and pleasure in the process of their ICT activities. It was also observed that most of them have acquired some ICT competencies as they could use e-pens for reading and play. For example, they were able to connect earphones to e-pens, open software and play programs on computers. However, there were a few children who could not use the computer mouse to click on-screen icons.

There were many occasions when the children immediately raised their hands up very high, even stood up when Fang was planning to call some of them to click their answers in front of the class during group teaching. In the computer lab, many children quickly grabbed front seats in order to use the mouse and touch the screen. In particular, during computer games, almost all the children actively participated in the play as they stood up and concentrated on watching the screen, as well as discussed which icon was right answer. They often exclaimed for their success and loudly reported their successful results to Fang with a sense of pride. In one instance, while the children watching the screen, some talked about a frog’s body quietly and some demonstrated their surprises about the pictures. Many of them loudly said: “wow!”; “how big!” Suddenly a boy made jokes about the frog’s cheek looking like a watermelon so the whole class laughed
and started discussing about the cheeks of frogs for about one or two minutes. They laughed and some looked at that boy.

During their ICT activities, the children had frequent interactions and collaboration with their peers. Some of these peer interactions spontaneously took place without their teachers’ presence, which had scaffolded their peers’ learning. For instance, when Fang called a girl to select an icon to fill in the water transition circle, the rest of the children reminded her not to forget to click the Chinese characters to get clues for the task (session 1). A few children supported their peers by giving their advice and instructions in clicking and dragging icons. Some spoke out their answers directly to help the children who were doing their tasks.

Peer teaching was also evident during their interactions, which had helped the children to achieve the learning tasks as a team. In another case, during a game (session 5), a boy as the team leader looked back at his members and asked: “Who should remember the first step?” A boy and a girl immediately raised their hands. This leader said to them “memorise the first step” with a sharp voice. Both the boy and the girl stood up and pointed to the location that the frog jumped on the screen. The leader then said: “the second step. Keep it in mind quickly.” Another girl stood up and pointed to an icon on the screen. The leader said: “the third step.” The rest two boys stood up and moved closer to the computer. The team leader said to them “memorise it.” After watching the frog jumping in the map, the leader again asked whose responsibilities for each step and the members responded his questions by raising their hands respectively.

**Teachers’ Use of ICT in the Classroom**

Fang and Li mainly used computers and educational software to teach the children in the classroom. In this way, the computer was used as a presentation tool to show software content. Fang used the software to teach the curriculum and then invited the children to click their answers on the screen. Both of them held power for the use of ICT in the classroom as they decided which programs to play, when to use it and which children to do tasks, which are illustrated in details in the next section.

**Teachers’ Pedagogical Practices Regarding Young Children’s Use of ICT**
Both teachers had used a wide repertoire of teaching strategies to support the children’s ICT activities, especially Fang. These pedagogical strategies were providing ICT resources and setting up environments, solving technical problems, modelling, interacting, providing feedback, instructing, explaining, managing discipline and facilitating peer interactions. These strategies are described in the following examples.

Providing ICT resources and setting up environments

Fang and Li set up the environment for young children to use e-pens and play computer games. Taking their reading with e-pens for example, Li distributed e-pens, earphones and interactive books to each pair of children. Fang helped the children move tables and chairs to organise spaces for them to sit and read in pairs.

Solving technical problems

During the children’s reading, some of them reported sound issues in the e-pens to the two teachers. In one instance, a girl loudly called the teacher to check the sound of her earphone and Li helped check the sound and adjusted the volume to fix it.

In computer games, when the computers of two groups crashed due to the children’s too many repeatedly clicks in a short time, Fang and Li immediately went to each of the group and helped them restart the computers. While restarting the game program, Fang also explained the reasons for computer crashing.

Modelling

Both the teachers had used modelling for different purposes. Fang used her body languages to show the content of the program while Li often demonstrated how to use the function of the e-pens. In session one, Fang used her body language to show the animated actions such as using her mouth to make loud sound and imitate strong wind blowing the water drops. In session 3, Li held up an e-pen and modelled how she pushed the button to turn on it while she was explaining its use to the class. During the reading activity, she also showed a girl how to use e-pens to draw lines in pictures by drawing an example for the girl. Notably, Li tended to use modelling to teach the children more often than Fang.

Interacting
There were rich and frequent interactions between the teachers and the children in particular in the form of conversations and dialogues. Fang generally had more frequent verbal interactions than Li during the children’s ICT activities. When Fang was playing the programs, she often interrupted and asked a few questions to stimulate the children’s thinking of their answers or solutions. In session 1, Fang played the program and displayed a riddle on the screen, which was like a poem and the software read it to the class. As soon as the program finished, a boy immediately called out his answer ‘a rain drop’ and many children quickly followed and gave the same answer too. Fang asked if there were any different opinions. Most of the children shook their heads saying “no” so the teacher probed a question ‘Why it was a rain drop?’ and called two children to explain the reasons for this answer. She discussed with them another possible answer, ‘water drop.’

In Li’s class, she also frequently asked questions to find out the progress of the children’s reading with the use of the e-pens. For example, Li asked a pair of boys what they read and if they could hear the content clearly with earphones. A boy who held the e-pen said to the teacher “He [his reading partner who wore an earphone] is listening.” This boy smiled and repeated a sentence of reading content to Li and Li laughed with him.

*Providing Feedback*

The two teachers had actively commented on the children’s performance during ICT activities. Fang had provided many more positive comments and feedback to encourage the children to concentrate on their reading and think of reasons for their mistakes, and collaborate in playing games. There were many occasions when the children succeeded in choosing answers by clicking the right icons, she praised them for their success by saying “very good” or “very clever!” She also led the class to applaud together for a child’s correct performance. If a child failed to achieve learning task, she gently patted his head and quietly said to him with smiles “think more about the answers and do it next time.”

In contrast to Fang, Li’s feedback to the children’s was more likely to come in the form of direct invention and she seemed to be less inclined to take the time to scaffold the
children’s ICT use. In one instance, a group of children could not double click in the software program. She observed the children’s actions on the screen and gave instructions, but she did for them after the group failed at the second try. In another case, a girl came to Li and reported the issue in the sound of her e-pen. Li said to her: “Why doesn’t it work?” Then she pushed the button and soon made the e-pen work for her. This shows that Li tended to provide direct help to solve the children’s issues.

Notably, Li was concerned about the children breaking the ICT so she emphasised using it carefully. While two boys were exchanging their earphone and e-pen for reading, they dropped the e-pen on the floor. Li said to them ‘oh, no! [you] do not take good care of your e-pen at all’. In another case, she loudly said “don’t drop e-pens, otherwise they break” to several pairs of children who were preparing reading with e-pens.

*Instructing*

The two teachers had often given their instructions to the class and taught them how to use ICT, especially Li. It was observed that Li directly gave orders many times and instructed some children in steps to click icons. For example, she said to a group of children “click the second icon and then click ‘start’”. When the children encountered issues in following her instructions, she still used a direct way of instructing to tell the children what they should do. During one observation in session 2, when many children made mistakes by clicking the wrong icons and they could not achieve the success of computer games, Li walked around the children and said: “once mistakes happen, you need to find out reasons” to them. These direct instructions reflect that Li did not consider her own role as a co-constructor and facilitator because she did not support the children’s ICT activities through any collaboration and co-construction. Instead, she acted as an authority who gave orders.

Fang sometimes also instructed the children what to do with the ICT, which mainly took place in the children’s computer games. She told the children to remember which icons to click. Moreover, when some children forgot their tasks before starting the game, Fang directly told them to remember which step. For example, in session 2, Fang gave instruction by saying: “each child remembers one location.” Then she raised the index finger to indicate the first step and said to a girl: “you remember the first.” Afterwards
she pointed to another child who sat beside the girl and said ‘you remember the second….’ until all the four steps were distributed to the individuals. It is worth mentioning that this way of distributing tasks to the children did not occur often during the computer games in session 5.

**Explaining**

Both Fang and Li frequently provided explanations to the children during ICT activities, which was one of the most common teaching strategies. Through this method, they had illustrated the functions of ICT resources in particular the e-pens, the content of programs (curriculum software), the rules of playing game software and the process of using ICT, as well as the reasons for mistakes. In one instance, Li explained the differences in four types of e-pens and interactive books and she provided reasons why the children needed to choose the right interactive books. It was observed that Fang had used the strategy of explanation to support the children’s ICT activities more often than Li. For example, Fang not only explained the reasons for the computer crash to help the children understand how to avoid it, but also emphasised how to distribute the whole task into subtasks so that each individual child in a team could have their responsibilities during games.

**Managing discipline**

Both of the teachers spent some time keeping children quiet during their group teaching. They also supervised the children to take turns to use their ICT resources. A few times Fang told the class to be quiet or not to shout so they could concentrate on watching the programs or listening to the rules for playing the games. In another instance, when a girl did not know how to use the mouse, a few boys told her to quickly click an icon. Fang said to them: “no rush, give her some time.” During the use of e-pens, Li told a few pairs to give their reading partners opportunities to use the e-pen.

**Observing**

It was noted that both teachers sometimes stood behind or beside the children to observe their use of ICT, especially in computer games. During the use of e-pens for reading, Li walked around the class and sometimes she stopped to watch the children’s reading. In
the beginning of the computer games, both of the teachers stood behind the children and watched the children’s preparation of starting the computer program for several minutes.

*Scaffolding*

Fang often assisted the children to facilitate them to achieve their learning tasks with the use of ICT. In one instance, a girl could not use the mouse to click an on-screen icon, Fang held the girl’s hand on the mouse and slowly moved the cursor to reach an icon the girl wanted to choose. During computer games, Fang had used most scaffolding strategy to help the children succeed in playing games. She gave clues to divide the whole task into manageable levels. For example, Fang said that the game consisted of four steps in each round and used her four fingers to indicate the numbers of steps. Fang reflected on this game the children played on Tuesday and reminded them of an issue in playing this game. She said: “one person could not remember the whole task last time, right?” A child said: “two people remember one step together.” Fang followed this boy’s idea and said to the class: “Every two people remember one step so please find a good friend to work with now.” Afterwards Fang pointed to some children and gently pulled them together to stand in groups, with six to eight children in each team. Fang nominated a team leader for each group and recommended that the leaders assigned the tasks to individual members. Fang also suggested to all the teams that they should discuss how to divide the task for every two children. Particularly, Fang emphasised the role of the leaders and repeatedly said: “the team leaders should discuss the first task now,” and she asked one team leader how he assigned the whole task to individuals to ensure the correct labour division among team members. Li sometimes used the same method as Fang did, but her support was less frequent and active.

Fang often talked with each group and checked with each individual child to see if all the children had a task. In this process, Fang questioned team leaders about their task distribution and reminded each member of their tasks to help them achieve the whole game. Moreover, she participated in the children’s game by counting the number of each step for the group and monitored the time spent on completing games to encourage competition among teams. Fang participated in their games and shared joy and pride with the children too when the teams completed the task successfully.

*Facilitating peer interactions*
Both teachers frequently encouraged the children to collaborate with their peers in pairs or teams. Li suggested that the children chose their reading partners and shared their reading by exchanging e-pens and interactive books. Fang also used this strategy regularly during computer games. She grouped the children into teams and nominated team leaders. In each group, she often reminded the team leaders to discuss their tasks with members and advised the leaders to raise members’ enthusiasm and motivation. They also facilitated peer teaching by asking more capable children to solve issues for less able ones. When a few children clicked wrong icons, the teachers called on some other children to help their peers by modelling or retelling the correct answers.

It is worth noting that the teachers had the intention of facilitating the gender equity in terms of obtaining access to use ICT. There were several occasions that Fang and Li gave some girls opportunities to play the computer games. For instance, Fang pointed to a short girl who stood behind the group to move to the front row and click her answer. She also told another girl who sat quietly to stand up and watch the screen. After a girl failed, Fang said to a girl “try again and have another chance” and she then gently patted the girl’s back when her tasks was displayed. In another group, when a girl was trying to use her finger to drag an icon, Li stopped a boy clicking the icons for the girl by patting his shoulder and said: “let her do it on her own.”

**Post-observation Interview with Fang**

On the last day of the observation, Fang was further invited to talk about her classroom practices, in particular to explain her pedagogical aims and reasons for her practices. It was found that young children’s use of ICT in her class was mainly mouse clicking, playing computer games and using e-pens for reading. As a result, she was asked to explain her purpose for letting the children perform these ICT activities. Fang said that she wanted to motivate the children’s initiative and enthusiasm rather than passively watch her use of ICT in the class. She believed that the children’s interaction with ICT could enhance their engagement in activities and active thinking.

If teachers just use the multimedia in the class, young children would only watch the teachers’ actions without participation. In contrast, if we let the children’ hands work with the ICT resources, it would foster their thinking.

Many children actively participated in computer games and experienced great pleasure.
And pride in success of their competition. Fang was asked if the observed classes were typical events in her classroom. She said that it was very common to integrate competition and play in their everyday activities. Fang further explained why the children in the last class observation had more successes in computer games, with a focus on her strategies of guiding them.

We always integrate competitions and play into activities. I found the children could not remember their tasks and have difficulties in doing tasks on Monday. After all, they are four or five years old and they could not remember all steps. It is a bit difficult for them therefore I grouped them into teams. Every team has seven or eight children and their abilities are different, so the more capable children can help the less able ones in a team. They can choose their individual tasks in their team and remember their tasks in the game. Otherwise some children would only watch others playing without any participation. I found problems in their earlier play, so I assign each of them a task and facilitate them to cooperate this time.

Fang indicated that she had spent some efforts on observing the children’s ICT activities and discovered problems such as, difficulties of computer games for the children and some children’s non-participation during their play. Through grouping children into teams and distributing the tasks to individuals, she facilitated collaboration between the children with different potentials. Fang also intended to facilitate more able children to help less able ones. For example, she said that more capable children were nominated as leaders to explain how to play the computer games and provide assistance in a team. In addition, Fang indicated that she promoted the less active children to participate in the play through assigning them individual tasks.

Fang was shown part of the video about her guidance of a child who had difficulties in using the mouse to click on-screen icons where she told the child to think about which hand to use and then suggested using the right hand to do the task. I asked her why she gave this instruction while the child just started using the mouse. She explained that the mouse was usually set for right-handed user, but some children in her class were left-handed. Consequently, she believed that those left-handed children might not succeed in using the mouse to do the task. Further she explained her aim of selecting those children was to correct their using gestures.

Some children use the left hand to click, but the mouse is set for right-handed users. As a result, they cannot succeed with their left hands. For some children with relatively low abilities, while I’m asking them to do the task, I also correct their actions or mistakes of gestures. Then they would know how to use the right hand when playing computer games next time.
During the observation, Fang helped the children who encountered difficulties with mouse clicks by holding their hands to click on the icons together. Fang explained her step-by-step guidance was because young children were developing fine motor skills. Notably, she wanted the children to master the skills of simple ICT use so that they were able to use the mouse to play games on their own.

When the children meet difficulties, I usually speak to them and prompt. Some children’s muscles on their arms are not well developed. Therefore their fingers are not flexible in using the mouse and I will teach them step-by-step. Clicking the mouse requires flexibility of fingers, but some of them have not reached this developmental level. After being taught by teachers, the child will understand the right ways of using the mouse.

It was also observed that Fang gave immediate help or called other children to support some children who had problems in using the mouse or dragging icons. In other words, she did not give individual children time to think about strategies for solving problems or reflecting on their errors. In order to know her reasons for providing help immediately, she was asked to explain why she did not give more time for them to explore how to use ICT individually or find out solutions independently. Fang explained her emphasis on interaction between the children as she believed that communication and help from more capable children in this process could enhance less able children’s early learning.

Because time in some lessons is limited and some children are also rushing to respond and they cannot keep their answers to themselves. Help from their peers is also a strategy. We emphasise peer interactions and communication. It is easy for them to communicate and teach each other, which has better effects than teachers’ direct and mechanic teaching.

This reflects that Fang had attached great importance to the role of peers in children’s learning with and through the use of ICT. She facilitated peer teaching and scaffolding during their ICT activities by creating opportunities for less able children to communicate and collaborate with their peers. With these strategies, more children engaged into computer games and experienced success and joy in the last observed lesson. Fang was asked if she could do something to improve the observed classes, what she would do for more ‘effective’ teaching practices. She said that she would give less capable children more opportunities to learn with more knowledgeable ones. In addition, she hoped to increase the challenges of the computer games if the children wanted to explore further.

Currently they can practice more and review some activities. For some less capable children, I will arrange some more able ones to provide one-to-one support. If some children who had more
abilities want to explore more, they can move to a higher level of the game. Seek the children’s opinions and let them decide what to play and choose. I don’t have to make them do.

Since Fang did not give her view on the most ‘effective’ pedagogical practices in the first interview, she was asked to indicate opinions again. She explained her roles and understanding about teaching strategies in relation to young children’s use of ICT.

[I am] an observer and then guide. When the children meet difficulties, teachers can guide or ask them questions to prompt. While children are solving problems, teachers don’t need to provide answers for them and [teachers] should encourage them to think about solutions. For instance, when some children tried to connect earphones with e-pens, I told them to try and find out solutions on their own.

Fang further illustrated her views on appropriate teaching strategies regarding the children’s ICT activities. That is, the teachers should let the children actively explore and provide questions to foster their thinking. Teachers’ guidance should come after the children’s exploration.

Young children should explore first and their teachers guide later. Teachers should not teach everything in the beginning and they should let the children actively explore first. Teachers provide some opportunities and questions to stimulate their thinking. While the children are searching for solutions, they would understand that they do not need to depend on teachers for all answers.

Fang had used software resources to teach different types of content and initiate activities frequently during a week. She explained that their ECE software was widely used for teaching the current curriculum. Fang pointed out that there was a mistake in the software so that she would select it more carefully next time.

The theme of this lesson is about animals at night, but the software content is not very thorough and it doesn’t provide much information. Some part of the software is about insects, but a lot of content is not related to insects. I found the software does not match, so I would not use it any more. I will search for other software and edit.

When she talked about the software error, she was asked to talk about the availability of their current ICT resources for teaching and learning. She stated the difficulties of finding appropriate software resources, but she had collaborated with IT experts from the local university to develop ICT resources for preschool. With her colleagues, she shared software and collaborated to build teaching resource database.

To be honest, we have difficulties in finding some electronic teaching materials…. We collaborate with IT teachers from the local university to make some flash animations and software. Sometimes I told them my ideas of design and they helped us design some software programs. Then I number and label these software programs, so other teachers can also use them. So the process is like building a teaching resource database for all teachers to use.
ICT was thus recognised by Fang as a strategic tool to enable the teachers to collaborate with IT experts and their colleagues together, which could develop the teachers’ knowledge and skills in using ICT and facilitate their teaching in their communities.

**Post-observation Interview with Li**

Since Li mainly assisted Fang in the classroom and did not give much teaching during the week, the following-up interview was more about eliciting her views regarding young children’s use of ICT. First she was asked if the observed lessons were typical classroom activities. She indicated that they were very common classroom activities in their everyday practices.

> It is our everyday lesson. We are providing our real and true lessons for your observation…. What happened in the class is very common and this is our routine.

Li was asked if there was anything about her teaching practices in the class she was not satisfied with. She pointed out a difference in the children numbers in the computer lab. The number of young children in the computer lab was twice as many on the observation days. It reveals that the observed class actually was not so ‘natural’ as she stated above.

> Usually only a half of the class play computer games. We divide the whole class into halves for two group activities. Each teacher has a half class. We had 29 children yesterday so that normally means that about 14 children are in each group. For example, one group uses the e-pen in the library while the other group plays outdoor activities. Next week we will take turns for their activities.

Li explained this change in student number of the observed class was because sometimes the teachers decided to have group activities together and the arrangement depended on the teachers’ week schedule. This week their teaching plan had been set before the observation. She was further asked about any differences in teaching fewer children in the computer lab. She indicated if the size of class became smaller, she would give more attention to young children, especially less able ones. She might spend more efforts in facilitating collaboration between young children who had different abilities.

> I pay more attention to the children. If the class only has a half of the current children, I probably consciously encourage capable children to help less capable ones. My attention would be more on the less capable children.

During the observation, Li often gave direct instruction to tell young children how to use computers. For example, when the children did not know how to solve problems,
she often gave orders or did the task for them. I asked why she taught some children in this way. She explained that sometimes time and other children’s enthusiasm in using ICT did not allow her to support some children in a very slow and patient way during teaching.

Teachers cannot just teach a particular child slowly and patiently and ignore the other children, especially in teaching time. In addition, the rest children are very eager to have a go and want to teach those children.

It is found that limited teaching time was not the only reason for her not providing less capable children with more opportunities to explore ICT, but her own belief had strongly influenced her attitudes towards the less capable children’s use of ICT. That was, some children who had little experience with a particular ICT resource could not use it.

Some children do not like thinking and they feel disappointed if they fail. They depend on teachers’ help. If a child has never seen a specific ICT product, he or she is still not able to use it even after being taught how to use it.

Perhaps, in order to avoid biased views on young children’s abilities regarding using ICT, she added some explanation about her aims of protecting the less capable children’s self-esteem. In doing this, she indicated that she gave some encouragement, but she also wanted them to experience a capability gap with other children so that they could catch up.

If the children really do not know how to use ICT, we would not criticise. We would tell them to learn from their peers or choose others to try. We may encourage them and tell them to do it next time.

We encourage and motivate those less capable children to do tasks, but they still cannot do. Under such circumstance, teachers have to placate them and not hurt their self-esteem. However, we also have to let them realise that they do not have certain ability and know they have to work harder.

In the class, she told some team leaders not to instruct other members to do the task such as clicking the answers in the groups. I asked her why she stopped them doing it.

They have to understand what they are doing in the game on their own.

Suddenly her smartphone was ringing in the interview, and a child’s grandparent asked about a sick leave for the child and talked about the child’s issue. Li left the interview room in order to check the child’s document. Because it was close the end of the semester, Li said that she was extremely busy in finishing all the work, and she was not willing to make another interview to discuss the rest of content.
Summary

This chapter had detailed the data collected from two teachers Fang and Li in the preschool. The case study with them reveals that a variety of ICT resources were available in the classroom, but the overall number of each device was limited when viewed from the children’s usage. The two teachers frequently used computers and educational software for teacher-led activities, such as presenting curriculum and giving lessons. The children’s ICT activities were basically electronic reading activities and playing game software on computers, which were mainly simple, passive and limited. However, most children had a high interest in using it and experienced pleasure, pride and a sense of success with the use of ICT.

Notably, a feature of the software both the teachers and the children used was coloured by behaviourist views of learning because it was designed with specific steps and a mechanisation of the learning process to encourage the children to practise and memorise learning tasks. As a result, the children were required to remember the content and try out their answers and passively respond to the task set by the software. This way of using technologies from the behaviourist perspectives mirrors traditional classroom practices (Koç, 2005) because the predetermined learning content is focusing on the acquisition of lower-level skills and children as users do not provide opportunities to explore authentic and creative learning. The lack of ICT integration in the current Shanghai preschool classroom is consistent with earlier findings that the use of ICT in the early years has been limited to teaching children how to use computer input devices such as opening documents (Walters & Fehring, 2009), and clicking a mouse rather than teaching with the ICT and encouraging learning through ICT (Ntuli & Kyei-Blankson, 2010; Oldridge, 2008). Such use also reveals a limitation in the use of ICT for teaching and learning within a sociocultural approach (Plowman, 2006; Plowman & Stephen, 2007).

Both Fang and Li were aware of contextual changes in the social and technological environments, and young children’s interest and competencies in using ICT, which were important reasons for young children’s use of ICT. Fang seemed to have slightly less positive perceptions of ICT value for young children as her responses were mainly
related to ICT benefits for teachers. It is not difficult to understand Fang’s responses because her responses to ICT benefits in the survey were sitting between tending to disagree and tending to agree, indicating her ambivalence. Although Li had relatively higher positive perceptions of the use of ICT for young children, she felt more challenged caused by the children’s increasing knowledge obtained from their use of ICT.

Nevertheless, Fang had a range of teaching strategies that support the children’s use of ICT, including scaffolding, guided participation and guided interaction. In contrast, Li had used the most direct oral instructions and physical intervention into the children’s ICT activities. Li perceived challenges from the children’s increasing information and knowledge obtained from the use of ICT, so she emphasised teachers’ own knowledge, even control to keep their expert role in the classroom.

