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Preservice Early Childhood Teachers' Attitudes and Intentions: Young Children's Use of ICT

Abstract

Preservice early childhood (EC) teachers are expected to support young children's engaged and meaningful use of information and communication technologies (ICTs) for early learning and development. Unless teachers believe that ICT is beneficial for young children, they will be unable or unwilling to encourage and support children's use of ICT in educational environments. This paper aims to uncover preservice EC teachers' attitudes and intentions regarding young children's use of ICT through a survey of 410 preservice EC teachers in a Chinese university. The majority of the participants had low positive perceptions of the role of ICT for young children, whereas they expressed great willingness to support young children's use of ICT. There are considerable parameters that influence both preservice teachers' attitudes and intentions: the frequency of ICT use, ICT professional learning or training, and ICT skills. Implications for initial teacher education preparation were discussed.

Keywords: Preservice early childhood teachers, attitudes, intentions, young children and information and communication technologies

Introduction

Information and communication technology (ICT) refers to all equipment that contains a computer or microcontroller, a list which now includes electronic or digital toys, games consoles, digital cameras, media players and smartphones as well as handheld, laptop or desktop computer (Palaiologou, 2016). ICT has shown to be a valuable educational tool for early learning and development (Clements & Sarama, 2003; Siraj-Blatchford & Whitebread, 2003; Yelland, 2007), as a result, many educational policies emphasized the importance of integrating ICT into early childhood education (ECE; e.g. Learning and Teaching Scotland, 2003). Although integrating ICT into the classroom is of increasing interest to policymakers, educators and teachers, the effective integration of ICT into early childhood classroom practice has not been widely found in many countries and areas

(Aldhafeeri, Palaiologou, & Folorunsho, 2016; Edwards, 2016; Hu & Yelland, 2017; Kerckaert, Vanderlinde, & Braak, 2015; Leung, 2012).

Factors influencing ICT integration into classrooms can be manifold and complex, but a growing 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 (Kerckaert et al., 2015; Nikolopoulou & Gialamas, 2015; Palaiologou, 2016). In particular, their attitudes towards the use of ICT and practices strongly influence the outcome of ICT integration in the early years (Lindahl & Folkesson, 2012; Mertala, 2017; Nikolopou & Gialamas, 2009). Preservice teachers are in a position where they will be expected to support young children's use of ICT for engaged and meaningful learning in ECE settings. According to the technology acceptance model (Davis, 1989), unless this group of future teachers believes in the potential of ICT for early learning and development, they will be unwilling or unable to encourage and support young children's ICT use. Preservice teachers' positive attitudes towards young children's use of ICT and their strong intentions to support children's ICT activities are critical if ICT is to be successfully incorporated into ECE.

Literature Review

Young Children's Use of ICT

Globally, there is an increasing pervasiveness of ICT in ECE settings and young children's everyday life experiences. Young children's access to ICT, in particular, computer and internet has been heatedly debated over the last three decades, although the focus of the debate has become less polarised and shifted to how to integrate ICT into the curriculum (Edwards, 2005; Hu & Yelland, 2017; Palaiologou, 2016). The old debates have centered on the impacts of new technologies on young children and resulted, broadly, in two schools of opinion. One group of scholars (Cordes & Miller, 2000; House, 2012) underscored the bad influence and referred to possible threats to early learning and development, such as risks to

children's health, reduced social interaction and replacing traditional learning activities.

Therefore, this group strongly argued against young children's use of ICT in the early years.

Negative views against young children's use of ICT have raised many responses and disagreements, which also led to more empirical research in this field (e.g. Clements & Sarama, 2003; Siraj-Blatchford & Whitebread, 2003). Consequently, many 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; Hsin, Li, & Tsai, 2014; Stephen & Plowman, 2008). For instance, Clements and Sarama (2003) demonstrated that young children's use of technologies contributes to their cognitive, social and emotional development. Recent studies (Arnott, 2013; Dong, 2016b; Hsin et al., 2014) found that the technologies had positive effects on young children's performance across developmental domains, in particular, social development.

Such long-term debates have raised many concerns over the effect of ICT for young children. In particular, voices from established and influential organizations appear to lead parents and educators to believe in harmful effects or become anxious about the way in which children are influenced by technologies (Hernwall, 2016; Plowman, McPake, & Stephen, 2010; Yelland, 2005). Plowman and others (2010) further revealed that parents were unsure how to respond to contradictory accounts reported in the media about the effects of ICT on young children. Under such circumstance, some educators had skeptical and reserved attitudes towards young children's use of ICT and they were concerned about the negative effect of ICT on young children (Blackwell, Lauricella, & Wartella, 2014; Dong, 2016a; Lindahl & Folkesson, 2012; Palaiologou, 2016).

Early Childhood Teachers' Attitudes and Intentions about the Use of ICT

Attitudes have been defined as “a learned predisposition or a tendency to respond positively or negatively to a specific object, situations, institution, concept, idea, or person” (Aiken, 1996, p. 2). Attitudes towards young children’s use of ICT in this paper refers to preservice teachers’ perceptions of the role of ICT for early learning and development. Research into in-service teachers’ attitudes towards ICT shows that they had overall positive views on the use of ICT and they recognized the important role that ICT plays in their personal lives (Aldhafeeri et al., 2016; Palaiologou, 2016) and their classroom teaching (Dong & Newman, 2016; Mertala, 2017). However, they viewed young children’s use of computer and digital media as a threat to real communication or other more important traditional practices, such as play-based learning (Aldhafeeri et al., 2016; Hernwall, 2016; Lindahl & Folkesson, 2012). As a consequence, they were hesitant to encourage young children’s use of ICT and did not use teaching strategies to support children’s ICT use in childhood educational settings. For instance, about 88% of Kuwaiti in-service EC teachers reported that they did not feel confident to allow children to use ICT on their own and 97% did not know where to start using ICT as part of their teaching (Aldhafeeri et al., 2016). The research to date has focused on teachers’ ICT integration (Mertala, 2018) and shows limited evidence on preservice EC teachers’ attitudes and intentions regarding young children’s use of ICT, despite their important role in harnessing the potential of ICT for early learning and development as future teachers.

Preservice EC teachers' ICT Experience

There is a widely held premise that people who grow up in an age of omnipresent digital technologies have been immersed in the rich technological world all their lives (Kirschner & Bruyckere, 2017; Mertala, 2018). According to Prensky (2001), today’s younger preservice teachers born in the early 1980s and after, labeled “digital natives,” are

surrounded by and using video games, cell phones, computers, digital music players, and all the other toys and tools of digital ages (Prensky, 2001). These younger preservice teachers are assumed to have constant access and exposure to new technologies and are more proficient and active in using ICT than older in-service teachers labeled ‘digital immigrants’ (Kirschner & Bruyckere, 2017; Teo, Yurdakul, & Ursavaş, 2016). Similar claims were made to preservice teachers who are free of hesitation in adopting new technologies and have more positive attitudes toward the use of ICT in the early years, as they view digital technologies as an integral part of their lives (Mertala, 2018).

However, the abovementioned generational differences arguments about preservice teachers’ ICT experience are potentially simplistic and problematic. These claims have ignored the differences in availability of and access to ICT in preservice teachers’ life