There are many similarities between the two teachers. The ‘two ways’ information regarding young children’s use of ICT flowed through families and the teachers was mainly about parents seeking advices and teachers’ giving guidance to parents. Both Li and Fang were concerned about potential ICT harm to young children, especially their eyesight, so they advised parents to limit the children’s exposure to screen-based media. They also considered parents’ concerns about harm with the use of ICT in the preschool. As a consequence, they explained to parents and modified ICT classroom practices if necessary. But they did not have any formal or specific forms of cooperation in terms of educating young children’s appropriate use of ICT with families and communities, mainly due to the low importance of ICT in the Chinese ECE system.

In a very similar way, they had consistent views on their role as an observer and guide, and tended to distance themselves from traditional teacher-centred instructions. Overall Fang and Li had used different approaches to the children’s use of ICT. Their main pedagogical strategies were modelling, instructing, interacting, explaining, providing resources and solving technical problems, observing, managing discipline, providing feedback, and facilitating peer interactions and gender equity in using ICT. There were also some differences in their pedagogies in terms of supporting the children’s ICT activities. For instance, Fang had scaffolded the children’s use of the touchscreen
through a wide repertoire of teaching strategies, such as providing direct assistance, working together, distributing tasks and monitoring the progress of playing games. On the other hand, Li had often given orders, explained rules and solved technical issues for the children in a direct way during the process of the ICT activities.

Both of their classroom practices were involved many teacher-direct instructions. They determined the children’s use of ICT in the classroom through their control of the ICT resources and access. They prepared ICT resources, created environments for ICT activities, and decided ‘when to use’, ‘which ICT’, ‘what ICT activities ’and ‘who can use.’ The observations revealed that the teachers, especially Li, were lacking a wide repertoire of sociocultural pedagogies in mediating the children’s learning such as scaffolding, constructing and co-constructing knowledge. It is worth noting that Fang and Li often facilitated the equal access to ICT between genders by encouraging the girls to use ICT, but some children also took turns spontaneously to play computer games in their teams without the presence of their teachers.

Drawing upon the continuum of teaching strategies (Arthur, et al., 2012), the two teachers’ teaching strategies such as setting up environments and modelling are low levels of interaction and engagement between them and the children. These strategies limited them in building equal and genuine relationships with the children in engaged ICT activities and extending their learning and thinking in an active and meaningful way.

The next chapter will continue to analyse and discuss these teachers’ perspectives and their classroom practices.
Chapter Seven: The Use of ICT in Shanghai Preschools

Introduction

This study investigates preschool teachers’ perceptions and pedagogical practices in terms of young children’s use of ICT. In the previous three chapters I provided descriptive results of the questionnaire and rich accounts of the interviews with four case study teachers as well as classroom observations in two preschools. This chapter draws together the key findings of the study in relation to the research questions provided in chapter one. It analyses the data generated from the multiple sources, including the questionnaire, pre-observation interviews, classroom observation and post-observation interviews. It identifies and synthesises the core themes that emerged from the analysis of the data and relates these to the literature as described in chapter two.

The key findings show that the enabling factors for integrating ICT for teaching and learning include that a wide range of ICT resources was available in the preschools studied and the majority of surveyed teachers had positive perceptions of the use of ICT for teaching and learning. The national and Shanghai ECE documents (see Appendix 10) have recognised the need for ICT infrastructure and its use for improving ECE quality in a limited way. But the current landscape of the use of ICT reveals that the goal of integrating ICT into ECE classrooms is not fully realised. The teachers dominated the use of ICT in the classrooms for teacher-led teaching and learning activities. In contrast, young children’s ICT access was low and their ICT activities were generally simple and passive, which reflects the value of ICT for early learning was not fully recognised by the teachers. This is due to six major barriers to integrate ICT into the early years which will be detailed in this chapter. However, the children had strong interest and some competencies in using ICT and their ICT activities were associated with high enthusiasm and joyful experiences. This fact had a significant influence on their teachers’ positive perceptions of benefits of the use of ICT and their provision of ICT access for the children in the classrooms.
Contextual changes in social and technological development also impacted the teachers’ perceptions of the use of ICT and ICT classroom practices. The teachers’ pedagogical beliefs about their role and pedagogical strategies regarding young children’s use of ICT were strongly influenced by constructivism, but their pedagogies also had deep roots in their Chinese cultural heritage and the tradition of teacher-centred instruction. The analysis of data reveals that lack of an explicit ECE ICT framework and curriculum guidance has led to ambiguities in implementing it into the children’s activities and limited the teachers’ vision to develop pedagogies that support early learning and development through the use of ICT. The limited status of ICT in ECE also created discontinuities, mismatches and tensions between the teachers’ positive perceptions of the use of ICT and the development of their pedagogy that can maximise ICT potential in ECE. The results of this study suggest that ICT for children’s learning in ECE settings should be emphasised because ICT used for early learning and development is more important than ICT itself or its use as a tool in teacher-led teaching.

Figure 7.1. The use of ICT in the Shanghai preschool classrooms

This chapter is divided into two sections. In the first section I examine the landscape of the use of ICT in the classrooms as represented in the data collected for the study. In the second section, built on the nature of young children’s ICT activities and the teachers’
pedagogies, three enablers and six barriers to integrate ICT are detailed. Both the enablers and barriers have contributed to shaping the use of ICT in the preschools. The structure of the chapter is mapped in Figure 7.1.

The Landscape of the Use of ICT in the Preschools

Teachers’ Use of ICT in the Preschools

The survey shows almost all the teachers (99.4%) used computers in the preschools. The case study teachers frequently used computers and other digital media to teach in the form of teacher-led lessons and they documented the teaching and learning for assessment or information sharing. In this way, ICT was adopted to support traditional classroom practices focusing on knowledge transmission, rather than for transforming the learning process to construct knowledge with the children or by the children. This result from Shanghai was in line with earlier literature from the US and Australia that reports ICT, as an educational tool, in ECE was often narrowly used to document and assess early learning or manage class by early childhood teachers (Barbut, et al., 2003; Campbell & Scotellaro, 2009; Zevenbergen & Logan, 2008). But the use of ICT as a documentation tool reflects that the contributions that ICT can make for young children’s learning have not been fully explored by the teachers in the Shanghai preschools. It is noteworthy that none of the teachers was concerned about any ethical issues when posting and sharing personal information (e.g. names and photos) on websites when they shared information. In the Chinese context, it seems that ethical issues, such as protection of young children’s privacy when publishing learning and teaching information online with children’s images, have not raised attention to date. It was also noted that one of the teachers mentioned one purpose of publishing the children’s learning online was to let parents see the differences in children’s development and know whether their child was ‘lagging behind.’ This indicates that ICT has been used to assess the children’s development.

Their use of ICT for administrative use is possibly related to simple prescription of ICT use in the Shanghai Early Childhood Education Curriculum Guidelines, which stipulates that EC teachers should “use ICT to improve the management and assessments of the curriculum” (Shanghai Education Commission, 2002, p. 21). This
document is the current Shanghai teachers’ guideline and has existed for over a decade, which has neither clearly mentioned young children’s use of ICT, nor provided ways of maximising ICT potentials for learning. Zhu (2010) pointed out that generalised curriculum guidelines in China do not “give clear and concrete statements on how to do in practice” (p. 5). This applies to the use of ICT in ECE. In this case it is even worse, in that no pedagogical suggestions regarding young children’s use of ICT are explicitly stated in the curriculum.

Hence, it is not surprising to see ‘how’ ICT is viewed and used by these teachers, since their perspectives and practices were very much in line with their curriculum and policy advice. However, the teachers’ dominant styles of ICT use mean that young children’s hands-on experiences were limited. This reality challenges the success of the curriculum agenda that aims to “provide richer resources and broad opportunities for early learning and development” and embed ICT into the learning environment for young children to explore (Shanghai Education Commission, 2002, p. 3). The next section is an elaboration on the young children’s use of ICT in the preschool.

**Young Children’s Use of ICT in the Preschools**

In stark contrast to the amount of ICT use by the surveyed teachers, young children’s reported use of ICT in the preschools was not a common activity in their classrooms. This finding is consistent with previous literature from China and elsewhere (Guo, et al., 2006; Siraj-Blatchford, et al., 2002; Xiao, et al., 2012; Zevenbergen & Logan, 2008), indicating that technologies have been embraced by EC teachers, but young children’s access to them, particularly computers, is much less in preschools. More significantly, however, the children’s observed usage was mainly teacher-directed, short in timeframe and specific so that the children did not have many opportunities to initiate or extend spontaneous play with ICT and design their own ICT activities for ongoing, creative, project focused integrated learning. The four teachers generally mentioned little about further uses of ICT for young children even when the researcher probed, revealing a limitation in their awareness of the potential of pedagogy for an meaningful integration of ICT.
Although the children had a very low access to ICT and simple, passive use in the preschools, they were enthusiastic, joyful and curious when they did have opportunities for ICT based activities. Their achievements and pleasure with ICT, enthusiasm and high interest in using ICT contrast with the findings of Plowman and Stephen (2003a, 2005). The authors reported boredom, disengagement and frustration were common with young children’s ICT activities in play because of operational difficulties and lack of adult support. There are four possible reasons to explain this difference. First, ease of use might contribute to their positive feelings with ICT. The children’s ICT activities in this study were simple and even repetitive such as doing mouse clicks, which was not challenging for most children. Second, inadequate ICT resources and the limited usage were possible reasons for raised motivation as the children might be more interested in ‘uncommon’ materials and more curious for rare using opportunities. Third, their studies were conducted in a different cultural context nearly 10 years ago, but there are probably many more new technologies with lower cost now available in the Shanghai preschool classrooms. The increasing availability of ICT in their living environment can shape the children’s interest, knowledge and skills in using ICT. Fourth, the children’s enthusiasm and high interest might be because some teachers, especially Hua and Fang, were positive in promoting young children’s use of ICT. The children’s positive experiences with ICT in this study is consistent with another study (McPake, et al., 2005), which reveals that most children aged 3-5 were enthusiastic about the use of ICT and had an interest in using the equipment, especially computers. Particularly, boys in the classroom were generally more active in seeking opportunities to play computer games and engaging in activities. This observation supports a view that difference in computer use by genders was emerging at a very early age (Zevenbergen & Logan, 2008), as boys were more frequent users of the computers for different activities and more likely to play computer games than girls.

The interviews and observations show that most children had acquired some ICT operational skills for learning and play. This result provides evidence for the argument that many children had experience of using a broad range of technologies and they were already in possession of some ICT knowledge and competencies (Marsh, 2005; Plowman, et al., 2010; Zevenbergen & Logan, 2008). Because of young children’s use of ICT in the educational settings, many contemporary EC teachers believed that young
children aged 3-5 could use some ICT resources such as operating a mouse or computer function keys (McPake, et al., 2005; O'Hara, 2011; Plowman, et al., 2010; Zevenbergen & Logan, 2008). In this study, the three interviewed teachers were also equipped with this knowledge of young children’s ICT competencies. Notably, Yan generally diverged from the other three teachers in viewing the children’s competencies of using ICT. For example, she believed that computers were too difficult for children aged 3-5 to use. This belief is consistent with Yan’s image of children’s agency and capabilities identified, which will be discussed later.

Pedagogical Belief and Practices Regarding Young Children’s Use of ICT

The four teachers shared the same view on teachers’ role as an observer and guide, which is highly consistent with the ideology and principles embedded in the Chinese ECE documents. For example, the Chinese Kindergarten Education Guidelines describes the teachers’ role as “facilitator, co-operator and guide” (Ministry of Education, 2001, p. 5) and encourages the teacher’s role as manager of the learning environment and facilitator of children’s development. It is evident that the discourse of teachers’ role in this document has been shaped by Piaget’s constructivist view of learning. From constructivist perspectives, teachers’ role is generally interpreted to observe what children can do and help the children reach challenges with minimal intervention (Arthur, et al., 2012). Influenced by this theoretical perspective, it is reasonable to see why one of the most frequent teaching strategies identified in the survey and observations was to prepare ICT resources and create an ICT using environment. The four teachers also held a social constructivism philosophy of learning as they emphasised the role of peers and more capable children. It was observed that they facilitated peer teaching, peer interaction and cooperation during ICT activities. The observation also showed that the children supported their peers’ ICT activities through a wide range of approaches, such as discussing solutions and collaborating on achieving goals.

The four teachers generally resisted a direct instructional approach and wanted to distance themselves from direct instructors who explicitly taught young children how to use ICT. However, their lessons in group teaching were characterised by teacher-directed instructions. They also intervened into the learning process and acted as
technique trouble-shooters when issues occurred. Their reservations about interventionist guidance are not difficult to understand based on ECE social historical contexts. The notion of child-centred curriculum has been a foundational idea in early childhood practices in past decades in many countries including China (Arthur, et al., 2012; Graue, 2005; MacNaughton, 2007; Plowman & Stephen, 2006b). The child-centred education assumes that young children are active and an “independent agency” to create and develop their own ideas in learning (MacNaughton, 2003, p. 178). The idea of child-centred education, along with constructivist, play-oriented, and child-initiated learning have become an influentially dominant discourse in China since the ECE reforms in the 1980s (Tobin, et al., 2009; Wang, Elicker, et al., 2008). The teachers in this study were educated and trained in the 1980s and 1990s and their training programs had put great emphasis on child development theories and introducing western ECE ideas (Wang, Elicker, et al., 2008). Under such circumstance, ideas like child-centred education and “play-based teaching” have been popularised among Chinese preschools (Liu & Feng, 2005, p. 94 ). The following opinions from Li are a good example to represent her child-centred educational belief:

We don’t need to instruct them and the children are the centre. Because young children are the centre and dominant in the contemporary society, teachers play a supporting role. This is our concept.

Influenced by the child-centred educational philosophy, many EC teachers tend to prioritise the planning and creating learning environment because direct interactions are not privileged in the early years and children’s free-play and self-exploration are seen as the medium for early learning (Plowman & Stephen, 2006b). This philosophy is widely embedded in the Chinese developmental, play-based curriculum. For instance, the Shanghai ECE curriculum (Shanghai Education Commission, 2002) places ‘free activities,’ ‘exploring the world’ and ‘self-expression’ at the centre of the curriculum. It is worth noting that the use of ICT to achieve these curriculum aims were not observed in the preschools studied. According to MacNaughton (2003), in a child-centred approach to plan and implement curriculum, teachers’ curriculum decisions and pedagogical practices are linked with their observation and assessment of the individual child. Together the ideas derived from the child-centred philosophy can well explain why these teachers earlier indicated their respect to the children’s interest in using ICT and emphasised the importance of observation, independent learning, learning from play
and resisted intervention. The degree of agreement across these teachers in their roles, strategic non-intervention and learning through play reflected the power of ECE reforms and strong influence of importing ideas from abroad.

However, the child-centred education and pedagogy have received major criticisms (Langford, 2010; MacNaughton, 2003; Singer, 1996). These critiques acknowledge that teachers in ECE should be placed at the centre too, rather than only the individual child (Langford, 2010). From a sociocultural perspective, teachers’ agency and pedagogical support play an important role in scaffolding children’s potential development. Thus, it can be inferred that these teachers’ resistance to giving ‘help’ to the children and insistence of the idea of ‘exploring on their own’ reveal that interactions between child-to-teacher for knowledge co-construction or developing sustained shared thinking were not fully acknowledged.

Although the teachers reported a wide range of teaching strategies in relation to young children’ use of ICT in the questionnaire, this was not evident in the observed classroom practices. This result is supported by the literature (Siraj-Blatchford, et al., 2002) that teaching strategies for integrating ICT into young children’s learning and development were relatively limited. The case study teachers’ very common strategy was learning conversations to explain and discuss the methods of using ICT. They interacted with the children through probing questions to push them to think and reflect, whereas the questions were mainly closed and seemed not very challenging as many children could answer quickly and correctly. Frequent dialogues between the teachers and the children in the form of asking and answering questions were used to keep children’s interest and attention, clarify the ways of using ICT and to discuss learning content. Their active verbal interactions also provided suggestions, reminding and encouragement for further thinking. For example, Fang asked a group of the children to talk about the division of tasks in the team. After hearing the children’s distribution of their tasks, Fang asked them: “Who was responsible for the first step?” This team could not make four pairs to do four steps as there were only six children in the team. Therefore, Fang told them to rethink how to divide the whole task among them. The team leader soon raised his hand and said that he could do the first step alone. In another case, Fang asked one team leader how he assigned the whole task to individuals. The boy pointed to his team
members and explained how he gave the task to each child in the team. Fang listened to his explanation, but she patted one boy in the team and asked “Why did he have two steps to remember?” to the team leader. She continued to ask: “Can he remember two tasks?” and “Why not think about solutions?” Through probing and pointing out issues in the children’s collaboration, Fang pushed the children to reflect on their strategies and stimulate them to rethink their problem-solving strategies.

It is interesting to find that the teaching strategies the four teachers used significantly varied, and they were sitting at two extremes. Fang had a wider range of teaching strategies that support the children’s use of ICT. She grouped the children into teams and nominated team leaders to assign tasks to individual children before games. Based on her observation and reflection on the difficulties of computer games for the children, she segmented the task into manageable sub-goals and made the tasks within their ‘ZPD.’ She scaffolded the children’s ICT activities by providing assistances, feedback and reminders. Through guided participation, she communicated with the children over the issues and offered them alternative viewpoints by provoking children’s thinking and speculation. These findings conflict with the survey result that the teachers with more positive perceptions of ICT benefits tended to use a wider range of teaching strategies. That is, Fang had least positive perceptions of the benefits, but she frequently engaged with the children and motivated them to participate with rich teaching strategies.

On the other hand, the other three teachers especially Yan’s and Li’s classroom practices were characterised with strong traditional teacher-centred instructions and their role was directive, rooted in authority. Their roles to provide a carefully prepared environment and design learning activities reflect that they gave limited opportunities for the children to actively engage in the process of creating their own learning environment. Although Fang took different approaches to support the children’s ICT activities, she sometimes also shifted her teaching strategies to traditional practices. During their group teaching, the four teachers more frequently employed teacher-directed instructions to give lessons in a didactic way than they did in the children’s reading with e-pens in the library, and their play with the game software in the computer lab. This is possibly related to the availability of ICT resources in their learning environment. In the children’s classroom, there was only one computer or one
touchscreen available so the teachers were more likely to be controllers, decision makers and instructors in regards to the children’s access to and their use of very limited ICT resources. Grandin (2006) was critical of this traditional approach to learning in which the role of the teachers is to plan, direct and control the learning environment because it can lead children to develop “a dependent approach to learning and tends to rely on the direct of the teachers to become involved in a learning experience” (p. 99).

Interestingly, the teachers’ classroom practices were not always consistent, sometimes even contradictory. Although the teachers tended to resist being viewed as direct instructors, their teaching strategies involved a lot of physical and oral instructions in a direct way. With the approach of direct instruction, the teachers assigned learning tasks and gave orders, and taught the children how to use ICT. According to Arthur, et al. (2012), directing or explicit instruction “is most appropriate when children are introduced to something for the first time” (p. 349), but the children’s observed ICT activities were not new for them, even frequently repeated. However, two teachers explained that the children were not very familiar with the use of e-pens and playing computer games. According to Vygotsky, “instruction is good only when it proceeds ahead of development” (cited in Rogoff & Wertsch, 1984, p. 3). Therefore, the instructions on the use of ICT should lead to the children’s potential development, rather than focus on completed stages. Notably, only Fang and Hua had used the strategy of scaffolding to facilitate the children to achieve their learning tasks and realise their potential with the use of ICT.

These teachers’ pedagogical strategies were associated with their attitudes towards young children’s ICT use. Yan and Li were sceptical about the role of ICT and the educational goals of young children’s use of ICT so both of them used fewer teaching strategies to enhance the children’s ICT activities. Their intention in supporting the children’s use of ICT may provide an insight to explain the differences in their pedagogy. Hua and Fang indicated that they encouraged the children to explore learning and play with ICT, but the other two said that they did not intentionally encourage the children to use it. This finding lends support to the literature (Ntuli & Kyei-Blankson, 2010; Sugar, et al., 2004) that supporting learning through the use of ICT is related to teachers’ intention and attitudes towards integrating it.
Enabling Factors of Integrating ICT into the Preschools

The Availability of ICT Resources

The full data on availability of ICT resources in the surveyed preschools were reported in chapter four. In brief, the preschools contained a variety of ICT resources and slightly more than a half of the participants (58.5%) had more than seven types of ICT devices in their classrooms. The observation data also revealed that some ICT resources were available for teaching and learning in Shanghai preschools. This is consistent with previous studies (Guo, et al., 2006; Guo & Wang, 2005) which found that ICT had been increasingly introduced into Shanghai preschools since the 1990s. In the eight years since these reports, the present study finds that more varieties of ICT equipment have become established in preschool classrooms, but the results of this study suggest only a small increase in their numbers, particularly of computers. The main reason reported for limited ICT resources was the complex funding system for technological products, which will be elaborated on later.

Investment in and implementation of ICT in Shanghai preschools have come about in a context where the need for ICT infrastructure to improve the quality of ECE has been recognised and emphasised in the Shanghai Early Childhood Education Curriculum Guidelines (Shanghai Education Commission, 2002). To meet such a need, the provision of ICT resources in classrooms to extend learning resources and provide young children with opportunities to explore environments is explicitly advocated in the policy Early Childhood Education Equipment Regulations (Shanghai Education Commission, 2006b) (see chapter one for a full explanation). Since both case study preschools heavily stressed the importance of developing literacy abilities, such emphasis had influenced their provision of interactive literacy resources for the children. Electronic literacy materials (e.g. interactive books, e-pens and e-paper) infiltrated into the learning environments in the two preschools. It is worth noting that the focus on improving reading was related to a traditional Chinese view that reading is the only effective means of learning. Reading and learning are often taken as synonyms in Chinese (OECD, 2011).
Considerable international research (Aubrey & Dahl, 2008; Plowman & Stephen, 2005; Siraj-Blatchford & Whitebread, 2003; Yelland, 2006) suggests that ICT has impacted contemporary young children’s lives and has become a part of ECE classroom culture in many countries. This study similarly finds that ICT has come into use for teaching and learning in the Shanghai preschools. More importantly, ICT was advocated as a valuable tool in ECE by a majority of the surveyed teachers, with the teachers interviewed indicating a broad definition of ICT. For instance, they often reported the use of multimedia, electronic reading materials and software. Previous studies of early childhood practitioners have often shown them to have a narrow understanding of ICT (e.g. O'Hara, 2008; Tsitouridou & Vryzas, 2004), tending to define ICT as computers (Plowman & Stephen, 2006b), but these Shanghai preschool teachers seemed to have a broader understanding of the term. This is perhaps shaped by the wide range of ICT availability and access in their living and working environments.

**Awareness of the Context for the Use of ICT**

The four teachers interviewed highlighted the changing nature of young children’s growing environment. These teachers said, because of the children’s rich ICT home environment and their strong interest and competencies in using ICT, they used ICT to teach young children and created ICT using opportunities for them in the classrooms. However, the opportunities were limited and led by the teachers. This finding shows that the teachers had an emerging understanding of the impacts of social and technological development on the children who are growing up in a society where new technologies are an integral part of their lives (Zevenbergen & Logan, 2008). These impacts have been considered as an important reason for the use of ICT in ECE, as Bolstad (2004) stated, “ICT already has an effect on the people and environments that surround young children’s learning” (p. vii ). Children’s home ICT experiences and family culture play an important role in shaping young children’s interest in ICT and their ICT activities in the preschool as social living environments between families, communities and educational institutes are connected and porous (Hill & Nichols, 2004; Stevenson, 2008). Children can make connections between these worlds, bringing together their knowledge and experiences related to ICT use and participating in ICT activities in different settings. These teachers’ provision of opportunities for the children to use ICT reflects that they recognised sociocultural contexts of early learning.
by connecting the children’s broad ICT experiences to their preschool lives. The results of this study also reveal that ICT use in the classroom was shaped by these teachers’ perceptions that young children were interested in it. This interest in ICT is linked to contextual changes in the social, economic and technological environments (Stevenson, 2008). For instance, Yan held a belief that the invention of ICT and its ubiquitous presences in daily lives had raised young children’s interest in it. Such an opinion suggests that social environments and rapid technological development had influenced her understanding about young children’s dispositions to new technologies.

However, the four teachers’ knowledge about children’s home ICT activities and their strategies to find this out were limited. They basically knew what technologies the children’s families own and some children’s ICT activities such as watching many programs on screens. However, these teachers generally did not actively draw upon a funds of knowledge approach (González, et al., 2005) to harness competencies, strengths and knowledge that the children and families already possess. They did not take children’s existing home ICT experiences into greater account and make strong connections between new learning to existing ICT experiences, thus the children’s ICT activities in the preschool were limited to simple clicks and pressing buttons.

Young children as active social members in a technology embedded culture also contributed to shaping their teachers’ thinking and reasoning, and the way that they taught. For instance, because of the children’s high enthusiasm in using ICT, the four teachers harnessed this interest to draw their attention to learning through the use of ICT. In this way, young children’s interest and agency in ICT were valued because the teachers responded to the needs and interests of young children. From a pedagogical perspective, these teachers employed a child-centred approach when they arranged access to ICT and planned ICT activities for the children in the classrooms. This child-centred approach was responsive to the child and focused on individual children’s strengths, needs and knowledge of sociocultural contexts in a limited way. Together these findings reveal that ICT as a sociocultural tool not only re-organises cognitive process and modifies human understanding, knowledge, social interactions, but also transforms their cultural practices (Goos, 2005; Rivera, et al., 2002). For example, the widespread ICT resources in the children’s living environment shaped the teachers’
beliefs that the children were interested in using them and the children’s ICT activities could develop their cooperation and problem solving skills. As a result, the teachers used ICT to facilitate their teaching, and provided some opportunities for the children to use ICT in the classrooms, as well as facilitated peer interactions and collaboration. According to Fang, the use of ICT in the classroom was not common in the past, so the introduction of ICT into ECE classrooms had created changes to their classroom practices.

As Rogoff (1990, 2003) argued that individuals’ efforts and sociocultural contexts are mutually related, the use of ICT in the classroom as cultural practices is involved with many sociocultural interconnected elements such as home ICT environments, educational policies and teachers. The fast social and economic development in the contemporary China over past three decades have significantly improved people’s living standards (Luo, Tamis-LeMonda, & Song, 2013; Tobin, et al., 2009). The dramatic socioeconomic changes have created ubiquitous presence of ICT in many families and educational settings. These teachers’ attention and respect of the children’s interest in and capabilities in using ICT are also associated with their recognition of the children’s active role. This awareness is related to ideological changes in viewing young children and childhood education created by the Chinese ECE reforms (Wang & Mao, 1996; Zhu, 2008b). The Chinese ECE reforms started in the 1980s have dramatically transformed EC practitioners’ ideology about how young children learn and the introduction of modern educational ideas, such as ‘respecting children’s interest’ and ‘active learning’ has been widely disseminated in ECE (Liu & Feng, 2005; Zhu, 2008b). It is worth noting that there were some limitations in the teachers’ vision for carrying out these reform ideas into their practices as their pedagogical beliefs and practices were often restricted by a traditional teacher-centred approach.

**Acknowledgment of the Value of the Use of ICT**

The majority of the teachers surveyed (approximately 80%) believed that young children’s use of ICT could benefit early learning and development, such as in literacy and problem-solving skills, whereas they viewed developing the foundation for young children’s future learning as the most important benefit. This large percentage indicates that most preschool teachers believed that ICT was valuable for teaching and learning.
However, the teachers’ responses to the survey were significantly different from those elicited from the interviews in terms of ICT potential, which means the design of the questionnaire based on the western literature cannot represent the complexity and uniqueness of the research phenomenon in the Chinese context. In general, while the interviewed teachers partially recognised the value of ICT for early learning and development, teaching and communication, and collaboration with colleagues and families, their understanding in this area was limited by drawing the children’s attention to learning and documenting, sharing resources and information.

For young children, three teachers (all except Yan) reported most potential in children’s ICT activities was in the process of developing cooperation, social interactions and problem-solving skills. Notably, these teachers’ positive perceptions of the role of ICT were not consistent with their classroom practices in terms of supporting the children’s ICT activities. The four teachers indicated that young children obtained more knowledge of the world through their access to ICT so they felt the children were cleverer in this regard than their earlier students. This opinion reinforces a sociocultural view of child development that young children acquire their knowledge and understanding within their surrounding environments and culture (Fleer, Anning, & Cullen, 2004; Newman & Ashton, 2009). The teachers also agreed that the children were more willing and active to participate in ICT activities and they had a longer concentration on learning activities if ICT was used in lessons. These data provide evidence for the proposition that engaging with ICT can support the development of learning dispositions such as motivation, concentration, a sense of pride and achievement (O’Hara, 2008). Together these findings of ICT benefits for the children challenge many claims of negative effects of ICT on early learning (e.g. Cordes & Miller, 2004; Healy, 1998) made in opposition to young children’s use of ICT. For example, House (2012) argued screen-based media at an early age can interfere with children’s attention skills, abilities in acquiring literacy skills and children’s capacity to read for pleasure.

The four teachers all regarded electronic resources as useful and particularly emphasised the value of electronic literacy resources for young children’s individual and independent learning. Note though, that there was a big element here of this helping
their own management. Their emphasis on independent learning without teachers’ guidance has its heritage in the Chinese educational tradition. Over centuries, the Chinese education system encouraged independent learning without supervision and instruction, because of its low cost and the long-term use of examination systems focusing on memorisation (OECD, 2011). At present, this way of independent learning still seems to have advantages as it can reduce children’s reliance on teachers’ support. Indeed, using ICT for individual learning could save these teachers effort, especially in their classes with high children-teacher ratios. This supports the claim that electronic reading sources and multimedia can be useful in supplementing teachers’ support in busy classrooms and motivating literacy development with the help of automatic instructions (Burnett, 2010). Another reason for their attention to individual learning is the influence of the Chinese ECE curriculum reforms, which stress viewing a child as an individual (Zhu, 2008b; Zhu & Wang, 2005).

Notably, the four teachers only acknowledged the value of electronic literacy resources in facilitating independent learning, but did not mention the influence of their own teaching strategies. It is possible that they were not aware of the sociocultural potential in literacy activities such as knowledge sharing, co-construction of knowledge, scaffolding and peer collaboration, although two of them (Hua and Yan) emphasised this in a general sense. This potential is shown in a study comparing young children’s reading with electronic and traditional storybooks (Moody, et al., 2010). These authors found that children with adult-led reading electronic storybooks had a higher level of persistence and participation in reading tasks than child led-interactive book reading conditions. This result suggests the importance of adult mediation such as scaffolding and dialogic techniques in enhancing emergent literacy and language development. Such mediated teaching strategies were not often observed in this study during the children’s use of electronic reading resources. Plowman and colleagues (2012, p. 101) stressed the critical roles of adults and more able partners in children’s learning with ICT because they argued that children at a very young age “are not usually able to derive maximum benefit [from ICT use] without additional assistance.” Therefore, strategies of letting young children read or listen to literacy programs alone while the teachers were not available or busy in these Shanghai classrooms could be limiting the potential for developing engagement and communication.
For the teachers themselves, in much the same vein, they all acknowledged advantages of ICT for teaching and regarded ICT as a useful tool for communication and collaboration with parents and colleagues. In their view, using ICT helped them teach curriculum in a more efficient, dynamic and diverse ways than some traditional ways (e.g. drawing pictures on blackboards with chalks). It appears that these teachers’ adoption of ICT was strongly related to their perception of ICT benefits, particularly for teaching. This can be explained by the Model of Technology Acceptance (Davis, 1989), suggesting one fundamental determinant of adoption of ICT is its perceived usefulness. For instance, Li said that the teachers found the software recommended by designers useful therefore the teachers used it to teach and provided it for the children. This reflects that the use of ICT in their classrooms was also influenced by a commercial factor, although Li emphasised that the teachers had strictly selected their software. Their selection of the software was a top-down process in which the principal first examined the content and quality of the software, followed by the teachers’ screening. But their selection was based on their own judgements and experiences without referring to evaluation standards. This is supported by the literature that some preschool teachers’ expectations about learning seemed to be shaped by the marketing of the software (Plowman & Stephen, 2003b).

The use of ICT in their work facilitated the teachers to communicate, create and share educational resources and ICT knowledge conveniently and efficiently. The flow of knowledge and information related to the use of ICT between the teachers and parents, and between colleagues, had produced many positive effects such as reciprocal learning, friendship and joyful experiences. These findings support a claim that ICT is fundamentally changing the way of living, the way that people connect and communicate information, create and share knowledge (Harasim, 2012). The use of ICT is changing the relationship between home and educational settings and the boundaries between home and preschools become increasingly permeable as ICT devices make communication instant and easy (Elkind, 2007). From a sociocultural perspective, these teachers co-constructed their knowledge and skills and developed teaching practices in particular with their colleagues in their community through the objects (ICT) and activities (communication and collaboration). For instance, Hua learned ICT skills from some parents and then taught her colleagues about the use of ICT. Therefore, ICT as a
sociocultural tool has mediated teachers and parents’ actions and shaped their practices and social interaction.

In general, these teachers held different views on the children’s use of ICT at home. Li believed that young children’s access to ICT resources at home were valuable as they could gain more information about the world and broaden their thinking. But Li and Fang indicated that they were concerned about the negative effects of too much time watching screen-based media. As a result, three teachers (Yan differed) emphasised collaborating with parents to guide the children’s appropriate use of ICT. However, the communication and cooperation between the teachers and parents were mainly one way as the teachers tended to inform the parents about the learning software and advised them to restrict children’s time spent on screen-based media at home.

These teachers’ experienced benefits from ICT in saving time and reducing their workload which provides a different insight because the literature indicates that EC teachers often found with a lack of time to apply ICT into their classrooms (Bingimnas, 2009). For example, a large number of EC teachers explained that they did not prepare teaching with ICT and use ICT with young children, due to time limitations (Oldridge, 2008) or their heavy workload in the preschools (Ihmeideh, 2009). On the contrary, the teachers in this study widely reported that ICT had enhanced their teaching and enabled sharing resources and information more efficiently and conveniently.

In general, the teachers in this study mainly recognised the value of ICT for teacher-led activities rather than child-initiated or family-initiated activities. This may be related to these teachers’ limited understanding of young children’s use of ICT in ECE. It is interesting to note that while they were asked to talk about young children and ICT, three of them immediately shifted to talk about their use of ICT for teaching. It seems that the concept of ‘using ICT to teach young children’ meant the same as ‘young children’s use of ICT’ for them. Perhaps they did not see differences between these two concepts or they minimally considered young children’s use of ICT. In fact, Hua said that she and her colleagues were a bit confused about the term of ‘young children’s use of ICT’ while responded to the questionnaire. They discussed this term and believed that teaching young children with ICT also meant the children using it because they
were watching or listening to it. Thus, these views presented reflect that they gave less attention to the children’s direct use of ICT for creative knowledge building purposes and hands-on experiences with ICT.

Hua had seen most benefits that ICT has for young children and teachers, which was consistent with her responses to the survey. On the contrary, Fang seemed to have the least positive perceptions of ICT value for young children as her responses were mainly related to the benefits for teachers, although she scaffolded children’s ICT activities. This is consistent with the general trends identified in the analysis of the survey data. Drawn from the survey and interview results, older teachers in this study seemed to have less positive perceptions of the use of ICT in the preschools. Previous research also reveals that some older EC teachers are likely to be more sceptical about the value of ICT (Hill & Mulhearn, 2007).

In this section, the three enabling factors show that there was supporting base for integrating ICT into ECE classrooms. These preschools had basic ICT infrastructure and their teachers were aware of the need and some value of the use of ICT in the ECE context. However, the outcomes from implementing ICT into the early years do not just depend on the provision of ICT resources and teachers’ recognition of the value of ICT. More importantly, the outcomes can be impacted by teachers’ dispositions, motivation and strategies of teachers to be proactive in obtaining the resources and creating opportunities for young children to explore, as well as the knowledge of relevant pedagogies that facilitate teaching and learning. In the next section, barriers to successfully integrating ICT in the preschools are explored.

**Barriers to Full Integration of ICT**

While the teachers were endeavouring to use ICT into their work, there were significant barriers that inhibited full integration of ICT into their teaching and learning. These major barriers include inadequate ICT resources; fears and concerns surrounding the use of ICT; the absence of ECE ICT framework and curriculum; teachers’ insufficient ICT skills and ineffective ICT training; restraints from strong cultural and educational traditions, and a lack of knowledge and appropriate pedagogies. In this section, these barriers and their impacts on the use of ICT in the classrooms are discussed.
**Inadequate Hardware and Inappropriate Software**

Although ICT had permeated the Shanghai preschools, both the quantitative and qualitative data show the number of ICT devices in the classroom was limited, when considering the number of children in each classroom. Particularly, when approximately one or two computers in most children’s classrooms were available, the children could only use them for short periods of time in turns, limiting the potential for the children working together with the use of ICT to develop problem-solving skills and sustained shared thinking. Inadequate ICT resources and the donation of old computers from the local schools were a typical reason for young children’s sporadic use of ICT in the Hongqi preschool. Even when funding was available, old computers were still used instead of buying new ones. It is noted that the donation of computers for young children to use was not uncommon. For example, in a New Zealand survey, almost a third of childhood centres/services (31%) reported using donated computers with children (Morrow & Mackey, 2008). In comparison, the Zhihui preschool had relatively rich ICT resources and the children had more opportunities to use the computer lab and electronic literacy materials because their principal laid more emphasis on using multimedia for teaching and management, and had implemented the relevant research. This shows that the preschool leadership mediated the provision of ICT resources and young children’s use of ICT in the preschool.

Young children’s lack of creative and meaningful use in ICT activities was linked to their available teaching and learning software. The teaching software involved a lot of programmed instructions and the children’s game software emphasised rote learning and drill-and-practice programs. Clements and Sarama (2003), argued that drill-and-practice software programs encourage turn-taking behaviours and competitive spirits, but they may limit children’s imagination, curiosity and creativity in exploring possibilities of new learning. In fact, the US *National Association for the Education of Young Children* (NAEYC) and the UK *Developmentally Appropriate Technology in Early Childhood* consider the use of drill and practice software as less appropriate in the early years (Siraj-Blatchford & Siraj-Blatchford, 2006). In early childhood, diverse and open-ended materials could provide children with more ways and more scope to explore the potential in the materials and children can develop their literacy, science,
mathematics and creativity joyfully through active play with these materials (Drew & Baji, 2004).

Three teachers also stressed their needs for appropriate educational software for teaching and children’s play, although Fang had been working with the university to develop some software that meets their needs. Such demand for high quality educational software for Shanghai preschool teachers was noted earlier (Guo, et al., 2006), revealing the lack of appropriate software as a barrier for teachers in Shanghai preschools to integrate ICT into their work. Evidence from this study suggests this issue has continued to be a concern to this day. Notably, a low or no access to appropriate ICT resources for this group of children is not consistent with the developmental goals of establishing a learning society supported by ICT resources for every learner made in the National Medium and Long-term Educational Reform and Development Program (2011-2020) (Ministry of Education, 2010b). It is also at odds with the ambition of equipping the new generation with ICT knowledge and skills for the Information Society as stated in this policy.

**Fears and Concerns Surrounding the Use of ICT**

In addition to the scarcity of ICT resources, the teachers’ fears and concerns about ICT harm to health and the cost of the ICT equipment provide some explanation for the children’s limited use of ICT. Similar findings on the concern about young children breaking ICT devices were evident in the literature. Two New Zealand studies found that EC teachers’ concern about the durability of ICT equipment was a significant barrier that impeded young children’s use of ICT in preschools (Morrow & Mackey, 2008; Oldridge, 2008). Kerawalla and Crook (2002) also noted that parents were concerned about the cost of ICT, thus they restricted their 7-11 years old children’s independent use of ICT at home. To avoid potential damage to ICT caused by the children, these teachers tended to intervene and guide the children’s home ICT use. This result is in line with a previous study (McPake, et al., 2005), which identified that preschool teachers expressed explicitly negative views about young children watching TV or playing computer games at home, therefore they advised parents to limit the time children spent on them or recommended particular learning software or programs. Such a method of restriction on children’s ICT access is associated with those adults’
conceptions of childhood and their view of the children’s abilities and potential in looking after ICT equipment. However, their views and practices stand in contrast to contemporary images strongly drawn on in the western world, that a child is “rich in potentialities, strong, powerful and competent” (Malaguzzi, 1993, p. 10).

Three teachers also expressed their fears the harm ICT might cause to the children’s health, especially their eyesight. It is noted that Yan and Li even had such fears in relation to their own health. At the time of conducting the research with Yan, she was pregnant and wore special radiation-proof maternity clothes at work during this research. Hua, as her colleague, explained a reason why Yan did not answer the researcher’s emails to review her interview transcripts was that she tried to avoid using computers and smartphones as much as she could. It is not surprising to see these teachers’ widespread concerns because many scholars claimed (e.g. Healy, 1998; Maynard, 2010) that young children’s exposure to screens could damage their visual systems. But these claims were based on these author’s assumptions rather than scientific evidence. A cross-sectional study of 1600 children aged five in Western Australia revealed that musculoskeletal disorders and vision problems related to sedentary ICT activities such as TV viewing and playing electronic games become a public concern (Straker, et al., 2006). This is the first large-scale study relating the use of ICT to specific health indicators in young children, showing a very small percentage of children were reported as having complained of tired or sore muscles (0.9%) and eyes (2.2%) after watching TV or using computers. The small percentage indicates that the impact of ICT to young children’s eyes might not be as high as these scholars (e.g. Healy, 1998; Maynard, 2010) assumed. It is also worth noting, that due to parental completion of questionnaires in the data collection, symptoms that parents reported might be not truly reflect the children’s experiences with screen-based media, which suggests research on the effect of screen watching on vision is needed.

Although many scholars have argued against the negative opinions on young children’s use of ICT (e.g. Morgan & Siraj-Blatchford, 2010; Price, 2009; Stephen & Plowman, 2008; Yelland, 2006), some of these Chinese preschool teachers seemed stuck with focusing on the alleged negative effects of ICT for the children. Such negative views
surely limited their vision to include ICT into meaningful use and harness the potential of ICT.

**The Absence of ICT Policies and Curriculum in ECE**

Cook (2003) argued that discourses of curriculum and policies have powerful influence on what is valued within early learning and the activities judged to be appropriate. Due to the absence of ICT policies and curriculum guidance, the use of ICT left ambiguous situations for the teachers’ classroom practices. Li’s and Yan’s responses were characterised by uncertainty, and sometimes, inconsistency. They wondered whether the children’s use of ICT had the right balance in the curriculum or fitted into educational goals. Their doubts about educational aims and pedagogy regarding young children’s ICT use are reasonable as the current Chinese ECE documents such as the *Guidelines for Learning and Development of Children Aged 3-6* have not recognised the importance of young children’s use of ICT and the possibilities of harnessing ICT potential for learning, which creates an air of ambiguity in implementing it into young children’s activities (Dong, 2010).

The surveyed teachers reported that meeting curriculum requirements was the most important aim of young children’s use of ICT. One of the requirements in the current Shanghai ECE curriculum is that EC teachers should integrate ICT into the curriculum for teaching and learning (see the section ‘ICT in Chinese education’). But the curriculum itself was also used to justify the children’s limited ICT use by three of the interviewed teachers. This indicates that these teachers were not sure about the place of ICT in ECE and whether or not young children should use ICT in preschool. Previous studies (McPake, et al., 2005; Plowman & Stephen, 2003b) similarly found that preschool teachers had “concern for the place of ICT in the balance of the curriculum experienced by each child” (p. 26). Such a finding reflects that ICT was regarded as a separate subject or learning area, but not as a tool for the children to learn with, or learn throughout the whole curriculum as evident in the lack of integration into ongoing daily routines and practices. The Shanghai ECE curriculum consists of four areas: activity of daily living, physical exercise, learning and play, but gives little concern for integrating ICT into these areas.
In addition, the limited and simple learning goals related to technologies in the Chinese documents have probably restrained Chinese EC teachers’ vision of ICT potential and employing pedagogy to support young children’s ICT activities. The goals are respectively defined to ‘feel the impacts of scientific and technological achievement on life’ and ‘learn about relationships between technologies and young children’ in the national *Kindergarten Education Guidelines* (Ministry of Education, 2001) and the *Guidelines for Learning and Development of Children Aged 3-6* (Ministry of Education, 2012a). Notably, the latest goal is almost the same as the old one stated a decade ago, despite the fast social and technological changes over the last decade. The unchanged goals ignore the fact that many children have already acquired this knowledge or gained these abilities before they enter into preschools as identified in many studies (e.g. Marsh, 2005; Zevenbergen & Logan, 2008).

Little attention to ICT integration in Chinese ECE polices and curriculum might contribute to the teachers’ limited ICT use for learning and teaching. For example, the meaningfully integration of ICT into early learning and development were not realised, nor even mentioned by the case study teachers. Their narrow and basic purpose of offering young children ICT using opportunities was to entice the children into learning. The surveyed teachers were not well-informed about the contemporary research-based trends of ICT in ECE and the case study teachers did not realise the wide range of ICT potential and benefits for early learning.

**Insufficient ICT Skills and Ineffective ICT Training**

A significant barrier for the teachers in adopting ICT into their teaching was their personal lack of technological skills. Both Hua and Yan indicated a sense of inadequacy related to the use of ICT for teaching. Yan even felt frustrated because despite spending a great deal of time using ICT to prepare teaching she could not solve technical issues. From their perspectives, using ICT to prepare teaching was time-consuming and required a lot of effort due to a lack of adequate ICT skills to work efficiently. This is in line with an Australia study (Mantei & Kervin, 2007), suggesting kindergarten teachers perceived ICT as a time-consuming element of their planning and preparation for teaching. The lack of time to explore possibilities of using ICT is also recognised as a barrier for EC teachers to integrate ICT into the curriculum identified in the Jordanian
preschools (Ihmeideh, 2009) and the New Zealand ECE services (Morrow & Mackey, 2008; Oldridge, 2008).

The reason for the lack of ICT skills was related to the Shanghai ICT training system. The survey revealed that more than two thirds of the teachers did not receive ICT training or relevant professional development in the past three years. Opportunities for ICT training were only available for a few teachers such as information administrators in the preschools. The limited access to ICT professional development and ICT training for the majority of EC teachers seems common as many researchers have reported the same issue (Chen & Chang, 2006; Guo, et al., 2006; Plowman & Stephen, 2006b). Further, the responses to the survey showed that ICT training programs for the teachers had focused on instructing teachers to use ICT resources, learning to design webpage and network administration. Hua and Yan stressed the great importance of systematic ICT training and expressed strong demands for more specific and advanced programs in that the current training content was not differentiated to meet the teachers’ specific, advanced and individual learning needs.

**A Lack of Knowledge and Appropriate Pedagogies**

The children’s limited use of ICT in the classroom was also related to a belief by the teachers that the children already had ‘sufficient’ access to ICT at home. Li’s assumption about the children’s extensive access to ICT and adequate use of ICT at home may be not true for all the children as socio-economic disadvantages and cultural factors do impact on young children’s access to ICT and their use in the home (Aubrey & Dahl, 2008; Straker, et al., 2006). While ICT resources are increasing in the home with the development of technologies it is by no means universally available to all families. In addition to the potential existence of digital divide among young children who grow up in low income families, ubiquitous presence of ICT in todays’ home environments does not necessarily mean that young children are using it, or allowed to use it (O'Hara, 2011), or are using it for constructive educational purposes. Li’s analysis of the relationship between home and preschool ICT use indicates that she did not consider the importance of forging links with families and the communities through involving home ICT experiences or drawing on family funds of knowledge, particularly in relation to the use of ICT. This shows that Li did not draw on a sociocultural view of
learning in which home and preschool work to bring learning in both environments together (Stevenson, 2008).

This study provides considerable evidence that the teachers’ lack appropriate pedagogies that can facilitate and extend early learning and development within learning communities through using ICT. For example, the children’s repeated mouse clicks and touching on-screen icons appeared to be easy for most children, which indicate that the teachers did not provide a higher level of cognitive challenges to motivate them to engage in learning and to achieve their potential development. They did not take the children’s prior knowledge and skills into account either as they clearly knew that many children already had acquired some ICT competencies. McPake et al. (2005) similarly noted that preschool teachers tended to develop children’s basic technical skills without valuing or considering children’s home ICT experiences. Another example of this is the teachers’ consistent attitude towards the children’s increasing knowledge. They did not consider learning from the children; or co-constructing or reconstructing knowledge with the children; or giving the children power and agency to create new knowledge.

The children’s passive ICT use was strongly related to the teachers’ belief that the children could learn through observation. This view of how the children learn has its root in the Bandura’s theory of social cognitive learning, namely, children learn from observation and imitation of others. Social cognitive learning theory has a powerful influence on EC teachers’ views of how young children learn, and modelling and imitations are regarded as crucial to learning behaviours (MacNaughton, 2003). It can be expected that the way young children’s ICT activities is taught is likely to be a direct result of these teachers’ philosophy and educational belief about how young children think and learn. This can explain why modelling the use of ICT was one of the most frequent strategies used to support the children’s ICT activities as shown in the survey responses and observations.

However, it has been shown that observation is not the best way for young children to learn to use ICT, and it is not advocated in their curriculum either. The national Kindergarten Education Guidelines explicitly states that teachers “should guide young
children to actively learn through their daily life and activities” (Ministry of Education, 2001, Section One, para 5). From a cognitivism perspective, learning is an active process where children “learn better through their own experience, [rather] than through passive acceptance of information provided by others or through technical means” (Barak, 2006, p. 123). Barak (2006) further went on to claim, for young children, physical experiences may be necessary for learning because ‘hands-on’ activities may also mean ‘minds-on.’ The passive role of the children in the use of ICT also contrasts with the constructivist view of the child as an active agent that constructs knowledge through interactions with their environments and others (Corsaro, 2011). The passive recipient of knowledge of ICT usage reflects that the culture of child-initiated activities and child-led approach, as stated in their curriculum, were not extended to the children’s use of ICT. One explanation is that the teachers considered ICT as a ‘new’ artefact or a less important learning tool so they did not view it in the same way as some traditional play materials like dolls and blocks. Another reason may be that they did not draw on the Vygotsky’s idea of children’s potential development, which can be achieved through interaction and participation in ICT activities with the assistance of adults or more skilled children (Rogoff, 1990; Rogoff & Wertsch, 1984). These findings demonstrate the teachers’ lack of understanding about a sociocultural approach to integrating ICT into the children’s activities though extending and scaffolding their learning.

**Restrains from Strong Cultural and Educational Traditions**

Cultural and educational traditions mediated these teachers’ practices and to some extent limited possibilities of incorporating ICT into the classrooms. For example, Yan’s concern about the inconvenience of designing ICT activities for the children restrained the children’s opportunities to explore ICT. She viewed early learning as a directed process in which the teachers are responsible for providing the context of the experience and the content to be learned. It can be seen that she tended to employ a traditional approach to control and manage the children’s use of ICT, which did not consider the children’s own creativity and autonomy, individual strengths, and the capabilities of the group.
Yan’s great emphasis on planning ICT activities and her assumption that the whole class should do the same ICT activities at the same time are most likely inherited from Chinese culture and communist ideology, which value unity, order, collectivism and control (Cleverley, 1991; Stimpfl, et al., 1997; Tobin, et al., 1989; Wang & Mao, 1996). The Chinese traditional early childhood programs specified unified content and schedules, and required teachers to teach different subjects in purposeful and planned ways (Zhu, 2002; Zhu & Zhang, 2008). As these teachers’ education and professional training was mainly during this era, it is not difficult to understand that they passed on educational culture as “the way teachers teach [is] strongly related to the way they have been taught” (Barak, 2006, p. 131). It is also not surprising to see that ICT was used as representational and didactic tools in the teacher-led lessons because Chinese early childhood traditional teaching was mainly done by lecture and demonstration, consisting mostly of direct specification and instruction (Wang & Mao, 1996).

The subject-dividing teaching model has a profound influence on ECE practices in China, which helps understand why the teachers viewed and taught ICT as an independent subject. Zhu (2008b) was critical of this model which overlooks the connection of learning areas, children’s activities and direct experiences. The recent Chinese ECE curriculum reforms from the 1980s to date have aimed to rid the subject-based curriculum mode in ECE and to underline the integrity of children’s activities (Wang & Mao, 1996; Zhu & Zhang, 2008), but it seems that powerful and deep-rooted cultural traditions have run counter to the meaningful integration of ICT into the curriculum.

The teachers’ authoritative and expert roles in controlling ICT resources, maintaining disciplines, and arbitrating tasks and turns has deep connections with Confucian culture, which laid great emphasis on adoring authority and respecting teachers (Hargreaves, 2000). This kind of authority role was similarly noted in the teachers’ relationship with the children’s parents as the teachers were seen to ‘inform’ parents on guiding the children’s home ICT use, based on their professional knowledge and experience. Tobin et al., (1989, p. 209 ) found that the role played by Chinese preschools and teachers in the relationship with families is “explicitly political and ideological.” Preschools are viewed as social representatives so they have the “right and responsibility” to correct
the deficiencies of overindulgent parents. Preschool teachers, “as government employees with a governmental mandate,” carry authority into their interactions with parents and see their roles as supporting and correcting parents (Tobin, et al., 1989). Today these teachers’ relationship with the children and families reflects a continuity of strong cultural traditions in social and interpersonal relationships, despite the rapid social and economic changes in China.

Notably, these teachers had a strong intention to develop the children’s language abilities. For this reason, they asked the children to repeat the content instructed by the software and recite or retell the story presented on the programs. The teachers’ attention to enunciation, memorisation and self-confidence in speaking and performing are related to Chinese tradition of, and emphasis on, language development (Zhu & Zhang, 2008). Memorisation and rote-learning have long been practised as an important approach in Chinese education (Cleverley, 1991; Liu & Elicker, 2005; OECD, 2011). Mechanical memorising became a traditional method of teaching and learning and was strongly associated with the Chinese cultural belief that remembering and reciting classics was great learning (Wang & Mao, 1996). As a result, Chinese educational traditions gave great importance to performance, mastery and content knowledge (Liu & Elicker, 2005; Tobin, et al., 2009; Zhu, 2008a). Wang and Mao (1996) were critical of the strong impacts of traditional cultural values on Chinese ECE, which remained essentially unchanged since the establishment of the People’s Republic of China in 1949.

This study shows a hybrid of Chinese ECE (Tobin, et al., 2009; Zhu, 2008b) currently combining its cultural traditions and foreign ideas has changed in some ways (e.g. educational belief), but it has also stayed the same in others (e.g. pedagogical practices). The analysis of the current practices reinforces a sociocultural view on the development of ECE in a particular context, namely, ECE “always functions within a cultural context and, is in many respects, restricted by its traditions and [the] vicissitudes of a culture” (Wang & Mao, 1996, p. 143). There are many inconsistencies and conflicts between the teachers’ constructivist views and their practices of ‘teacher-initiated’ activities and ‘teacher-directed’ instructions. The ‘child-led’ activities and ‘active learning’ advocated in the Shanghai ECE curriculum were not implemented in the use of ICT. These
inconsistencies demonstrate that the two biggest challenges for these Chinese EC teachers are how to move from strong traditions to adopt new pedagogy, and how to reconcile their child-centred belief and “facilitative role with more proactive pedagogical approach” as promoted by sociocultural theories (Anning, et al., 2004, p. 17).

Summary

The landscape of classroom practices indicates that ICT has not been cemented in place in Chinese ECE policies and ICT integration has not been fully realised. This, of course is an outcome of a number of barriers identified in this section. There are multifaceted and complex relationships between these barriers and some barriers might play a central role in excluding the use of ICT in the classrooms. For example, the absence of ICT framework and curriculum guidance could lead to fears and concerns. However, the results generated from this study also suggest possibilities for positive changes that can further integrate ICT into the classrooms. The four teachers indicated three solutions to improve the use of ICT in their classrooms: more ICT resources and appropriate software, a lower teacher-child ratio, and specific ICT training for all the teachers. The teachers perceived a large class size as an obstacle to facilitate individual children’s use of ICT because they did not have enough time to support each child, especially the less capable children to learn ICT use in group teaching. Tobin et al., (2009) noted that large class size and high student-teacher ratios were consistent with the tradition of Chinese ECE and well matched to China’s teacher-centred and didactic approach, but might impede implementation of a constructivist curriculum. To move forward full integration of ICT into teaching and learning in ECE requires resolution to solve or reduce the barriers. From a practical standpoint, a number of recommendations drawn from the teachers’ and the researcher’ perspectives are suggested to assist the teachers to integrate ICT into their classrooms, which will be elaborated in the next chapter.
Chapter Eight: Conclusion

Introduction

It will be recalled that the major concern of this thesis was

What are preschool teachers’ perceptions and pedagogical practices regarding young children’s use of ICT in preschools in Shanghai?

The chapter is organised into three sections. In the first section, I review each of the initial research questions to reflect on the success of the study in achieving the research objectives. In the second section, I synthesise the main research findings and discussion from chapter seven and draw upon theoretical and research based literature on the use of ICT to show how the study has contributed to the use of ICT in the early years. In this section I argue that the study upon which this thesis is based holds significant implications for stakeholders (teachers, parents, teacher educators and policymakers) in exploring full integration of ICT in the ECE context. In the final section of the chapter I review the methodology and data collection methods along with the limitations of the present study. Following this, I suggest implications for future research identified to help extend knowledge of this burgeoning area of interest in ECE.

Questions and Main Findings

This study was undertaken to investigate how preschool teachers perceive and support young children’s use of ICT in preschools. The study was guided by the following five research sub-questions:

1. What ICT resources are available in classrooms?
2. What do young children do with ICT when they have access to it in classrooms?
3. What are preschool teachers’ perceptions regarding young children’s use ICT?
4. What are preschool teachers’ pedagogical practices regarding young children’s use of ICT?
5. What are the barriers to integrating ICT into the classroom?

The main findings of this study answering these five research questions are summarised as follows.
The Availability of ICT Resource in the Preschool

The research has revealed the existence of ICT resources in the preschools surveyed. There were a wide range of ICT resources such as TV, CD/DVD players, tape recorders, multimedia, educational software, cameras, internet connections, video cameras and desk computers in the two case study preschools, but the numbers of each device were small when viewed from individual children’s usage. Because of the focus on developing children’s literacy in the two case study preschools, this study shows that electronic literacy materials were relatively more common and had infiltrated into their learning environments.

Young Children’s Use of ICT in the Preschool

The research has shed considerable light on the question of young children’s use of ICT in the preschool settings. Despite a diffusion of ICT and the teachers’ frequent use of ICT, young children’s access to ICT and hands-on exploration with it in the classrooms were not common. Inadequate ICT resources for a class with about 30 children led to young children’s low access to ICT and sporadic use of ICT in the Hongqi preschool. The lack of appropriate software for teaching and children’s learning and play inhibited creative and meaningful use of ICT. It appears that the preschool leadership played an important role in investment and provision of ICT resources in the preschool. More significantly, however, the children’s usage was mainly teacher-directed, of short duration and specifically directed so they did not have many opportunities to initiate spontaneous play with ICT or design their own ICT activities for ongoing, creative, and meaningful learning.

Although the children’s access to ICT was low in the preschools, the children were reported and observed as enthusiastic, joyful and curious when they did have opportunities for ICT based activities. The children’s hands-on experiences with ICT were associated with pleasure and strong interest. This study shows that most children had acquired some ICT operational skills for learning and play. It is important to note that the children’s creative and active use of ICT was not common, in comparison to their simple and passive use. Their ICT activities were mainly watching and playing computer games, listening to digital programs, and reading with interactive materials.
Preschool Teachers’ Perceptions of Young Children’s Use of ICT

The research was particularly successful in revealing teachers’ perceptions towards young children’s use of ICT. The majority of the teachers surveyed had overall positive perceptions of young children’s use of ICT in the preschools. They recognised the value of ICT in young children’s learning and development in a limited way. They believed that young children’s ICT activities could develop their abilities in many areas such as problem-solving skills and literacy. In particular, the case study teachers regarded electronic literacy materials as a useful tool for the children’s individual and independent learning. In much the same vein, the four teachers acknowledged many advantages of ICT for teaching and regarded ICT as a useful tool for communication and collaboration with parents and colleagues. However, due to lack of sufficient ICT skills, these teachers indicated that using ICT to prepare teaching was time-consuming and required more effort.

The questionnaire data revealed that meeting curriculum requirements and extending play materials were the two most important aims for young children’s use of ICT in the preschool. Nevertheless, the case study teachers had significantly different perceptions of reasons for prioritising ICT and aims for the children’s ICT use. The case study teachers were aware of the impacts of social and technological development on young children who grow up in the society where new technologies have been an integral part of their lives (Zevenbergen & Logan, 2008). This result reveals that social environments and rapid technological development had influenced the teachers’ perceptions of young children’s dispositions to new technologies. But their main purpose for enticing the children into learning appears to be narrow and basic as the meaningful integration of ICT into early learning and development was not realised, nor even mentioned by these teachers. These teachers also had some concerns about harm from the use of ICT in particular potential damage to the children’s eyesight. They indicated that the use of ICT had brought changes and challenges to their teaching.

Teachers’ Pedagogical Practices regarding Young Children's Use of ICT

This research has provided a new insight into the question of teachers’ pedagogical practices in terms of young children’s use of ICT. The data showed the teachers’ limitations in using a sophisticated repertoire of teaching and learning strategies,
particularly the mediating strategies (Arthur, et al., 2012), which support the higher order learning that children need for future success including creativity, problem solving and co-construction of new knowledge.

The four teachers shared a very similar understanding about their roles as an observer and guide in the children’s use of ICT and generally resisted a direct instructional approach. But they did employ intervention into the children’s learning process and acted as technique trouble-shooters when issues occurred. Furthermore, they provided a carefully prepared environment and designed learning activities for the children. This is in line with their social and historical understanding of and traditions of teaching. Of important note though, was that teachers’ classroom practices were characterised with strong traditional teacher-centred instructions and involved a lot of physical and oral instructions in a direct way. With the approach of direct instruction, the teachers assigned learning tasks and gave orders, and taught the children how to use ICT. These teachers’ practices were generally consistent with their attitudes towards young children’s ICT use. Their intention to support the children’s use of ICT may provide an insight to explain differences in their pedagogical practices. The limitations in their pedagogical strategies are consistent with the transitional nature of their temporal, geographical and social contexts in China in 2013.

**Barriers to Full Integration of ICT**

Whilst there were some enabling factors for integrating ICT into the classrooms, there were significant barriers that inhibited full integration of ICT into teaching and learning. Inadequate hardware and inappropriate software in most children’s classrooms meant that the children could only use ICT for short periods in turns, limiting the potential of ICT for them working together to develop problem-solving skills and sustained shared thinking. Young children’s lack of creative and meaningful use in ICT activities was linked to their teaching and learning software that emphasised rote learning and drill-and-practice programs. In addition to the scarcity of ICT resources, fears and concerns about the potential threat to children’s health and the cost of ICT equipment surely limited the teachers’ vision to include ICT into a meaningful use and harness the potential of ICT.
Due to the absence of ICT policies and curriculum guidance, the use of ICT led to ambiguous situations for the teachers’ classroom practices. The simple and limited learning goals in the curriculum have probably restrained Chinese EC teachers’ vision of ICT potential and employing effective pedagogies to support young children’s ICT activities. Little attention to ICT integration in ECE polices and curriculum might contribute to many issues such as insufficient and ineffective ICT professional development for the teachers, lack of informed knowledge and pedagogical practices. These issues further restricted the teachers’ understanding, and hindered the development of their capabilities and skills in integrating ICT into the classrooms. The strong cultural and education tradition mediated these teachers’ practices and, to some extent, limited the possibilities of incorporating ICT into the classrooms too.

**Potential for Changes**

The study proposes a number of recommendations through which the barriers to full ICT integration might be addressed. It is not intended to be used as a checklist but does have potential to assist stakeholders in integrating ICT for teaching and learning with and through ICT. In many respects the study validates these recommendations as the basic principles for creating potential changes and harnessing the power of ICT in ECE. This level of knowledge is important and timely as many teachers in ECE settings are struggling to fully integrate the use of ICT into their practices.

**Principle One: Sufficient reliable hardware and appropriate software for Shanghai preschools**

Performance of specific behaviours “depends at least to some degree on availability of requisite opportunities and resources,” which to some extent determine the likelihood of behaviours and achievement of actions (Ajzen, 1991, p. 182). The availability of ICT resources like hardware numbers, functions and qualities is a critical factor in influencing teachers’ adoption of ICT and their further ICT integration into the classroom, as well as young children’s ICT access in preschools. The funding for ICT investment and infrastructure is the basic condition for teachers and young children in preschools to have access to explore ICT and benefit from its use.
A key element of the technology that can make a unique contribution to early learning is the availability of developmentally appropriate software (Clements & Sarama, 2003). The development of high quality software is critical for the successful integration of ICT in ECE. International research (Ihmeideh, 2009; Siraj-Blatchford & Siraj-Blatchford, 2006) demonstrated a strong need for developing appropriate software for EC practitioners and young children. Ihmeideh (2009) pointed out that the most serious obstacle facing the use of ICT in preschools perceived by the Jordanian preschool teachers was the shortage of developmentally appropriate software.

An effective way of addressing the need for appropriate software suggested by the teacher (Li) in this study was that teachers seek to collaborate with software designers and take the lead in the development of suitable ECE software. This idea of building cross-disciplinary partnerships could share understanding and practices and co-construct knowledge about ECE software within the professional community. Such a community of practice (Cullen, 2004) can take new forms and meanings from multiple perspectives and make contributions to decision making in terms of improving young children’s use of ICT.

Adequate and equitable access to functioning and reliable hardware, and high quality software in ECE settings can facilitate teachers and young children incorporate these resources into their learning programs. With sufficient ICT hardware and high-standard software, EC teachers could create natural, rich and curious ICT environment for young children to explore a variety of ICT resources for a range of different purposes and to engage in authentic learning tasks meaningfully. With equal access to reliable ICT materials, all young children could have opportunities to initiate spontaneous play with ICT or to design their own ICT activities for ongoing, creative and project focused integrated learning.

**Principle Two: Creation of communities of learners**

This study finds the teachers and some parents had deep-seated concerns about the negative effects of ICT and they were not well informed about the benefits of ICT. Their conflicting views and uncertainties that surround young children’s use of ICT created a barrier for the children to learn through using ICT. As the literature review
highlights, it is not until these negative beliefs are challenged and changed that teachers can fully integrate ICT into their classrooms. If the teachers communicated with parents and built shared understanding of the use of ICT, concerns over and oppositions to the use of ICT in the classrooms from parents would be less as Fang experienced in her work. If teachers actively participate in debates and explore issues and benefits around ICT use, they could reflect and evaluate their practices, as well as creating possibilities of integrating ICT. For example, Hua stated a positive change in integrating ICT led by the discussion with her colleagues after this research (see chapter five).

Through robust research, discussion about the value of ICT in ECE and deep reflection on possibilities of ICT integration into curriculum, stakeholders may realise a wide range of ICT potential and broaden their vision in harnessing the potential. Through reflection on possible ways of ICT integration in preschools or outside preschools, ECE policymakers may realise the gap and relevant issues in polices and curriculum, which could lead to possible changes in promoting ICT integration in more specific policies. Teachers could realise and correct their misinterpretations of curriculum balance or misassumptions about young children’s home ICT access. Parents could also take a more active role in guiding children’s home ICT use and collaborating with teachers to support young children to learn with ICT, but this will not happen until they perceive an invitation to engagement (González, et al., 2005). Thus, it could potentially be a network of learning communities involving teachers, researchers, families and policy makers.

**Principle Three: Systematic and specific ICT training and professional development**

In this study, due to inadequate or inappropriate ICT training, the teachers neither sufficiently prepared teaching nor effectively carried out full integration of ICT in the classroom. To initiate changes in these teachers’ ICT skills, equitable access to ICT training and professional development for all the teachers in the Shanghai preschools becomes crucial in improving teachers’ ICT skills and developing pedagogy that can harness ICT potential. Drawn upon advices from Hua and Yan, ICT training programs should meet teachers’ various needs at different levels. For this purpose, the programs designers should first identify EC teachers’ needs and current ICT levels to ensure the programs that can specifically address the needs. After the training, continued follow-up,
support and further assistance from ICT specialists and technician are essential for teachers to master and implement new knowledge and skills into daily work (Keengwe & Onchwari, 2009).

Having sufficient technical and pedagogical knowledge of and skills in integrating ICT are of utmost importance in integrating ICT into teaching and learning in meaningful, creative and authentic ways. For this purpose, teachers do not only need technological ‘training,’ but also professional learning communities where teachers and ICT experts can come together to provide deeper knowledge of integrating ICT into the curriculum. Rather than simply ‘training’ teachers on how to use ICT and acquiring basic ICT skills, it is important to provide ongoing ICT professional learning for teachers to develop their pedagogy. According to Cox et al. (1999), if teachers perceive the value of ICT in their teaching, further training should focus on pedagogical practices. The four teachers were already aware of some ICT benefits, but they did not fully apply ICT for teaching and learning due to a lack of greater pedagogical understanding and practices of ICT integration. Saude et al. (2005) showed that many European EC teachers clearly have a strong desire to strengthen their general knowledge and skills in the use of ICT, especially the development of knowledge of the pedagogical possibilities of different kinds of ICT. Teachers’ ICT professional development could also be improved if learning communities are established to identify their needs.

**Principle Four: A high priority for ICT integration in ECE policies and curriculum**

The analysis of Chinese ECE policies reveals that current national and Shanghai curriculum have advocated the existence of ICT within the classrooms and including ICT into ECE programs. However, because of a low priority and limited status of ICT in these documents, the teachers were able to justify their omission of ICT and little intention of integrating ICT into teaching and learning. The key point here is the lack of emphasis and pedagogical suggestions for young children’s use of ICT within the curriculum which have led to ambiguity, a mismatch in the teachers’ views and practices as related to the children’s ICT activities. This inconsistency provides clear evidence that the simple and limited educational goals and advices cannot comprehensively support the teachers to incorporate ICT in ECE and the current policy landscape is unlikely to advance and achieve the agenda of transforming classroom
practices (Shanghai Education Commission, 2002). Until a clear and strong confirmation of the place of ICT, the importance of young children’s use of ICT, complex ICT early learning goals and pedagogical guidance for ICT integration are explicitly stated in ICT frameworks and endorsed as principles for implementing ICT, the confusions and doubts about the purpose of the use of ICT in ECE will continue to surround its use. Moreover, a series of issues such as limited funding for ICT infrastructure, insufficient teachers’ ICT training and restriction on young children’s access will not be solved.

**Principle Five: Young children’s active, creative and complex ICT use**

The use of ICT in many ECE settings has been limited to teaching children on how to use computer input devices such as opening and accessing of documents (Walters & Fehring, 2009), and mouse and keyboard skills instead of teaching with the technology and encouraging learning through ICT (Ntuli & Kyei-Blankson, 2010; Oldridge, 2008). Such a lack of meaningful integration of ICT in early years learning has received criticism because it is at odds with today’s understanding of the young child as an empowered, creative and active learner (Aubrey & Dahl, 2008; Plowman & Stephen, 2003b). The image of young children held by teachers strongly influences their classroom practices, such as their decisions about children, methods of interactions and expectations of children’s development. Historically, childhood was seen as a period of immaturity so that children must be trained, disciplined and prepared to be competent and “a fully functioning member” (Corsaro, 2011, p. 9) of society. This traditional thinking about childhood and children has been criticised for underestimating the active and innovative capacities of young children, but is, however, in line with traditional Chinese ECE practices. Instead, the child as a powerful player and citizen in his or her world requires teachers to be aware of what the child thinks and is able to achieve, to engage in co-construction with the child and scaffold learning (Jordan, 2004). In this sense, if the teachers in this study like Yan could give the children some responsibilities to take care of their learning equipment or initiate ICT activities, the risk of breaking ICT machines or the inconvenience of planning ICT activities might no longer be her concerns.
Young children’s increasing knowledge through the use of ICT suggests a need for new thinking and pedagogy that can respond to challenges and address concerns. Arthur et al. (2012) argued that young children’s access to ‘adult’ knowledge through their access to a range of technologies has resulted in changing the experience of childhood and images of young children. In response to such changes, they recommended that contemporary EC teachers move beyond their traditional views and establish new perspectives in considering children’s agency and capacity.

The power that children have through their ability to independently access information and entertainment and to access ‘adult’ knowledge challenges traditional images of children as dependent, morally pure and incompetent. An alternative view is that children are competent users of technology, active agents in their own learning and very aware of the world beyond their family (p. 13).

Hence, teaching today’s young children with ICT knowledge and competencies requires teachers to view them as competent and active learners situated in a social, historical and cultural context, and to adopt a sociocultural approach to mediate their learning through cultural tools (Fleer, et al., 2004). This would support the current ECE reforms in China, which advocate many modern educational ideas such as emphasising children’s agency and capabilities. To achieve this, teachers need to fully understand and know how to carry these ideas into their daily routines. This involves deep reflections and actions to address how to synergise strong Chinese cultural and educational traditions and break down barriers to bring fundamental changes.

**Principle Six: Employing a sociocultural approach to support young children’s use of ICT**

According to Piaget’s theory of learning process, learning can be triggered when ‘disequilibrium’ or discrepancies between what children already know and new phenomenon or experience occurs (Harrison et al., 2009). Drawn from a sociocultural perspective, learning that took place in different contexts (e.g. at home and in the communities) should be valued and incorporated into classrooms. In doing this, it can bridge boundaries between home and preschool and enable children to see links between their learning, the community and experiences with which they are familiar. Thus, it is important for teachers to discover and pay attention to skills, knowledge and experiences that children have already acquired in their families and communities and incorporate these into their pedagogy so that they can extend greater continuity and connection to children’s lived experiences and developmental level. Moreover, teachers’
judgements about young children’s ICT experiences outside the preschool should be carefully made and informed by a deep knowledge of the children’s families and their home ICT culture and funds of knowledge.

Based on the conclusive evidence drawn on UK Researching Effective Pedagogy in the Early Years (REPEY), effective pedagogy should “assess children’s performance to ensure the provision of challenging yet achievable experiences” (Siraj-Blatchford, 2004, p. 146). For this purpose, learning tasks and materials should interest and challenge the children and allow them to solve problems through active discovery (MacNaughton, 2003). In this sense, if the teachers in Shanghai preschools can recognise the children’s current ICT competencies and dispositions and provide them with authentic opportunities with appropriate challenges in ICT activities, then they would be better to support young children’s learning in ways that “have implications” for them (Plowman, et al., 2012, p. 102).

From a sociocultural perspective, teachers are not outsiders, but act, think, talk, guide and participate together with the children about the activities with which they are involved. To support young children’s learning with and through the use of ICT requires teachers to develop a wide repertoire of pedagogical strategies. With rich and dynamic teaching strategies, teachers can switch between the roles of observers, mediators, participants in, and leaders of children’s learning in different contexts and with different children for a range of learning purposes (Arthur, et al., 2012). Rather than interfering, taking over, or overwhelming young children with too many instructions, teachers’ actions should support children’s learning and extending children’s activities through “offering ideas, know-how, and wisdom” (Juster, 2008, p. 112). However, in emphasising the importance of teachers’ role in young children’s use of ICT, it never diminishes the vital importance of children’s sustained child-initiated and child-led ICT activities, as well as their interactions with teachers, peers and ICT. The balance of agency, namely, the mix of teacher and learner subjectivities in the learning process should be maintained (Kalantzis & Cope, 2008).

In the Chinese context, recent ECE curriculum reforms have aimed to change teacher-centred tradition and emphasise children’s agency, with a democratic relationship
between teachers and children, but many teachers still implement the curriculum with high control, high-structured and highly planned ways (Zhu, 2008b). Zhu’s critique of superficial improvement in educational practices reveals that great efforts should be put into shifting Chinese EC teachers’ pedagogy to bring fundamental changes. Until teachers adopt new perspectives on young children’s capabilities and employ a wide range of pedagogical strategies, then deep and strong cultural and historical influences suggest there will be no fundamental changes.

**Reflections on Methodology**

**Contribution of the study**

This study has highlighted teachers’ perceptions and pedagogical practices regarding young children’s use of ICT and how they influenced young children’s use of ICT in the preschools. This informs an area of research locally and internationally where there is little data about the use of ICT in Chinese preschools. A mixed research method approach has been used to investigate the phenomenon studied. This was to gain rich data that is both indicative of possibilities with wider populations, as well as providing an in-depth understanding about teachers’ perceptions, young children’s ICT activities, and teachers’ pedagogical practices.

This study has used classroom observations to investigate the teachers’ pedagogical practices and uncover young children’s use of ICT. It also examined the consistencies between what teachers said and what they did, which approximated the reality in the preschools studied. In particular, inviting these case study teachers to the post-observation interview provided an opportunity for them to state/clarify/affirm their intentions and explain/challenge/explore conflicting information or unexpected results collected from those interviewees in the video. This approach was worthwhile as it helped teachers recall and reflect on their pedagogical practices and provided fuller explanations about their reasons for the specific teaching practices that they employed in the recorded and observed lesson.

**Limitation of the study**

The findings and results of the study were significant as they exposed the phenomenon of how teachers perceive and support young children’s use of ICT in Shanghai.
However, although the scope of this study was broad and the data from the survey was obtained from 20 public preschools with 316 questionnaires returned, the survey was not distributed to private preschools in urban areas, which also play an important role in the ECE system in Shanghai. Also it did not go beyond Shanghai to rural and poor communities where findings may have been quite different. The age group of children in the case study teachers’ classrooms was mainly between 4 and 5. Young children at 3 and at 6 in the preschools were not included. In addition, due to time constraints and the manageability of the research, the small-scale design of case studies did not allow time or the scope for conducting observations of the children’s home ICT usage or extending classroom observation over a longer period. This approach may be helpful for the researcher to catch a fuller picture of the use of ICT in the ECE and gain a deeper understanding of everyday activities related to ICT use, rather than reliance on teachers’ self-reports about children’s home ICT activities. Because of the presence of the researcher, an observed lesson may not have been typical because the teacher may have arranged it specifically for the observation. This might also influence the authenticity of the result.

**Suggestions for Future Research**

Future research with young children and their teachers related to the use of ICT is needed. This study can be replicated with children in other age groups in the early years to extend its scope. In addition, teachers’ perceptions and pedagogical practices regarding young children’s use of ICT in preschools among various contexts could be included. This means surveying and case studying teachers and young children in private preschools or preschools in suburban and rural areas across China. Literature would benefit from cross-cultural studies, which could compare the use of ICT for teaching and learning in the ECE field. Furthermore, future studies could explore young children’s home ICT experiences to enable a triangulation of data to occur between ICT use by young children and the perceptions of teachers or parents. Action research in learning communities where teachers work with academics to investigate effectiveness of different ICT professional learning projects could also enable changes in teachers’ technological and pedagogical knowledge of and skills in ICT integration.
Summary

This chapter presents the main findings and reflects on the contribution of this study. ECE is the fundamental stage for education and future development. The use of ICT in the early years is of great importance in shaping young children’s knowledge, skills, experiences and future learning with ICT. To achieve the successful integration of ICT in ECE, it is imperative that ECE settings have sufficient reliable hardware and appropriate software, which is a basic condition for users such as teachers and young children to have access to explore ICT and benefit from it. The creation of communities of learners and engagement in robust research, discussion and deep reflection about ICT value and ICT integration between stakeholders are critical because until their uncertainties and hesitations are challenged and changed, they will not be able to understand the range of ICT potential and broaden their vision in harnessing this potential. In doing this, a high priority for ICT integration in formal ECE policies and framework, and systematic and specific ICT professional development for all the teachers are of utmost importance in legitimising the role of ICT in ECE and in equipping these teachers with sufficient technical and pedagogical knowledge of and skills in integrating ICT into teaching and learning in meaningful, creative and authentic ways.
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Appendix 1  Human Research Ethics Approval Letter

HUMAN RESEARCH ETHICS COMMITTEE

Notification of Expedited Approval

To Chief Investigator or Project Supervisor: Associate Professor Linda Newman

Cc Co-investigators / Research Students: Miss Chuanmei Dong, Doctor Nicole Mockler, Professor Sid Bourke

Re Protocol: Young Children's Use of Information and Communication Technology: Preschool Teachers' Perceptions and Pedagogical Practices in Kindergartens in Shanghai China

Date: 17-Apr-2012
Reference No: H-2012-0066
Date of Initial Approval: 17-Apr-2012

Thank you for your Response to Conditional Approval submission to the Human Research Ethics Committee (HREC) seeking approval in relation to the above protocol.

Your submission was considered under Expedited review by the Chair/Deputy Chair.

I am pleased to advise that the decision on your submission is Approved effective 17-Apr-2012.

In approving this protocol, the Human Research Ethics Committee (HREC) is of the opinion that the project complies with the provisions contained in the National Statement on Ethical Conduct in Human Research, 2007, and the requirements within this University relating to human research.

Approval will remain valid subject to the submission, and satisfactory assessment, of annual progress reports. If the approval of an External HREC has been "noted" the approval period is as determined by that HREC.

The full Committee will be asked to ratify this decision at its next scheduled
meeting. A formal Certificate of Approval will be available upon request. Your approval number is H-2012-0066.

If the research requires the use of an Information Statement, ensure this number is inserted at the relevant point in the Complaints paragraph prior to distribution to potential participants You may then proceed with the research.

**Please note and action the following:**

Teacher Consent for Future Use of Recordings. The consent for future use of the video recordings in conference presentations should be included on Part 2 of the Consent Form (rather than Part 1). This way, participants are given the opportunity to give this consent with full knowledge of what the content includes and whether they are happy for it to be presented (and in what format, eg. Pixilated or unedited).

**Conditions of Approval**

This approval has been granted subject to you complying with the requirements for Monitoring of Progress, Reporting of Adverse Events, and Variations to the Approved Protocol as detailed below.

PLEASE NOTE:

In the case where the HREC has "noted" the approval of an External HREC, progress reports and reports of adverse events are to be submitted to the External HREC only. In the case of Variations to the approved protocol, or a Renewal of approval, you will apply to the External HREC for approval in the first instance and then Register that approval with the University's HREC.

- **Monitoring of Progress**

Other than above, the University is obliged to monitor the progress of research projects involving human participants to ensure that they are conducted according to the protocol as approved by the HREC. A progress report is required on an annual basis. Continuation of your HREC approval for this project is conditional upon receipt, and satisfactory assessment, of annual progress reports. You will be advised when a report is due.

- **Reporting of Adverse Events**

1. It is the responsibility of the person first named on this Approval Advice to report adverse events.

2. Adverse events, however minor, must be recorded by the investigator as observed by the investigator or as volunteered by a participant in the research. Full details are to be documented, whether or not the investigator, or his/her deputies, consider the event to be related to the research substance or procedure.

3. Serious or unforeseen adverse events that occur during the research or within six (6) months of completion of the research, must be reported by the person first named on the Approval Advice to the (HREC) by way of the Adverse Event Report form within 72 hours of the occurrence of the
event or the investigator receiving advice of the event.

4. Serious adverse events are defined as:
   - Causing death, life threatening or serious disability.
   - Causing or prolonging hospitalisation.
   - Overdoses, cancers, congenital abnormalities, tissue damage, whether or not they are judged to be caused by the investigational agent or procedure.
   - Causing psycho-social and/or financial harm. This covers everything from perceived invasion of privacy, breach of confidentiality, or the diminution of social reputation, to the creation of psychological fears and trauma.
   - Any other event which might affect the continued ethical acceptability of the project.

5. Reports of adverse events must include:
   - Participant's study identification number;
   - date of birth;
   - date of entry into the study;
   - treatment arm (if applicable);
   - date of event;
   - details of event;
   - the investigator's opinion as to whether the event is related to the research procedures; and
   - action taken in response to the event.

6. Adverse events which do not fall within the definition of serious or unexpected, including those reported from other sites involved in the research, are to be reported in detail at the time of the annual progress report to the HREC.

   Variations to approved protocol

If you wish to change, or deviate from, the approved protocol, you will need to submit an Application for Variation to Approved Human Research. Variations may include, but are not limited to, changes or additions to investigators, study design, study population, number of participants, methods of recruitment, or participant information/consent documentation. Variations must be approved by the (HREC) before they are implemented except when Registering an approval of a variation from an external HREC which has been designated the lead HREC, in which case you may proceed as soon as you receive an acknowledgement of your Registration.
Linkage of ethics approval to a new Grant

HREC approvals cannot be assigned to a new grant or award (ie those that were not identified on the application for ethics approval) without confirmation of the approval from the Human Research Ethics Officer on behalf of the HREC.

Best wishes for a successful project.

Professor Allyson Holbrook
Chair, Human Research Ethics Committee

For communications and enquiries:
Human Research Ethics Administration

Research Services
Research Integrity Unit
HA148, Hunter Building
The University of Newcastle
Callaghan NSW 2308
T +61 2 492 18999
F +61 2 492 17164
Human-Ethics@newcastle.edu.au

Linked University of Newcastle administered funding:
Appendix 2   English Version of the Questionnaire for the Pilot Study

Questionnaire for Teachers

Introduction

Thank you for taking the time to participate in a survey conducted by the School of Education of the University of Newcastle, Australia, to better understand the personal views and pedagogical practices of Chinese preschool teachers. This questionnaire is not a test, so there are no “right” and “wrong” answers. We are interested in your personal opinions. Your experience and knowledge will be used to build a developing understanding of how Information Communication and Technologies (ICT) are currently being used in Shanghai, China. If you really cannot make up your mind, please leave the question out.

Information Communication and Technologies (ICT): refers to “the tools and processes to access, retrieve, store, organize, manipulate, produce, present and exchange information by electronic and other automated means. These include hardware, software and telecommunications in the forms of personal computers, scanners, digital cameras, handhelds/PDAs, phones, faxes, modems, CD and DVD players and recorders, digitized video, radio and TV and programs like database systems and multimedia applications” (UNESCO, 2010).

1. Background Information

1.1 Your gender:   ☐ Female      ☐ Male

1.2 Please indicate which age category you fit into with a tick in the appropriate box

☐ Under 20      ☐ 20-29      ☐ 30-39      ☐ 40-49      ☐ 50+

1.3 Please identify the highest qualifications you currently hold and those you are studying toward by ticking the box.

<table>
<thead>
<tr>
<th>Highest Qualification</th>
<th>Hold</th>
<th>Studying Toward</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional diploma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor degree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postgraduate qualification</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Others (please specify):______________________________________________________________

1.4 This question seeks information on your teaching experience. Please answer each row in the following table to the best of your ability.

<table>
<thead>
<tr>
<th>How many years have you.............</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worked in the early childhood education field</td>
<td></td>
</tr>
<tr>
<td>Held your current position</td>
<td></td>
</tr>
</tbody>
</table>
1.5 Have you attended a professional development or training session related to ICT in education over the past **three** years?

☐ Yes  ☐ No

If yes, please give details:

______________________________________________________________________________

______________________________________________________________________________

1.6 How informed do you feel about the ICT policies or research in early childhood education? (Please tick one box)

☐ I don’t know  ☐ Not well informed  ☐ Informed  ☐ Very Informed

1.7 How would you rate your technical skills in relation to using ICT? (Please tick one box)

☐ None  ☐ Novice  ☐ Emerging  ☐ Proficient

1.8 How often do you use ICT resources with the children in your class? (Please tick one box)

☐ Never  ☐ Sometime  ☐ Often  ☐ Always

1.9 On average, what is the age of the children in your class? (Please tick one box)

☐ Under 3  ☐ 3-4  ☐ 5  ☐ 6 +

1.10 Which of the following best describes your preschool? (Please tick one box)

☐ Public  ☐ Private  ☐ Community-owned  ☐ Others

2. Availability of ICT resources/ Equipment and Level of Access

2.1 How many ICT resources does your preschool have? If you do not have any, please indicate “**Zero**” in the number box.

<table>
<thead>
<tr>
<th>ICT resources</th>
<th>Approximately, how many are in working order?</th>
<th>Approximately, how many are not in working order?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer/laptop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital camera</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scanner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD/DVD player/recorder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video recorder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internet Connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fax machine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Printer/photocopier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Electronic whiteboard

Phones/Smart Phones

Electronic projector

iPhones/ iPad

Others

Others (Please specify):

2.2 On average, how old are computers in your preschool? (Please tick)

☐ 1 to 2 years  ☐ 3 to 5 year  ☐ 6 to 10 years  ☐ Older

2.3 Who used computers in your preschool? (Please tick all those applicable)

☐ Principal  ☐ Teachers  ☐ Children  ☐ Administration staff

☐ Parents  ☐ Committees  ☐ Others (Please state) ___________________

2.4 Where are the computers located in your preschool? (Please tick all those applicable)

☐ Administration area  ☐ Children’s classroom  ☐ Computer Lab

☐ Teachers only area  ☐ Another location (please say where)____________

3. Young Children’s use of ICT

3.1 On average, how often do most children engage in the following experiences (Please tick)

<table>
<thead>
<tr>
<th>ICT activities</th>
<th>Never</th>
<th>Monthly</th>
<th>Weekly</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taking photos with a digital camera</td>
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</tr>
<tr>
<td>Making videos</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Searching the Internet</td>
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<td></td>
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<tr>
<td>Using educational software programs</td>
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<tr>
<td>Watching TV/ DVD /Videos</td>
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</tr>
<tr>
<td>Creating their own work/presentation</td>
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</tr>
<tr>
<td>Playing games on the computer</td>
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<tr>
<td>Sending and receiving email</td>
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<tr>
<td>Talking on the microphone/telephone</td>
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<tr>
<td>Others</td>
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</tbody>
</table>

Others (Please specify):

3.2 If children use computers in your preschool, approximately what percentage of children used them last week? (Please tick one box)

☐ Less than 25%  ☐ Between 25% - 50%
☐ Between 51%-75%  ☐ More than 75%

3.3 On average, how often most children use computers in your preschool? (Please tick one box)
☐ Not used  ☐ Monthly  ☐ Weekly  ☐ Daily

3.4 On average, how much time did most young children spend on computers in your preschool last week? (Please tick one box)
☐ Not used  ☐ Less than 1 hour  ☐ 1-5 hours  ☐ 6-10 hours  ☐ Over 10 hours

3.5 On average, how much time did most children spend on the Internet in your preschool last week? (Please tick one box)
☐ Not used  ☐ Less than 1 hour  ☐ 1-5 hours  ☐ 6-10 hours  ☐ Over 10 hours

4. Teachers’ perceptions of young children’s use of ICT

<table>
<thead>
<tr>
<th>Below you will find a series of statements relating to your opinions. Please indicate on the six point scale whether you agree or disagree with the statement by ticking the box.</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Tend to disagree</th>
<th>Tend to agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ICT can benefit young children’s early learning and development</td>
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<td>2. I should observe young children to understand what they can do with ICT</td>
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<td>3. An important aim of using ICT is to meet the requirements of the early childhood curriculum</td>
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<td>4. Adults can strongly impact young children’s experience with ICT</td>
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<td>5. Young children’s use of ICT can benefit their future jobs</td>
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<td>6. Young children’s use of ICT can reduce their social interaction</td>
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<tr>
<td>7. Young children’s use of ICT can develop their foundation for future learning</td>
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<td>8. I should find out about children’s use of ICT at home or in communities</td>
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<tr>
<td>9. Young children’s use of ICT can benefit their social skills, such as collaboration</td>
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<tr>
<td>10. An important aim of using ICT is to develop children’s information skills for their future jobs</td>
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<tr>
<td>11. The preschool, families and communities should collaborate in building a good ICT environment for young children</td>
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<td>12.</td>
<td>An important aim of using ICT is to give our preschool a market advantage</td>
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<td>13.</td>
<td>ICT is appropriate for young children’s use</td>
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<td>14.</td>
<td>An important aim of using ICT is to develop children’s critical thinking and problem solving skills</td>
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<td>15.</td>
<td>Young children should be allowed to get access to ICT at home/in their communities</td>
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<td>16.</td>
<td>Young children should learn ICT knowledge</td>
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<td>17.</td>
<td>Young children’s use of ICT can benefit their language development</td>
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<td>18.</td>
<td>Young children should be encouraged to use ICT</td>
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<td>19.</td>
<td>Young children’s use of ICT can benefit their problem-solving skills</td>
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<td>20.</td>
<td>Young children’s ICT experience outside preschool is important</td>
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<td>21.</td>
<td>Young children’s use of ICT can cause harm to their health such as obesity.</td>
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<td>22.</td>
<td>Young children should learn ICT skills, such as saving documents on computers.</td>
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<td>23.</td>
<td>Young children’s use of ICT can benefit their creativity</td>
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<td>24.</td>
<td>Young children should be guided while using ICT</td>
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<td>25.</td>
<td>An important aim of using ICT is to extend traditional materials for children’s activities</td>
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<tr>
<td>26.</td>
<td>Young children should freely explore with ICT</td>
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<tr>
<td>27.</td>
<td>Young children should be taught how to use ICT appropriately</td>
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<td>28.</td>
<td>An important aim of using ICT is to develop young children’s abilities to use high technologies in their everyday lives</td>
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<td>29.</td>
<td>Young children’s use of ICT can benefit their numerical development</td>
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<td>30.</td>
<td>Young children should understand everyday use of ICT</td>
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<td>31.</td>
<td>Young children’s use of ICT can benefit their cognitive development.</td>
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<tr>
<td>32.</td>
<td>Young children should get access to ICT in their preschool</td>
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<td>33.</td>
<td>Young children learn from their peers while using ICT</td>
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<td>34.</td>
<td>An important aim of using ICT is to assist</td>
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<tr>
<td>children’s early learning</td>
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<tr>
<td>35. I should communicate with children’s families/communities in educating young children to use ICT</td>
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<tr>
<td>36. Young children’s use of ICT can reduce their hands-on experience or physical play</td>
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<tr>
<td>37. Young children’s use of ICT can benefit their literacy development</td>
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<tr>
<td>38. I should assess children’s learning during ICT use</td>
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</tbody>
</table>

5. Teachers’ pedagogical practices regarding young children’s use of ICT

<table>
<thead>
<tr>
<th>Below you will find a series of statements relating to your practice. Please indicate your frequency of your practices by ticking the appropriate column</th>
</tr>
</thead>
<tbody>
<tr>
<td>39. I encourage young children to use ICT in the preschool</td>
</tr>
<tr>
<td>40. I create a natural, curious, safe ICT using environment for young children</td>
</tr>
<tr>
<td>41. I model the use of ICT for young children in the classroom</td>
</tr>
<tr>
<td>42. I prepare ICT resources for young children to use</td>
</tr>
<tr>
<td>43. I interact with young children in using ICT</td>
</tr>
<tr>
<td>44. I explain to young children how to use ICT appropriately</td>
</tr>
<tr>
<td>45. I discuss using ICT with young children</td>
</tr>
<tr>
<td>46. I assess young children’s progress with ICT</td>
</tr>
<tr>
<td>47. I observe young children’s use of ICT</td>
</tr>
<tr>
<td>48. I provide assistance for young children using ICT</td>
</tr>
<tr>
<td>49. I encourage young children to cooperate with peers in using ICT</td>
</tr>
<tr>
<td>50. I give feedback regarding young children’s use of ICT</td>
</tr>
<tr>
<td>51. I help young children to use ICT to solve learning problems</td>
</tr>
</tbody>
</table>

Thank you for participating in this research. Your time is valuable, and appreciated. Your response will be used to help inform improvements in early childhood education.
Appendix 3  English Version of the Questionnaire

Questionnaire for Teachers

Introduction

Thank you for taking the time to participate in a survey conducted by the School of Education of the University of Newcastle, Australia, to better understand the personal views and pedagogical practices of Chinese preschool teachers. This questionnaire is not a test, so there are no “right” and “wrong” answers. We are interested in your personal opinions. Your experience and knowledge will be used to build a developing understanding of how Information Communication and Technologies (ICT) are currently being used in Shanghai, China. If you really cannot make up your mind, please leave the question out.

Information Communication and Technologies (ICT): refers to “the tools and processes to access, retrieve, store, organize, manipulate, produce, present and exchange information by electronic and other automated means. These include hardware, software and telecommunications in the forms of personal computers, scanners, digital cameras, handhelds/PDAs, phones, faxes, modems, CD and DVD players and recorders, digitized video, radio and TV and programs like database systems and multimedia applications” (UNESCO, 2010).

1. Background Information

1.1 Your gender:  □ Female  □ Male

1.2 Please indicate which age category you fit into with a tick in the appropriate box

□ Under 20  □ 20-29  □ 30-39  □ 40-49  □ 50+

1.3 Please identify the highest qualifications you currently hold and those you are studying toward by ticking the box.

<table>
<thead>
<tr>
<th>Highest Qualification</th>
<th>Hold</th>
<th>Studying Toward</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional diploma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor degree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postgraduate qualification</td>
<td></td>
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</tr>
</tbody>
</table>

Others (Please specify): ____________________________________________

1.4 This question seeks information on your teaching experience.

<table>
<thead>
<tr>
<th>How many years have you...........</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worked in the early childhood education field</td>
<td></td>
</tr>
<tr>
<td>Held your current position</td>
<td></td>
</tr>
</tbody>
</table>
1.5 Have you attended a professional development or training session related to ICT in education over the past three years?

☐ Yes ☐ No

If yes, please specify: ______________________________________________________________

1.6 How informed do you feel about the ICT policies or research in early childhood education? (Please tick one box)

☐ I don’t know ☐ Not well informed ☐ Informed ☐ Very Informed

1.7 How would you rate your technical skills in relation to using ICT? (Please tick one box)

☐ None ☐ Novice ☐ Emerging ☐ Proficient

1.8 How often do you use ICT resources with the children in your class? (Please tick one box)

☐ Never ☐ Sometime ☐ Often ☐ Always

1.9 On average, what is the age of the children in your class? (Please tick one box)

☐ Under 3 ☐ 3-4 ☐ 5 ☐ 6 +

1.10 Which of the following best describes your preschool? (Please tick one box)

☐ Public ☐ Private ☐ Community-owned ☐ Others

2. Availability of ICT resources/ Equipment and Level of Access

2.1 How many ICT resources does your classroom have? If you do not have any, please indicate “Zero” in the number box.
ICT resources

<table>
<thead>
<tr>
<th>Computer/laptop</th>
<th>Digital camera</th>
<th>CD/DVD player/recorder</th>
<th>Internet Connection</th>
<th>TV</th>
<th>Electronic Projector</th>
<th>Phones/Smart Phones</th>
<th>Other ICT resources</th>
</tr>
</thead>
</table>

Others (Please specify):__________________________________________________________

2.2 On average, how old are computers in your preschool? (Please tick)

☐ 1 to 2 years  ☐ 3 to 5 years  ☐ 6 to 10 years  ☐ Over 10 years

2.3 Who used computers in your preschool? (Please tick all those applicable)

☐ Principal  ☐ Teachers  ☐ Children  ☐ Administration staff

☐ Parents  ☐ Communities  ☐ Others (Please state) __________________________

2.4 Where are the computers located in your preschool? (Please tick all those applicable)

☐ Administration area  ☐ Children’s classroom  ☐ Computer Lab

☐ Teachers only area  ☐ Another location (please specify)___________________

3. Young Children’s use of ICT

3.1 On average, how often do most children engage in the following experiences in your Classroom in a Month? (If children do not have any, please indicate “Zero” in the number box)

<table>
<thead>
<tr>
<th>ICT activities</th>
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</thead>
<tbody>
<tr>
<td>Taking photos with a digital camera</td>
</tr>
<tr>
<td>Making videos</td>
</tr>
<tr>
<td>Searching the Internet</td>
</tr>
<tr>
<td>Using educational software programs</td>
</tr>
<tr>
<td>Watching TV/ DVD/Videos</td>
</tr>
<tr>
<td>Creating their own work/presentation</td>
</tr>
<tr>
<td>Playing games on the computer</td>
</tr>
<tr>
<td>Sending and receiving email</td>
</tr>
<tr>
<td>Talking on the microphone/telephone</td>
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<tr>
<td>Others</td>
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</tbody>
</table>

Others (Please specify):__________________________________________________________
3.2 If children use computers in your classroom, approximately what percentage of children used them last week? (Please tick one box)

- Less than 25%
- Between 25% - 50%
- Between 51%-75%
- More than 75%

3.3 On average, how often most children use computers in your classroom? (Please tick one box)

- Not used
- Monthly
- Weekly
- Daily

3.4 On average, how much time did most young children spend on computers in your classroom last week? (Please tick one box)

- Not used
- Less than 1 hour
- 1-5 hours
- 6-10 hours
- Over 10 hours

3.5 On average, how much time did most children spend on the Internet in your classroom last week? (Please tick one box)

- Not used
- Less than 1 hour
- 1-5 hours
- 6-10 hours
- Over 10 hours

4. Teachers’ perceptions of young children’s use of ICT

Below you will find a series of statements relating to your opinions. Please indicate on the six point scale whether you agree or disagree with the statement by ticking the column.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Tend to disagree</th>
<th>Tend to agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ICT can benefit young children’s early learning and development.</td>
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<td>2. I should observe young children to understand what they can do with ICT.</td>
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<td>3. An important aim of using ICT is to meet the requirements of the early childhood curriculum.</td>
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<td>4. Adults can impact young children’s experience with ICT.</td>
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<td>5. Young children’s use of ICT can develop their foundation for future learning.</td>
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<td>6. I should find out about children’s use of ICT at home or in communities.</td>
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<tr>
<td>7. Young children’s use of ICT can develop their social skills, such as cooperation.</td>
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<tr>
<td>8. An important aim of using ICT is to develop children’s information skills for their future jobs.</td>
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</table>
9. The preschool, families and communities should collaborate in building a good ICT environment for young children.

10. An important aim of using ICT is to give our preschool a market advantage.

11. ICT is appropriate for young children’s use.

12. An important aim of using ICT is to develop children’s critical thinking and problem solving skills.

13. Young children should be allowed to get access to ICT at home/in their communities.

14. Young children should learn ICT knowledge.

15. Young children’s use of ICT can benefit their language development.

16. Young children should be encouraged to use ICT.

17. Young children’s of ICT can benefit their problem-solving skills.

18. Young children’s ICT experiences outside preschool are important.

19. Young children’s use of ICT can cause harm to their health such as obesity.

20. Young children should learn ICT skills, such as saving documents on computers.

21. Young children’s use of ICT can benefit their creativity.

22. Young children should be guided while using ICT.

23. An important aim of using ICT is to extend traditional materials for children’s activities.

24. Young children should freely explore ICT.

25. Young children should be educated how to use ICT appropriately.

26. An important aim of using ICT is to develop young children’s abilities to use high technologies in their everyday lives.

27. Young children’s use of ICT can benefit their numerical development.

28. Young children should understand everyday use of ICT.

29. Young children’s use of ICT can benefit their cognitive development.
30. Young children should get access to ICT in their preschool.
31. Young children learn from their peers while using ICT.
32. An important aim of using ICT is to assist children’s early learning.
33. I should communicate with children’s families/communities in educating young children to use ICT.
34. Young children’s use of ICT can reduce their hands-on experiences or physical activities.
35. Young children’s use of ICT can benefit their literacy development.

5. Teachers’ pedagogical practices regarding young children’s use of ICT

<table>
<thead>
<tr>
<th>Statement</th>
<th>Never</th>
<th>Very Rarely</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Very Frequently</th>
<th>Always</th>
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<tbody>
<tr>
<td>36. I encourage young children to use ICT in the preschool.</td>
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<tr>
<td>37. I create a natural, curious, safe ICT using environment for young children.</td>
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<td>38. I model the use of ICT for young children in the classroom.</td>
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<td>39. I prepare ICT resources for young children to use.</td>
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<td>40. I have a learning conversation with young children while they are using ICT</td>
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<tr>
<td>41. I explain to young children how to use ICT appropriately</td>
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<td>42. I discuss using ICT with young children</td>
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<tr>
<td>43. I assess young children’s progress with ICT</td>
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<tr>
<td>44. I observe young children’s use of ICT</td>
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<tr>
<td>45. I provide assistance for young children using ICT</td>
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<tr>
<td>46. I encourage young children to cooperate with peers in using ICT</td>
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<tr>
<td>47. I give feedback regarding young children’s use of ICT</td>
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</table>
6. Do you have any other comments about the use of ICT in early childhood education that have not been covered

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

7. Thank you for completing the questionnaire. This is Phase 1 of a two-phase study. Phase 2 involves classroom observation of teacher practices and two interviews. It will involve approximately 10 hours of researcher time in your preschool for observation and 1.5 hours of your time for interviews. If you are interested in participating in Phase 2, please provide your details below.

☐ Yes  ☐ No  ☐ Possibly, if you provide me with more details

Please provide contact information:

Your name:_______________________________________________________

Address: _______________________________________________

Telephone:__________________Email:_________________________________

Thank you for participating in this research. Your time is valuable, and appreciated. Your response will be used to help inform improvements in early childhood education.
Appendix 4  Chinese Version of the Questionnaire for the Pilot

预测试教师问卷调查

我们诚挚地邀请您参加由澳大利亚纽卡斯尔大学教育系主持的调查。该调查旨在研究中国学前教育教师关于信息通信技术应用的个人观点及教学方法。本调查不是测试，所以没有对错之分。我们很想知道您对相关问卷内容的看法。您的经验和知识对于深入了解中国上海地区信息通信技术应用情况有重要意义。如果您在回答过程中，对一些问题不能做出判断，请勿作答。非常感谢您的参与和帮助。

信息通信技术（简称为“ICT”）定义：通过电子和自动化方式接触、检索、存储、组织、操作、加工、呈现和交换信息的工具和过程。包括硬件，软件和通信设备，如电脑、扫描仪、数码相机、掌上电脑、电话、传真机、调制解调器、CD 和 DVD 播放机、摄像机、广播、电视以及数据库系统和多媒体设备 (联合国教科文组织，2010)。

1. 基本信息
1.1 您的性别： □ 女 □ 男
1.2 请您在以下选框中选择您所在的年龄段：
□ 20 岁以下 □ 20-29 岁 □ 30-39 岁 □ 40-49 岁 □ 50 岁及以上
1.3 请选择您已经获得的最高学历和正在进修的学历：

<table>
<thead>
<tr>
<th>最高学历</th>
<th>已有学历</th>
<th>进修学历</th>
</tr>
</thead>
<tbody>
<tr>
<td>大专</td>
<td></td>
<td></td>
</tr>
<tr>
<td>本科</td>
<td></td>
<td></td>
</tr>
<tr>
<td>研究生</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

其他(请说明)：

1.4 请根据您的工作情况对以下表格做出回答：

<table>
<thead>
<tr>
<th>您从事幼儿教育工作有多少年？</th>
<th>年</th>
</tr>
</thead>
<tbody>
<tr>
<td>您从事目前的工作有多少年？</td>
<td>年</td>
</tr>
</tbody>
</table>

1.5 在过去三年中，您是否参加过有关 ICT 专业发展或教育培训项目？
□ 有 □ 没有
如果有，请说明：

1.6 您对学前教育中 ICT 政策或研究的了解如何？（请选择一个选项）

□ 不了解 □ 不是很了解 □ 了解 □ 非常熟悉
1.7 您运用 ICT 的技能水平如何？(请选择一个选项)

- □ 不会  □ 新手  □ 正在发展中  □ 熟练

1.8 您在学前教育课堂中使用 ICT 资源频率如何？(请选择一个选项)

- □ 从不  □ 很少  □ 经常  □ 总是

1.9 在您的课堂中，幼儿的平均年龄段是多少？(请选择一个选项)

- □ 3 岁  □ 3-4 岁  □ 5 岁  □ 6 岁及以上

1.10 以下哪个选项最准确描述了您所在的幼儿园的性质？(请选择一个选项)

- □ 公立  □ 私立  □ 社区拥有  □ 其他性质

2. ICT 资源的可使用性

2.1 您所带的班级中有多少以下 ICT 资源？如果没有，请在表格中填入“0”。

<table>
<thead>
<tr>
<th>ICT 资源</th>
<th>能正常使用的数量大约多少 (总计)</th>
<th>不能正常使用的数量大约多少 (总计)</th>
</tr>
</thead>
<tbody>
<tr>
<td>电脑/笔记本电脑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>数码相机</td>
<td></td>
<td></td>
</tr>
<tr>
<td>扫描机</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD/DVD 播放机</td>
<td></td>
<td></td>
</tr>
<tr>
<td>录像机</td>
<td></td>
<td></td>
</tr>
<tr>
<td>网络连接端口</td>
<td></td>
<td></td>
</tr>
<tr>
<td>传真机</td>
<td></td>
<td></td>
</tr>
<tr>
<td>打印机/复印机</td>
<td></td>
<td></td>
</tr>
<tr>
<td>电视</td>
<td></td>
<td></td>
</tr>
<tr>
<td>电子白板</td>
<td></td>
<td></td>
</tr>
<tr>
<td>投影仪</td>
<td></td>
<td></td>
</tr>
<tr>
<td>电话</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iPhones/iPad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>其他</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

其他(请说明):
_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

2.2 平均情况下，您幼儿园中的电脑一般使用多久了？(请选择一个选项)

- □ 1-2 年  □ 3-5 年  □ 6-10 年  □ 10 年以上

2.3 哪些人可以使用您所在幼儿园中的电脑？(请选择所有符合的选项，可多选)

- □ 园长  □ 教师  □ 幼儿  □ 管理人员  □ 家长
- □ 社区  □ 其他人 (请说明) ____________________________________________________
2.4 您所在的幼儿园中的电脑是在什么位置？（请选择所有符合的选项，可多选）
- ☐ 管理办公区  ☐ 幼儿的教室  ☐ 电脑室  ☐ 教师办公室
- ☐ 其他地方（请说明位置）__________________________________________

3. 幼儿使用 ICT 情况

3.1 平均情况下，大部分的幼儿在您的班级中参与以下活动的频率如何？（请选择）

<table>
<thead>
<tr>
<th>ICT 活动</th>
<th>从不</th>
<th>每月</th>
<th>每周</th>
<th>每天</th>
</tr>
</thead>
<tbody>
<tr>
<td>用数码相机拍照</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>制作录像</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>使用互联网</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>使用教育软件</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>观看电视/DVD/录像</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>创作自己的作品或演讲</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>在电脑上玩游戏</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>发送和接收邮件</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>使用电话/手机交流</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>其他</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

其他（请说明）：________________________________________________________________

3.2 上周您班级中幼儿使用了园中电脑的比例大约是多少？（请选择一个选项）
- ☐ 少于 25%  ☐ 25%-50%  ☐ 51%-75%  ☐ 多于 75%

3.3 您班级中大部分幼儿平均使用园中电脑的频率是多少？（请选择一个选项）
- ☐ 不使用  ☐ 每月  ☐ 每周  ☐ 每日

3.4 上周您班级中大部分幼儿使用园中电脑的平均时间是多少？（请选择一个选项）
- ☐ 不使用  ☐ 不足一小时  ☐ 1-5 小时  ☐ 6-10 小时  ☐ 超过 10 小时

3.5 上周您班级中大部分幼儿使用网络平均时间是多少？（请选择一个选项）
- ☐ 不使用  ☐ 不足一小时  ☐ 1-5 小时  ☐ 6-10 小时  ☐ 超过 10 小时

4. 教师对幼儿使用 ICT 的认识

您将在下面发现有关您的看法的一系列陈述。请针对您对这些陈述的同意程度，用“√”做出合适的选择。

1. ICT 有利于幼儿的早期学习和发展：

2. 我应该通过观察来了解幼儿能使用 ICT 做什么：

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3. 运用 ICT 的重要目标之一是满足学前教育课程的要求；
4. 成年人能够很大程度上影响着幼儿的 ICT 经验；
5. 幼儿使用运用 ICT 能够有利于他们未来的工作；
6. 幼儿使用 ICT 会减少他们的社会交往活动；
7. 幼儿使用 ICT 可以为他们的将来学习打下基础；
8. 我应该了解幼儿在家庭或社区中使用 ICT 的情况；
9. 幼儿使用 ICT 能够有利于他们的社会技能，如合作；
10. 运用 ICT 的重要目标之一是发展幼儿信息技能，为将来工作做准备；
11. 幼儿园、家庭和社区应该相互合作为幼儿创建好的 ICT 使用环境；
12. 应用 ICT 的重要目标之一是让我们的幼儿园有市场竞争力优势；
13. ICT 适合幼儿使用；
14. 应用 ICT 的重要目标之一是发展幼儿批判性思考和问题解决能力；
15. 应该允许幼儿在家庭或社区使用 ICT；
16. 幼儿应该学习 ICT 知识；
17. 幼儿使用 ICT 能够有利于他们的语言发展；
18. 应该鼓励幼儿使用 ICT；
19. 幼儿使用 ICT 能够有利于他们的问题解决能力；
20. 幼儿在幼儿园环境以外的 ICT 经验是重要的；
21. 幼儿使用 ICT 会对他们的健康产生危害，如肥胖；
22. 幼儿应该学习 ICT 技能，如在电脑上保存文件；
23. 幼儿使用 ICT 能够有利于提升他们的创造力；
24. 应该指导幼儿使用 ICT；
25. 运用 ICT 的重要目标之一是为了拓宽幼儿活动的传统教学材料；
26. 幼儿应该自由探索 ICT；
27. 应该教育幼儿如何适宜地使用 ICT；
28. 应用 ICT 的一个重要目的是培养幼儿在日常生活中使用高科技产品的能力；
29. 幼儿使用 ICT 能够有利于他们数学能力的发展；
30. 幼儿应该了解日常生活中 ICT 的使用；
31. 使用 ICT 能够有利于幼儿认知能力的发展；
32. 幼儿应该在幼儿园中能够得到 ICT 的使用；
33. 在使用 ICT 过程中，幼儿从同伴中学习；
34. 应用 ICT 的重要目标之一是辅助幼儿早期学习；
35. 我应该和幼儿的家庭、社区针对如何教育幼儿使用 ICT 进行沟通；
36. 幼儿使用 ICT 会减少他们实际动手经验或身体活动；
37. 幼儿使用 ICT 能够有利于他们读写能力发展；
38. 我应该评估幼儿使用 ICT 过程的学习；
5. 教师对幼儿使用 ICT 的教学行为

您将在下面发现有关您的看法的一系列陈述。请表示您是否同意或不同意，并对六个不同等级的观点所在的选框做出选择。

<table>
<thead>
<tr>
<th></th>
<th>经常</th>
<th>比较少</th>
<th>比较多</th>
<th>有时</th>
<th>少</th>
<th>从不</th>
</tr>
</thead>
<tbody>
<tr>
<td>39. 我鼓励幼儿在幼儿园中使用 ICT;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. 我为幼儿创造自然的、新奇的、安全的 ICT 应用环境;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. 我在课堂中为幼儿示范 ICT 的使用;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. 我准备 ICT 资源材料以供幼儿使用;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. 在使用 ICT 过程中，我和幼儿互动;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. 我向幼儿解释如何适宜地使用 ICT;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. 我和幼儿讨论使用 ICT;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. 我评估幼儿使用 ICT 的进展;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47. 我观察幼儿使用 ICT;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48. 我对幼儿使用 ICT 提供帮助;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49. 我鼓励幼儿在使用 ICT 过程中和同伴合作;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50. 我为幼儿使用 ICT 提供反馈;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51. 我帮助幼儿使用 ICT 来解决学习问题;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. 请问您对 ICT 在学前教育中应用有什么进一步补充的观点吗？

__________________________________________________________________________
__________________________________________________________________________

7. 感谢您完成了这份问卷。这是该研究的第一阶段，阶段二涉及到了教师教学行为的课堂观察和两轮访谈。在第二阶段，研究者将会在幼儿园中进行课堂观察（总计 10 小时）和两次教师访谈（总计 1.5 小时）。如果您有兴趣参与阶段二，请在下面提供您的信息。

□ 参与  □ 不参与  □ 可能，如果能提供更多的信息

姓名:__________________________________________________________________________
地址:__________________________________________________________________________
电话:__________________________________________________________________________
邮件:__________________________________________________________________________

感谢您参与这项研究，感谢您的宝贵时间！您的回答将会对改善学前教育的发展提供有价值的帮助。

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Appendix 5  Chinese Version of the Questionnaire

教师问卷调查

我们诚挚地邀请您参加由澳大利亚纽卡斯尔大学教育系主持的调查。该调查旨在研究中国学前教育教师关于信息通信技术应用的个人观点及教学方法。本调查不是测试，所以没有对错之分。我们很想知道您对相关问卷内容的看法。您的经验和知识对于深入了解中国上海地区信息通信技术应用情况有重要意义。如果您在回答过程中，对一些问题不能做出判断，请勿作答。非常感谢您的参与和帮助!

信息通信技术（简称为“ICT”）的定义：通过电子和自动化方式接触、检索、存储、组织、操作、加工、呈现和交换信息的工具和过程。包括硬件，软件和通信设备，如电脑、扫描仪、数码相机、掌上电脑、电话、传真机、调制解调器、CD 和 DVD 播放机、摄像机、广播、电视以及数据系统和多媒体设备(联合国教科文组织，2010)。

1. 基本信息
1.1 您的性别： □ 女  □ 男

1.2 请您在以下选框中选择您所在的年龄段：

□ 20 岁以下 □ 20-29 岁 □ 30-39 岁 □ 40-49 岁 □ 50 岁及以上

1.3 请选择您已经获得的最高学历和正在进修的学历：

<table>
<thead>
<tr>
<th>最高学历</th>
<th>已有学历</th>
<th>进修学历</th>
</tr>
</thead>
<tbody>
<tr>
<td>大专</td>
<td></td>
<td></td>
</tr>
<tr>
<td>本科</td>
<td></td>
<td></td>
</tr>
<tr>
<td>研究生</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

其他(请说明)：______________________________________________________________

1.4 请根据您的工作情况对以下表格做出回答：

| 您从事幼教工作有多少年？ | 年 |
| 您从事目前的工作有多少年？ | 年 |

1.5 在过去三年中，您是否参加过有关 ICT 专业发展或教育培训项目？

□ 有  □ 没有

如果有，请说明：______________________________________________________________

1.6 您对学前教育中 ICT 政策或研究的了解如何？（请选择一个选项）

□ 不了解  □ 不是很了解  □ 了解  □ 非常熟悉

1.7 您运用 ICT 的技能水平如何？（请选择一个选项）

□ 不会  □ 新手  □ 正在发展中  □ 熟练
1.8 您在学前教育课堂中和幼儿使用 ICT 资源频率如何？（请选择一个选项）
- □ 从不    □ 很少    □ 经常    □ 总是
1.9 在您的课堂中，幼儿的平均年龄段是多少？（请选择一个选项）
- □ 3 岁    □ 4 岁    □ 5 岁    □ 6 岁及以上
1.10 以下哪个选项最准确描述了您所在的幼儿园的性质？（请选择一个选项）
- □ 公立    □ 私立    □ 社区拥有    □ 其他性质

2. ICT 资源的可使用性

2.1 您所带的班级中有多少以下 ICT 资源？如果没有，请在表格中填入“0”。

<table>
<thead>
<tr>
<th>ICT 资源</th>
<th>能正常使用的数量大约多少（总计）</th>
</tr>
</thead>
<tbody>
<tr>
<td>电脑/笔记本电脑</td>
<td></td>
</tr>
<tr>
<td>数码相机</td>
<td></td>
</tr>
<tr>
<td>CD/DVD 播放机</td>
<td></td>
</tr>
<tr>
<td>网络连接端口</td>
<td></td>
</tr>
<tr>
<td>电视</td>
<td></td>
</tr>
<tr>
<td>投影仪</td>
<td></td>
</tr>
<tr>
<td>电话</td>
<td></td>
</tr>
<tr>
<td>其他</td>
<td></td>
</tr>
</tbody>
</table>

其他(请说明): __________________________________________________________

2.2 平均情况下，您幼儿园中的电脑一般使用多久了？（请选择一个选项）
- □ 1-2 年    □ 3-5 年    □ 6-10 年    □ 10 年以上

2.3 哪些人可以使用您所在幼儿园中的电脑？（请选择所有符合的选项，可多选）
- □ 园长    □ 教师    □ 幼儿    □ 管理人员    □ 家长
- □ 社区    □ 其他人（请说明） ________________________________

2.4 您所在的幼儿园中的电脑是在什么位置？（请选择所有符合的选项，可多选）
- □ 管理办公区    □ 幼儿的教室    □ 电脑室    □ 教师办公室
- □ 其他地方（请说明位置） __________________________________________

3. 幼儿使用 ICT 情况

3.1 平均情况下，您班级中大部分的幼儿在一个月中参与以下活动的是多少次？如果幼儿没有任何相应的活动，请填写“0”

<table>
<thead>
<tr>
<th>ICT 活动</th>
<th>次数（每月）</th>
</tr>
</thead>
<tbody>
<tr>
<td>用数码相机拍照</td>
<td></td>
</tr>
<tr>
<td>制作录像</td>
<td></td>
</tr>
<tr>
<td>使用互联网</td>
<td></td>
</tr>
<tr>
<td>使用教育软件</td>
<td></td>
</tr>
<tr>
<td>活动</td>
<td>内容</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>观看电视/DVD/录像</td>
<td></td>
</tr>
<tr>
<td>创作自己的作品或演讲</td>
<td></td>
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<tr>
<td>在电脑上玩游戏</td>
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<td>发送和接收邮件</td>
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<td>使用电话/手机交流</td>
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其他(请说明): ____________________________________________

3.2 上周您班级的幼儿在园中使用电脑的比例大约是多少？（请选择一个选项）

- 少于 25%
- 25%-50%
- 51%-75%
- 多于 75%

3.3 您班级的大部分幼儿在园中使用电脑的频率是多少？（请选择一个选项）

- 不使用
- 每月
- 每周
- 每日

3.4 上周您班级的大部分幼儿在园中使用电脑的平均时间是多少？(请选择一个选项)

- 不使用
- 不足一小时
- 1-5 小时
- 6-10 小时
- 超过 10 小时

3.5 上周您班级的大部分幼儿在园中使用网络的平均时间是多少？(请选择一个选项)

- 不使用
- 不足一小时
- 1-5 小时
- 6-10 小时
- 超过 10 小时

4. 教师对幼儿使用 ICT 的认识

您将在下面发现有关您的看法的一系列陈述。
请针对您对这些陈述的同意程度，用“√”做出合适的选择。

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<tr>
<th>陈述</th>
<th>强烈不同意</th>
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<tbody>
<tr>
<td>1. ICT 能够有利于幼儿的早期学习和发展；</td>
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<td>2. 我应该通过观察来了解幼儿能使用 ICT 做什么；</td>
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<td>3. 运用 ICT 的重要目标之一是满足学前教育课程的要求；</td>
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<td>4. 成年人能够影响着幼儿的 ICT 经验；</td>
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<td>5. ICT 可以为幼儿的将来学习打下基础；</td>
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<td>6. 我应该了解幼儿在家庭或社区中使用 ICT 的情况；</td>
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<td>7. 幼儿使用 ICT 能够有利于他们的社会技能，如合作；</td>
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<td>8. 运用 ICT 的重要目标之一是发展幼儿信息技能，为将来工作做准备；</td>
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<td>9. 幼儿园、家庭和社区应该相互合作为幼儿创建好的 ICT 使用环境；</td>
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<td>10. 应用 ICT 的重要目标之一是让我们的幼儿园有市场竞争力优势；</td>
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<td>11. ICT 适合幼儿使用；</td>
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<td>12. 应用 ICT 的重要目标之一是发展幼儿批判性思考和问题解决能力；</td>
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<td>13.</td>
<td>应该允许幼儿在家庭或社区中使用 ICT;</td>
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<td>14.</td>
<td>幼儿应该学习 ICT 知识;</td>
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<td>15.</td>
<td>幼儿使用 ICT 能够有利于他们的语言发展;</td>
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<td>16.</td>
<td>应该鼓励幼儿使用 ICT;</td>
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<td>17.</td>
<td>幼儿使用 ICT 能够有利于他们的问题解决能力;</td>
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<td>18.</td>
<td>幼儿在幼儿园环境以外的 ICT 经验是重要的;</td>
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<td>19.</td>
<td>幼儿使用 ICT 会对他们的健康产生危害如肥胖;</td>
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<td>20.</td>
<td>幼儿应该学习 ICT 技能，如在电脑上保存文件;</td>
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<td>21.</td>
<td>幼儿使用 ICT 能够有利于提升他们的创造力;</td>
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<td>22.</td>
<td>成人应该指导幼儿使用 ICT;</td>
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<td>23.</td>
<td>运用 ICT 的重要目标之一是为了拓宽幼儿活动的传统教学材料;</td>
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<td>24.</td>
<td>幼儿应该自由探索 ICT;</td>
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<td>25.</td>
<td>应该教育幼儿如何适宜地使用 ICT;</td>
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<td>26.</td>
<td>应用 ICT 的重要目标之一是培养幼儿在日常生活中使用高科技产品的能力;</td>
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<td>27.</td>
<td>幼儿使用 ICT 能够有利于他们数学能力的发展;</td>
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<td>28.</td>
<td>幼儿应该了解日常生活中 ICT 的使用;</td>
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<td>29.</td>
<td>幼儿使用 ICT 能够有利于他们认知能力的发展;</td>
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<td>30.</td>
<td>幼儿应该在幼儿园中能够得到 ICT 的使用;</td>
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<td>31.</td>
<td>在使用 ICT 过程中，幼儿从同伴中学习;</td>
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<td>32.</td>
<td>应用 ICT 的重要目标之一是辅助幼儿早期学习;</td>
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<td>33.</td>
<td>我应该和幼儿的家庭、社区针对如何教育幼儿使用 ICT 进行沟通;</td>
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<td>34.</td>
<td>幼儿使用 ICT 会减少他们实际动手经验或身体活动;</td>
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<td>35.</td>
<td>幼儿使用 ICT 能够有利于他们读写能力发展;</td>
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5. 教师针对幼儿使用 ICT 的教学行为

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<td>36.</td>
<td>我鼓励幼儿在幼儿园中使用 ICT;</td>
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<td>37.</td>
<td>我为幼儿创造自然的、新奇的、安全的 ICT 应用环境;</td>
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<td>38.</td>
<td>我在课堂中为幼儿示范 ICT 的使用;</td>
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<td>39.</td>
<td>我准备 ICT 资源以供幼儿使用;</td>
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<td>40.</td>
<td>在使用 ICT 过程中，我与幼儿就学习过程开展对话</td>
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<td>41.</td>
<td>我向幼儿解释如何适宜地使用 ICT;</td>
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<td>42.</td>
<td>我和幼儿讨论使用 ICT;</td>
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<td>43.</td>
<td>我评估幼儿使用 ICT 的进展;</td>
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<td>44.</td>
<td>我观察幼儿使用 ICT;</td>
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<td>45.</td>
<td>我对幼儿使用 ICT 提供帮助;</td>
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<td>46.</td>
<td>我鼓励幼儿在使用 ICT 过程中和同伴合作;</td>
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<td>47.</td>
<td>我为幼儿使用 ICT 提供反馈;</td>
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6. 请问您对 ICT 在学前教育中应用有什么进一步补充的观点吗？

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

7. 感谢您完成了这份问卷。这是该研究的第一阶段，阶段二涉及到了教师教学行为的课堂观察和两轮访谈。在第二阶段，研究者将会在幼儿园中进行课堂观察（总计 10 小时）和两次教师访谈（总计 1.5 小时）。如果您有兴趣参与阶段二，请在下面提供您的信息。

☐ 参与 ☐ 不参与 ☐ 可能，如果能提供更多的信息
姓名:___________________________________________
地址:____________________________________________
电话:____________________________________________
邮件:____________________________________________

感谢您参与这项研究，感谢您的宝贵时间！您的回答将会对改善学前教育的发展提供有价值的帮助。
Appendix 6  Pre-Observation Interview Schedule and Questions

Interview Schedule and Questions

Preliminary:
- Thanks the interviewee
- Ask the interviewee whether they have any questions about the study that they would like to ask before the interview.

Part 1: Teachers’ perceptions of young children using ICT

(1) Can you describe how young children are using ICT in your preschool?

(2) In your opinion, whether young children need to use ICT in the preschool? Why?

(3) What potential does ICT hold for influencing young children’s learning and development?

(4) What are children’s interests and purposes of using ICT in ECE settings? And how can you support them using ICT in a meaningful way?

Part 2: Teachers’ pedagogical practices regarding young children using ICT

(5) In your opinion, what is ‘effective’ pedagogy in terms of ICT used by young children in the preschool? How can it be achieved?

(6) What are the changes and challenges to your pedagogical practices in terms of young children’s use of ICT? How do you address these challenges in your practice?

(7) What do you think children’s home use of ICT? And what are impacts on their ICT activities and your teaching in the preschool?

(8) How do you/your preschools and families/other communities collaborate in improving young children’s use of ICT?

(9) Do you have any further comments about young children using ICT? Or is there anything that I didn’t ask about that you think I should know?
Appendix 7  Post-Observation Interview Schedule and Example Questions

Preliminary:
- Thanks the interviewee
- Ask the interviewee whether they have any questions about the study that they would like to ask before the interview.

(1) Is there anything particular you would like to talk about in relation to what I saw in the observation?

(2) What do you think your teaching strategies in the video while children using ICT? Was there anything you weren't happy with? Why?

(3) If you can do something to improve that observed class, what will you do for more ‘effective’ teaching practice?

(4) Was this observed class a typical classroom event in your preschool or did something unusual happen in this class?

(5) In your first interview you told me…, but in the observation you did….Can you explain….

(6) Can you tell me a little more about why you did ….in the observed class.

(7) I saw you ….. Can you please tell me what you were thinking about/why did you decide …?

(8) Why did you decide to … When (a child) said/did …?
Appendix 8  Transcripts of Classroom Observation in the Hongqi Preschool

Session 1

E-pens, interactive e-books and e-paper were generally located in several reading corners inside and outside the classroom. On the wall of the classroom, many pieces of interactive e-paper were pasted and the instructions for using e-pens and e-books with earphones were also demonstrated step by step with pictures. Outside the classroom, young children could play block construction and chess and took e-pens to play music activity in stages. According to the vice principal, the children could choose these ICT resources to play freely for a while if they came to the preschool earlier before their class started. Overall it was observed that only three to five children chose to use these electronic resources for music play and story reading.

In the music stage, many songs were shown with cartoon pictures on the interactive e-paper. A girl skilfully used her e-pen to select songs and adjust sound volume by clicking icons on the e-paper. She hung an e-pen around her necks while she were singing and dancing with several girls. Meanwhile, a boy was listening to programs alone with an e-pen in another play area, but he switched it on and off several times. He put the e-pen very close to his ear might because of noisy surrounding environment during free play. He gave up using it shortly.

Inside the classroom, most of the children were engaging in building blocks and doll house play as well as doing handicraft work. Only one boy was using the e-pen to read flags of countries. This boy had an earphone on the head. He used the e-pen to point to different icons on the e-paper quickly. Sometimes he walked around in the classroom with the e-pen in his hand, with smiles on his face all the time. The boy went to Hua who was with several children in a reading group, reporting his problem. Then Hua went with him to his reading corner and both of them talked about flags shown on the e-paper and Hua used an electronic speaker to play the content with him. Suddenly a girl came to Hua for help, so she left the boy immediately.

During the whole play, Hua passed the children’s activities with e-pens, but did not stop or visit them until that boy sought her help. Sometimes she walked back and forth
between the classroom and the corridor because most children were spread around. Several children played with e-pens and interactive materials on their own until Hua called to end all the plays and start group teaching inside the classroom.

**Session 2**

Hua led the whole class to a room where a computer with a large digital touchscreen installed. She organised them to sit in two rows facing the screen and then opened software programs. It was a cartoon story about ‘big and small umbrellas for animals of different sizes in a rain day,’ aiming to teach the children to understand the difference in sizes. Hua chose to sit right in front of the children where she was close to the screen. This location of her sitting seems convenient for her to use the computer and hold discipline of the class.

Hua first introduced the story with several still images shown on the screen and played a short video to the whole class. Hua told young children to listen to the story quietly. The class looked up to the screen, except one boy who kept talking and moved himself on the chair. As a result, Hua quietly walked to this boy and spoke a few words with him.

While playing the story, Hua interrupted and prompted questions to the class several times. The dialogues between her and the children were active and engaged because most children loudly spoke out their answers to respond to her questions. She also discussed with them and provided feedback to their responses. Hua was like a facilitator whose role was to stimulate the children to think, respond and rethink. Her questions like ‘what’, “how” and ‘why’ seem not very challenging to many children so asking and answering between them were short and quick. It is noted that she used closed questions first and then added open questions to ask the children to explain why, but her discussion with them did not go in-depth. She often instructed the children to speak a clear and full sentence while they were talking about video content or answering her questions. She sometimes illustrated umbrella sizes with her body gestures, but she mainly pointed to the screen and explained the content to the class.
After the video finished, there was a game program for the children to rank the size of umbrellas. Its task was to rank and insert umbrella icons. The children became very excited about it and a lot of them expressed their high enthusiasm for gaining opportunities to play it. Before the game started, Hua told the children to be quiet and listen to the instructions provided by the software, which could speak about game rules. It seems that most children were familiar with the game rules because they followed and recited rules correctly.

Hua first called a girl to drag the biggest umbrella icon to insert into the targeted area. In order to reach on-screen icons, Hua helped the girl get on the chair and stood close to her to give safety and emotional support. This girl failed shortly and Hua held the girl’s right hand and dragged the icon together. The software immediately produced a music sound to praise this correct performance. Hua demonstrated a gesture of applause to the class. The rest class warmly applauded to give encouragement for this girl’s success.

Hua repeatedly explained the rules and instructed on how to drag the icon without failure. While Hua was explaining, many children became impatient and could not sit quietly. A few of them raised their hands high to gain the teacher’s attention so they could be selected to do next task. After her explanation, Hua looked around the class and chose another three children to play the same game individually. They all quickly succeeded in doing it. When they achieved the task, they were excited with big smiles on their faces. Meanwhile the rest children were also joyful and enthusiastically gave a loud applause to whom successfully did the task each time.

Hua moved the children to a slightly higher level of difficulty when they could do this task. She told the children to pay attention about new game requirements. Similarly, Hua first explained and loudly emphasised game rules. Because most children were eager to touch the screen, Hua kept stating ‘taking turns’ to them and explained why she chose the children who did not play this before. She also told the children to observe their peers’ operations on the screen.

It seems that most children understood the requirements and had little operational difficulties. However, several of them failed at the first time and the teacher helped
them to achieve tasks through prompting or doing it together at a second try. The software also had built-in feedback to encourage another try if a child did not succeed, which was speaking and responding to young children’s touch.

Although some young children did not get access to play this game, they supported their peers by giving their advices and instruction. Some spoke out their answers directly to help the children who were doing their tasks. Some children reminded the teacher moving the chair close to the touchscreen so the children could stand comfortably to reach the icon, but the teacher did not take it into account. To some extent, the children had their autonomy in deciding what to do if their requests were in the teacher’s plan. For instance, a few children insisted playing more games before the end of this class, Hua agreed and called more children to do similar tasks.

Session 3

The whole class with about 30 children sat on chairs in the middle of the classroom in two rows. They faced Yan and a big computer screen hung on the wall. Yan sat on a higher chair between the children and the computer monitor. This sitting position seems convenient for her to see the children and use the computer mouse.

Yan smiled and explained the background of a video to the children. It was a dollhouse play in which a boy learned to feed a toy baby. She presented a still image on the screen for two minutes or so. This image was a boy from the preschool using a spoon to feed a toy baby. While Yan was playing images, all the children looked up at the screen. Then she asked two questions to the class related to what was in the picture. Most children seemed to know answers as they immediately raised their hands as high as they could. Some even spoke out their answers quietly. Yan called a boy to answer and his answer was right and full. Yan added another question “what was the food for the boy was feeding to a toy baby” on the screen. Most children responded loudly and correctly. Then she restated the content and played a whole video, which lasted about 2 minutes.

Once the video finished, Yan asked the children a few questions such as "how the child fed a baby toy" and she called several children to answer respectively. After the children answered, Yan often used body language to demonstrate the actions shown on the video.
She discussed with the children and explained reasons. For example, she said: “what will happen to the baby’s tongue if she eats very hot food?” Some children quietly answered: “Her tongue will be burned.” A few children stood up and raised hands high, but Yan selected a boy who sat in the back row to answer this question. Yan said to the class that she would select the children who sat and raised hands to answer questions. Perhaps she wanted to use this method to manage the class discipline. Yan added more questions like “What other methods can cool food before feeding a doll baby.” Questions like this seemed more challenging to the children because a half of them did not raise their hands. Yan raised her hand as a demonstration to encourage them to respond.

Yan repeated individual children's answers loudly to the class and vividly described their responses with her gestures. She gave a positive comment such as, "you are very smart" to the children who answered. The whole lesson finished within approximately 15 minutes.

Session 4

12 children were in the observed classroom and the rest went out for physical exercises. The lesson was about ‘a snake eating food of different shapes’. The content was from a storybook and Yan scanned the book pages for displaying on the computer. Yan often pointed to the screen and asked the children to watch it. She asked several questions such as how the snake ate the food (round apple, triangular sandwich and banana) without chewing and then what happened to the snake's body shape. Yan frequently imitated how the snake ate the food with her big mouth open and made exaggerative and funny sounds. The children also imitated and performed her actions. While the children concentrated on watching the screen, Yan interrupted and probed questions that facilitated them to think about shapes and quantity of food. For instance, she asked: “did the snake chew the apple while eating?” The children loudly answered “No.” In the end, Yan presented all pictures of different shapes of food that the snake had eaten on the screen. She called several children to describe the story and required them to retell it in a full sentence. Yan encouraged them to reflect on what was right ways of the eating food for people and discussed their answers together until the morning break started.

Session 5
A half of the class were led to read in the preschool library. Yan requested the children to take turns in each reading zone, and she determined that six children were taking part in the group reading activity. The children freely selected their reading materials and quickly started reading. In the electronic reading zone, there were four children sitting on chairs in two corners and every two children were sharing a table for reading. Three of them put on earphones and plugged them to e-pens, and opened interactive books skilfully.

However, a girl had a problem with her earphone, which did not have sound. Yan went directly to test it. Yan found the earphone not working and put it away. So this girl clicked her interactive book to read without the earphone. Yan moved to the other corner where two girls were using e-pens. Yan bent and closely watched what they read. The volume from the e-pen of the girl who did not have an earphone perhaps was too loud, so Yan went to search for another earphone in an electronic resource basket. Shortly Yan found one and gave it to that girl. Yan helped her wear it and connected the earphone to the e-pen. She told the girl to click the book to try it. Unfortunately, the earphone did not work. Yan put it on the table and left. This girl clicked the same icon several times so the story was repeatedly played. Yan went back to this girl again after a while. It may be because Yan heard her repeatedly playing the same story so she talked a few words with the girl. The other three children were reading stories, learning about flags and doing number calculations respectively. Their interactive books consisted of different content, such as pictures, stories, music and simple maths. These books were programmed to read stories and provide learning tasks for the children with built-in feedback.

Yan walked to another reading zone where a big pumpkin-shaped electronic player was telling stories to a group of children sitting on the floor. They called the player “magic pumpkin” which appeared like a soft toy. Yan squatted there and smilingly looked at the children and discussed with them quietly for about 2 minutes. She interrupted and pressed a button to change the story for them.

Yan went back and forth between e-pen reading and ‘magic pumpkin’ reading zone. She frequently bent towards the children and interacted with them quietly. For example, a
boy pointed to the book to show the teacher his reading. Yan gently patted the boy's head with smiles. A girl used the e-pen to click a part of the book where Yan had pointed. Yan adjusted the position of another girl’s earphone and talked with her for a minute or so.

The children exchanged their reading zones quickly as soon as Yan gave this order loudly to them. Many children ran to the e-pen reading zone but they left immediately when other four children already grabbed e-pens. The children first quickly put on earphones, but two girls who shared a table could not untie a cord knot. One of them looked at Yan to indicate this problem. Yan immediately went to untie the knot for them and then stood beside them and watched their preparation for a few seconds until they started reading. After Yan left, the children communicated and looked at each other’s interactive book. They laughed and used e-pens to click their peer’s book frequently. Yan also spent a few minutes was with the children who read paper based books. Meanwhile she told the children to sit down and listen to stories in the ‘magic-pumpkin’ reading zone.

The reading activity finished within 20 minutes when Yan called all the children to sit together. She asked them to talk about what they had read. She called a girl who had used the e-pen to describe her reading experiences. The girl spoke about her reading stories in front of the class. Yan nodded to agree with her accounts. Yan added a few questions to the class and they responded clearly.

Yan invited this girl to demonstrate how to use e-pens and interactive books. She and the girl went together to fetch a book and an e-pen. Yan held up the book for the girl to demonstrate how she used it to the class. Yan asked her questions about interactive book functions and gave clues about how to search stories. The class watched their demonstration. Yan suggested the girl playing questions in the book to the class and she also encouraged other children to ask this girl some question related to her reading.

Yan selected another girl to show an interactive maths book and asked her to play a math problem for the whole class. It was a game about even and odd numbers. Because the volume was very low, Yan invited other children to turn it up by clicking the
volume icon on the book. She asked them to listen to requirements of the game instructed by the book. A boy was called to do the task but failed to achieve it. Yan asked the rest of class for the reason and for a correct answer. In the end, the teacher told them they could read this maths book next time if they wanted to find more.
Appendix 9  Transcripts of Classroom Observation in the Zhihui Preschool

Session 1

In the first day of the observation, Fang conducted a morning group teaching while Li sat behind the children in a corner during the whole lesson. About 30 children gathered together in a group, sitting on chairs in two rows facing the big digital screen, which was connected to the computer. Fang sat higher next to the screen in front of the children.

When all the children sat quietly, Fang said “how about guessing a riddle?” and the children loudly answered “Yes”, “Ok”. Then Fang played the program and displayed the riddle on the screen, which was like a poem and the software read it to the class. As soon as the program finished, a boy immediately called out his answer ‘a rain drop’ and many children quickly followed and gave the same answer too. Fang asked if there were any different opinions. Most of the children shook their heads saying “no” so the teacher probed a question ‘why it was a rain drop’ and called two children to explain the reasons for this answer. She discussed with them about another possible answer ‘water drop.’

Fang presented a still video picture of an animated water drop cartoon to the children and asked “what’s the name of the story?” She told the children to ‘use a clear and full sentence’ to answer, and most children said ‘the trip of a water drop’. Fang said that their answers were right and then played the story. It was about three states of matter in water and transition processes between gas, liquid and solid states. The children concentrated on watching the screen and listening to the story.

After showing the video, Fang asked a few questions related to what they had seen in the video and chose several children to talk about it. For example, a boy said: “the wind blew the water drop.” Fang nodded with smiles while she was listening to their answers. She said that they were going to watch the changes of the water drop step by step, but they were required to click the mouse to play the program. Therefore many children raised hands very high and she called a boy to come the front and he clicked the mouse to continue to play the video. After the story of the water changes in the first stage from
the ocean was shown on the video. The children looked up the screen and some repeated
the content by following the sound.

Fang often stopped the video for a few minutes and asked several questions to the
children. For instance, Fang asked ‘what happened to the water drop in the video,’ ‘how
can the water drop fly?’ She discussed with the children over their answers and added
explanation about the video content. Fang repeatedly encouraged the children to loudly
recite the content during the whole class. Fang called another two children to click the
icons and she said: “pay attention to special content on the screen” to them. After each
session of the video, she used her body languages to demonstrate the animated actions
such as using her mouth to make loud sound and imitate strong wind blowing the water
drops. Fang required the children to retell the whole story while the video was replaying
and they all loudly and actively repeated the content correctly.

Subsequently Fang told the class that “there was a play of ordering the steps of water
changes on the computer” and the children needed to select appropriate icons to make
the water transition circle in right sequence. Fang showed four animated pictures on the
screen which were all connected by red arrows to indicate the circle process. Again, she
asked the children ‘what it was in each picture’ and they all responded clearly and
correctly. Some children told the teacher that the Chinese sign could provide some
instructions for the play so they suggested the teacher clicking them for hints. The
teacher praised them for their good observation and showed surprise by saying “oh!
You already saw it, very clever!”

Fang called a boy to come to the front of the class and click the Chinese sign. The boy
clicked the mouse once and then he walked back to his seat with smiles. The program
soon read ‘there are many water drops living in the ocean.’ Fang showed a surprised
facial expression and said “oh! It’s like this” and “Who can find the right picture
matching it?” Several children immediately raised their hands very high and some even
stood up for seeking their opportunities to do this task, but Fang called a girl to do the
task. After the girl clicked the icon, the rest of the children reminded her not to forget to
click the Chinese characters to get clues for next task.
Fang moved to a task of a higher level of difficulty and selected the children to drag and insert animated icons into four cycling boxes on the screen. She first gave some oral clues before the children started doing the task. For example, she said: “select these four icons on the right top of the screen.” Soon Fang called a boy to the front and put the boy’s right hand on the mouse and slightly adjusted his body to face the screen, but this boy failed because it was a wrong icon. As a consequence, Fang gently patted his head and closely said to him with smiles “think more about answers and do it next time.” Then this boy left the computer and looked at his class with a smile while he was walking back to his seat.

Fang let this boy go without any further explanation about his operational error and called a girl to do same task. When the girl walked to the front, Fang suddenly stood up and let the girl sit on her chair. Fang slightly moved the girl’s body to face the screen and adjusted her hand on the mouse. The girl succeeded in doing the task shortly so the software provided a feedback for her correct answer. When the girl was going to leave the screen, Fang said to her “you got right answers so you can continue.” Then the girl did the second step right. Fang demonstrated her surprise and quietly said: “wow”, and several children loudly said: “wow, amazing”, “very good.” Fang stood close to her and observed her doing the task. She failed at the third step and Fang immediately talked with her about reasons. Fang asked her “you forgot using which hand, did you?” Fang gently touched the girl’s cheek and patted her back to encourage her to try again. The girl finally finished the remaining steps successfully so Zhao led all the children to applaud. In the end the cartoon music started, all of them clapped with the rhythm. The whole class last about 30 minutes which was longer than their scheduled learning time.

**Session 2**

Fang and Li took the whole class with about 28 children to a computer lab, which was on the first floor. There were four desktops located close to windows in a row while the rest of the room was full of a display of hand-made robots models. The teachers referred to this activity as playing game software called ‘Yi Zhi’ play. ‘Yi Zhi’ means it is beneficial for intelligence.
Fang grouped the class into four teams with about seven children in each team. Li organised them to find their seats and sit down. She loudly told some children who were slower in finding vacant seats where to sit and directed them to sit down quickly. The children in the each group sat around the computer desk in two rows as there was no physical space for one long row. Some active boys grabbed front seats and sat closer to the screen.

Both the teachers stood beside computer tables and told the children to get ready for playing. Li loudly said “double click a green icon in the Start menu” and repeated this instruction three times. Some children used fingers to touch the icon whereas some used the mouse to click it. Both the teachers walked back and forth behind the four groups and watched the children’s actions, whereas Li also loudly repeated ‘double clicks’ to the children. It was observed that three teams were able to follow this instruction and they waited for the teachers’ further order after they successfully started the program. However, a group could not start the program because a boy in this team only touched the icon once. This boy observed next group and tried to learn from them, but Li came to him and explained that ‘double click’ meant clicking the mouse twice consecutively and used the rhythm ‘Ta, Ta’ to give clues. Then this boy used his finger to touch the icon again, unfortunately he failed. Two children in the group stood up to watch this boy’s operation. Finally Li opened the game program for him.

When all the groups started the program, Li loudly told them to click the first session of the game. Perhaps due to too many repeated clicks in a short time, two computers crashed. Both the teachers went to help restart the computers. Then Li instructed steps of clicking icons to the children. For example, she said “click the second icon and then click ‘go’.” The children followed her instruction and quickly clicked and dragged icons to do tasks. Fang quietly talked with a group in the corner for a few minutes about the reasons of computer crash while they were waiting to restart it. Meanwhile Li walked around and observed the remaining three groups. Almost all the children in other three teams were active in participating as they concentrated on looking at the screen and some stood up close to the screen. A few boys loudly discussed with their peers about the play such as ‘why clicking this’ and the boys seemed more active in touching icons frequently than many girls.
Within group some children communicated and discussed about which were the right icons to click before they took actions while their teachers were busy with other groups. When they clicked the wrong ones, the screen displayed a big red crossing mark. Some children questioned their peers’ answers and reminded them to think about their answers before touching icons. Li watched a boy who repeatedly touched an icon but encountered difficulties in activating it. She went to him and held his hand to click the icon. It is noted that Li later repeatedly helped another girl in the same way. She looked serious and seemed not very patient at that moment. Maybe because the difficulty of game increased step by step, many children made mistakes. Li walked around and said: “once mistakes happen, you need to find out reasons” to them.

Most children stood up and closely watched the screen and actively clicked and dragged icons. They clapped for their success and laughed, even jumped when they got correct answers. A few boys later were very excited and they moved their bodies like dancing very often and loudly spoke out their ideas. The boys in the four teams generally stood closer to computers than girls so they had more chances to play games. In a group both a tall girl and a boy stood closest to screen, but he waved his hand to indicate not to click icons while she just tried to touch icons. Consequently, both the teachers repeatedly encouraged girls to take their turns by calling them to have a try. For instance, Fang pointed to a short girl who stood behind the group to move to the front row and click her answer. She also told another girl who sat quietly to stand up to watch the screen. After a girl failed, Fang said to a girl “try again and give you another chance” and then gently patted the girl’s back to when her tasks displayed. In another group, when a girl was trying to use her finger to drag an icon, Li stopped a boy clicking icons for a girl by patting his shoulder and said: “let her do it on her own.” Li also told team leaders to give their peers opportunities to think about solutions, rather than direct them how to do the task. Approximately four children out six or seven in each group put their hands on the computer tables and actively took part in the play, but not every child got opportunities in particular some children sitting in the back row.

In the middle of this lesson the game moved to a more difficult level, which required the children to remember consecutive four locations which a frog had jumped in a map.
Then the children needed to memorise the same track and quickly click previous locations in the map for another frog to jump. Two teachers often stood behind groups and watched the children playing it for two minutes or so. When Li saw a group failing to achieve the task, she said: “one person can remember one location but cannot remember four [locations] so divide the task” to them. This group failed again after another try. However, Li did not provide any further help and left them to continue to play.

In contrast, Fang pointed to the locations on the screen one by one after the frog jumped, and explained the steps of remembering all locations by using her fingers to demonstrate the order of tasks. For example, Fang said: Each child remembers one location. Then she raised the index finger to indicate the first step and said to a girl: “you remember the first.” Afterwards she pointed to another child who sat beside the girl and said ‘you remember the second….’ until all the four steps were distributed to individuals. After her above explanation, Fang first asked their opinions which steps that they wanted to remember, but she soon pointed to a few of them to give the order of doing the task. Afterwards a boy in this group clicked ‘Start’ menu to play the game again, but they only made one out four correct. Fang repeatedly explained the division of the whole task and emphasised their responsibilities of remembering steps. For instance, once each child finished clicking the icon, she immediately asked “whose task is next one?” A few children in the same team sometimes provided their answers to those who were not sure which icons to touch. This group succeeded after a few tries and Fang clapped for them and said: “yeah, finally succeed,” and the children laughed. It is noted that Fang later repeatedly gave similar instructions to other groups during the class and similarly commented on the children’s success with great excitement.

In the same way, Li reminded the children to remember their individual tasks and called some children to do the task respectively, but she directly clicked icons when none of them in the group knew which to click. Li also said: “take turns to play” to them and then she went to organize block toys which were behind the computers. Some children discussed the task for a few minutes such as which was correct icons and took actions when most of them reached agreement on its correctness. Many children in groups later assigned the task to themselves without the teachers’ presence. Fang monitored the time.
that the children spent on doing the task and encouraged them to compete between groups. She stood closely to observe their activities and repeatedly reminded them not to forget individual duties. Fang counted one, two, three and four to help them quickly memorise steps and demonstrated her fingers. Sometimes she pointed to the screen and explained to the children why wrong answers happened. For instance, she said “you two did not pay attention to it.” The children in a group which the teacher was with them all stood very close to the screen and watched the game. The class ended when Li said, “turn off computers and put away your chairs.” Li also closed the program for one group. The class lasted about 25 minutes and the children queued up to leave the computer lab.

Session 3

After morning outdoor physical exercises about 30 children walked back to their classroom and started reading. Li sat in the middle of the classroom with the e-pens and interactive books in the four different boxes on the tables. The class sat in a half circle around her and Fang sat on the small chair behind the class. Li told the children they needed to select e-pens with specific interactive books because each type of e-pens only could read matched books. Li asked a few questions to the children and discussed the differences among four types of e-pens and interactive books. For instance, she held an orange e-pen high and asked “which book this e-pen can read?” Most children said: “the big book with animals on the cover.” It is noted that Li repeatedly asked the children how to switch on and off each type of e-pens before they started reading. Immediately some children loudly spoke out their answer such as “push the button for a while” and then some children followed answers.

Li then explained the differences again and modelled switching on and off four kinds of e-pens respectively. She reminded them of light signal on the e-pen which indicated on or off. Li told the children to click an icon on the cover so e-pens could read all content in the book and she demonstrated clicking volume sign to adjust sound. Li also said to the class that they could select a friend to read together and choose whether they wanted to use earphones for reading. Soon the children found their reading partner and stood hand in hand to wait for the teacher handing out reading materials. Li pointed to the
classroom corners for the children to sit and read, and loudly said to them: “not to drop the e-pens because it will break.”

Li called each pair to fetch an e-pen and an interactive book together. A pair of girls had different opinions on which e-pens to choose therefore Li told them to negotiate and come back to fetch it later when they made their minds. But one girl immediately gave in her decision while the other insisted choosing a red e-pen. While some children walked with earphones in their hands, Li told them to “be careful with the cords.” Meanwhile, Fang moved the tables for the children to sit down while Li was telling and helping some children to move tables and chairs. A girl and her reading partner soon ran to Li and said: “cannot turn on the e-pen.” Li said: “I just taught it”, “did you listen what I said before?” The girl answered: “I can click it to show you,” and she pressed the button. Li told her to push the button to the sign ‘on.’ The e-pen did not work either and Li took it to click the book. Then she said “change another one” to the girls. Two children in another group reported that the volume was too low and Li immediately told them that they could turn it up by using their e-pen to adjust the volume.

Li showed some groups how to use the e-pen to click story icons in their books. For instance, she pointed to a Chinese character to tell the girl “gently click it and then listen to it.” Fang walked to different groups and stood watching their reading activities for a few seconds. Li told a boy to let his reading partner use the e-pen for a turn. In most pairs one child used the e-pen to click the interactive book while the other wore the earphone to listen to the content, and they exchanged the activities after a while.

Li frequently helped several pairs untie the earphone cords and taught them to connect earphones to the e-pen. For example, she walked to a pair of girls and picked up their earphone cord from the table and passed it to a girl. Then she told this girl to insert the cord into the e-pen and the girl followed her instruction. Suddenly another girl loudly called the teacher to check the sound of her earphone. Therefore Li went to her and gently moved her to sit close to her reading partner and held the earphone between their ears for a while and then put it on this girl’s head. Later Li asked a pair of boys what they read and if they could hear the content clearly with earphones. A boy who held the e-pen said to the teacher “he [his reading partner who wore an earphone] is listening.”
This boy smiled and repeated a sentence of reading content to Li and Li laughed with him.

While another two boys were exchanging an earphone and an e-pen for each other, they dropped the e-pen on the floor. Li said ‘oh, no! [you] do not take good care of your e-pen at all’ to them. Li walked around groups and bent down to watch their reading. It was observed that some children played with earphones and laughed without the teachers’ presence.

Suddenly a girl loudly said: “my e-pen was good before, but it does not work now.” Li said to her: “you clicked too fast and the e-pen cannot respond so quick.” Fang walked to this girl and took the e-pen to click the icons on the interactive book, but she soon left this girl to try on her own because another staff member was waiting for Fang inside the classroom. However, the girl went to Fang again and said: “I only know how to turn it on, but I do not know how to switch it off.” Fang smiled and listened to her statement of problems and then she demonstrated the process of switching off the e-pen. But after a few minutes, this girl came back to Li again to report the same issue. Li said to her: “why it does not work?” and then she pushed the button and soon made the e-pen work for her.

A loud sound of reporting errors from one e-pen was repeatedly played for one or two minutes. Li went to the pair whose e-pen made such sound. Li squatted at their table and said: “oh, mistakes happened.” Just when the girl tried to continue using the e-pen to click some icons, Li took the e-pen to click an icon on the top of book for clues. She showed the pair how to use the e-pen to draw lines. After Li finished modelling, she encouraged them to try to draw the map by themselves. Fang sometimes walked among reading pairs and gave a short praise to some children who were quietly reading. For example, she said ‘very good’ and gently patted their heads with smiles.

It was observed that some pairs took turns to use e-pens and cooperated in connecting earphones to the e-pens without the presence of the teachers. They communicated about the use of e-pens and collaborated to solve problems. For instance, sometimes they pointed to the book and talked about the content as well as help peers wear earphone for
a turn. In the end, Li told them to turn off the e-pens and put away all the e-pens and interactive books. She reminded them to switch off the earphones. Li asked four children to put away all the reading materials on the back tables in the classroom. The whole class took turns to drink water and rested for a moment before lunch.

Session 4

Fang organised the whole class with about 30 children to sit in two rows in the middle of the classroom. While the children moved their chairs and prepared to sit down, Fang opened the software on the computer. After the children became quiet, she asked the children to talk about nocturnal animals and many children immediately raised their hands. Most children gave different answers. For example, a boy said cats and owl and his observation on their eyes at night. Fang repeated the children’s answers to the class, but she did not judge the correctness of their answers. Fang listened to the children talking about animals and insects for about two minutes and then said “let’s watch animals at night.” She played a short video session of an owl catching a rat and then paused the program to ask the children to think what had happened in the video. She discussed with the children about the eyes of owl in the video and all the children looked up the screen at that moment. A child suddenly spoke out her experience of observing cats’ shining eyes at night, and Fang nodded and acknowledged her good observation. It seemed that some children were very interested in watching the program as they followed the background music to move their bodies with rhythm like dancing. Sometimes they also repeated the sound of the program autonomously.

After showing two video sessions of owl catching rats, Fang called a girl to play the program by using the mouse to click an icon of a frog. While the girl walked to the computer, Fang smilingly asked her: “can you click it?” The girl stood beside the teacher and put her right hand on the mouse. Fang told her to click the frog and some children also said clicking it. This girl did what she was told and then three frogs on the screen spoke out a short story. Fang asked her to repeat what did the frogs said to the class, but she did not respond at all, although Fang gave her some clues such as asking what happened to the frogs at night. In the meantime, some children spoke out their answers quietly while the teacher was waiting for the girl’s response. As a result, Fang gently patted the girl’s shoulder and let her leave the computer, but this girl had smiles
while walking to her seat. Soon the teacher called another girl to do the same task and the girl used her own words to retell the story correctly.

After the frog story finished, Fang said: “Let’s learn to be frogs, shall we?” and the children said: “yes” and “ok.” All of them immediately stood up and jumped high, and made loud sounds “gua, gua” to imitate the frogs. Fang watched them with laughs and the children excitedly talked with and touched their peers for two minutes or so. A girl jumped to Fang and tightly hugged her.

When the children gradually sat down, Fang asked a boy to explain how frogs ate insects and what happened to frogs’ tongues. Several boys were very active to respond this question by straightening their two arms to indicate that frogs extruded tongues. She invited a boy to the front of the class and he demonstrated the answer with his arms straightening. Fang agreed on what he said and repeated his answer to the rest of the class.

Fang continued to play the video again. While the children watching the screen, some talked about the frogs’ body quietly and some demonstrated their surprises about the pictures. Many of them loudly said: “wow!”; “how big!” Suddenly a boy made jokes about the frog’s cheek like watermelon so the whole class laughed and started discussing about the cheek of frogs for about one or two minutes. They laughed and some looked at that boy. Fang told them to concentrate on the video so that the children became quiet again. When specific content such as frog’s breath was on the video, she pointed to the screen and told the children to pay attention to it. Later, the video showed a story of animated ants and Fang called a girl about to retell the story. She then asked ‘how do ants eat food at night’ and discussed the children’s answers with them.

Fang asked if the class wanted to continue watching the program, they loudly said that they wanted. Fang told them not to shout while watching and then she called a girl to click a sign written in Chinese on the screen. When the video presented a scorpion, many children loudly guessed what it was while some shouted “scorpion.” Fang immediately reminded them of discipline of no shouts they just promised. The program later displayed a few more animals and the children discussed about animals’ name and
living habits. Fang sometimes interrupted with questions such as which animals were active at night which and explained what appearances of some specific animals.

Fang told them to play a game of differentiating nocturnal animals from other animals. There were 13 animals on the screen and the children were required to click nocturnal ones. She called a boy to tell which animals that he planned to click, but he stood in front of the class and did not say anything. As a consequence, Fang let him go back his seat and he left neutral facial expressions. Fang asked: “who can help him?” Many children raised their hands and actively discussed their answers with their peers who sat next. Fang called a girl to do the same task and this girl clicked an animated frog. The program immediately played a short story about the frog and then the teachers commented this girl’s answer was right. The teacher led the children to applaud together for her. Later a few girls and boys were chose to click their answers and retell the stories respectively. During this process, a boy said that he wanted to choose a monkey (as nocturnal animal), Fang asked the class whether his choice was right and some children responded: “not sure.” As a result, Fang let this boy click the monkey icon and the program reported errors of this answer. Fang then asked the rest of the children to think about the reasons for this mistake. When this boy walked back to his seat, Fang asked him again why the monkey was not a nocturnal animal. The boy walked back to the computer and said to the teacher: “at night the monkey already sleeps.” Fang further asked him would the monkey come out at night and the boy shook his head. At the same time, other children actively spoke out correct answer to this boy. Fang smilingly said to him “clicked wrong animal, did you” and the boy nodded his head. Afterwards he walked to his seat directly with blank facial expressions.

Many children got opportunities to select and click most on-the-screen animal icons. A few children said that butterflies were nocturnal animals, but Fang did not comment on it. She chose a girl who believed the butterfly was active at night to click it. When this girl stood beside the computer mouse, she looked at the screen for a short while without any action. Several children loudly said “click, click it” to the girl. A boy loudly said “cannot use the mouse?” As a result, Fang said, “Oh, do not know how to click it. Let me help.” Fang clicked the icon for her.
Fang played another task of drawing a picture of night on the screen. It required the children to choose icons such as the moon, stars and animals to locate in a picture. During this task, the majority of the children concentrated on the program as they all looked up the screen. When a girl did not know how to use the mouse, a few of boys urged her to quickly click. Fang said: “no rush, give her some time.” Fang held the girl’s hand on the mouse and slowly moved the cursor to reach an icon the girl wanted to choose. In the end, the program showed an animated night picture with light music and many children slowly clapped. The class last about 23 minutes and the children started drawing picture about owl afterwards.

**Session 5**

Fang led the whole class to the computer lab and called them to gather together in one corner of the lab which was opposite to computers. Li was talking with other teachers at the entry of the lab. Fang told the children that they would play the 8th level of the game, which was a higher level in terms of difficulties. She said that the game was consisted of four steps in each round and used her four fingers to indicate the numbers of steps. Fang reflected on this game the children played on Tuesday and told them an issue in playing this game. She said: “one person could not remember the whole task last time, right?” A child said: “two persons remember one step together.” Fang said: “every two persons remember one step so please find a good friend to work with now.” Afterwards Fang pointed to some children and gently pulled them together to stand in groups, with six to eight children in each team. She named the teams with different colours (e.g. red or yellow team)

Fang nominated a team leader for each group and recommended the leaders to assign the tasks to individual members. Fang also told all the teams that they should discuss how to divide the task for every two children. Particularly Fang emphasised the role of the leaders and repeatedly said: “the team leaders should discuss the first task now,” and asked one team leader how he assigned the whole task to individuals. The boy pointed to his team members and explained how he gave the tasks to each one. Fang listened to his explanation, but she patted one boy in the team and asked “why he had two steps to remember?” to the team leader. She continued to ask: “can he remember two tasks?” and “why not think about it?” Fang directly said to another boy in this team “you do the
first step,” then she asked the rest of the member about their tasks. After hearing their correct answers, she walked to another team.

While the teacher was instructing and distributing the whole game into four parts, many children actively talked with and touched peers and some children played with table cloth. After first two teams finished dividing tasks, Fang said that they could go to the computers. She repeated similar methods to help the rest teams to assign the task to each pair of the children for about two minutes. In one instance, she loudly asked which two children were responsible for the second step in their group. All the children raised their hands to indicate the order of their tasks respectively except a boy who was the team leader. So the teacher raised this boy’s hand high and said to him “you are doing number four.” In this process, the children in other teams stood in pairs to wait for the teacher’s further order. While the teacher was busy in one team, a leader told his team members whose task to remember which step. For example, he said: “you two remember the first step.” When this group was walking to the computers, Fang suddenly called them back and spoke out the division of tasks in the team to her. The teacher asked them several questions such as ‘who was responsible for the first step?’ This team could not make four pairs to do four steps as there were only six children in the team. Fang told them to rethink how to divide the task and the team leader soon raised his hand and said that he could do the first step alone. As a result, Fang grouped another four children into two pairs. Then she said to a girl “you are responsible for the third step alone.” Afterwards Fang quickly repeated her previous questions and the children answered and raised their hands in sequence correctly.

Fang told the children: “it’s time to play and get ready.” Three groups turned on computers and started the program shortly. Fang told these three teams to wait for another group and she went to help them to start the computer. The three teams did not click the screen while waiting for the teacher’s order. Fang told the class to be quiet and said the team competition started soon. She walked around to observe their activities and gave instructions of starting the game. For instance, she said: “[click] the first session and the fifth icon on the third row.” She then announced “ready” and “start” to indicate that game competition began.
Most children in particular those sitting in the first row were very active. They stood up and used their fingers to point to the screen and communicated about whose tasks, and discussed their responsibilities while they were doing the task. Taking one team for example, a boy as the team leader looked back at his members and asked: “who should remember the first step?” A boy and a girl immediately raised their hands. This leader said to them “memorise the first step” with a sharp voice. Both the boy and the girl stood up and pointed to the location that the frog jumped on the screen. The leader then said: “the second step. Keep it in mind quickly.” Another girl stood up and pointed to an icon on the screen. The leader said: “the third step.” The rest two boys stood up and moved closer to the computer. The team leader said to them “memorise it.” After watching the frog jumping in the map, the leader again asked whose responsibilities for each step and the members responded his questions by raising their hands respectively.

Fang went to a team and asked if they still remembered their task division. A few of them told her they did not succeed so Fang pointed to each child and asked them the order of their individual task. A girl who sat in the corner of the back row could not answer ‘which step she should remember?’ As a result, Fang moved her to the front row and said to her “yours should be the fourth step, are you?” The girl slowly nodded her head. Afterwards Fang patted another girl’s shoulder and asked her the same question. After the girl answered, Fang said “ok, you can play now” to the team.

While the teacher was talking with a particular group, the children in other groups loudly communicated about their play. For example, a boy loudly said to his group “the game starts now.” One team leader counted one, two, three and four to his team while the frog jumped on the screen. A boy said: “that’s alright” when the team failed to achieve the task. Most children were watching the screen except a girl who was playing with a colourful paper windmill behind her. Meanwhile Li came to watch the children’s activities and stood beside Fang for a few minutes. It was observed that the children heatedly argued for their turns. For instance, a boy said: “this is the fourth step” and then clicked an icon, and a girl said to him: “do not interrupt others and do not click other’s answers.” For a few seconds, this team did not take any actions and Fang stood behind them and told them to continue the play. After watching this team for one or two minutes, Fang squatted to the computer table and asked each child about his or her task.
She asked whose task was to remember the fourth step, but no children responded. As a consequence, Fang asked the leader: “what happened to the two girls who did not have task?” Then Fang told these two girls to collaborate in doing the last step. Most of the time, Fang squatted down and gave similar instructions to the teams.

Similarly, Li explained separating the whole task into small parts with another team. When some children came up with different answers, they questioned the correctness of the answers and discussed whose answers were right. Fang moved between groups and spread the competition results of each team. She said that she wanted to see which team was the final winner of today’s games. A boy proudly told Fang that he did all the tasks and succeeded. Fang made a surprised face and gave him praise by saying “congratulations”, but she smilingly told him to let other members have chances to do their own tasks. Sometimes she patted one or two boys and girls who sat in back rows and were not very concentrated on the games and told them to pay attention to their tasks.

While one team said his team succeeded in three games to Fang, a few children in another team loudly said that their team got five successes to the teacher too. As a result, Fang raised her left hand very high and said “the best result is five so far” and she also said “that’s not good enough and still need to do better” to the team who had three successful games. Suddenly the team leader who just reported they achieved three successes loudly blamed his members clicking a wrong icon. Therefore Fang looked at this team and told this leader that he had to raise his members’ enthusiasm and motivation. It was observed that the children were very excited and jumped with shouts and laughs when they experienced success of making all four steps correct. Most children stood very closely to the screen except one or two children who sometimes looked at robots behind them. Most of them used their figures to point their answers on the screen. A shorter girl stood behind the team wanted to move close to the screen so that she had an argument with a girl next to her, but she finally squeezed and moved closer to the screen.

In the end of play, Fang mainly watched them doing the tasks and interrupted with some instructions when she saw failures. The children all reported their success and fast
progress to the teacher one after one. It was observed that most children sometimes watched the competing team’s progress. In the end of this lesson, Fang counted each team’s success and gave praise to them by reporting the result of each team respectively. She also told the children to switch off computers and put away of the chairs before they left the lab.
Appendix 10  Chinese Policy Documents for Analysis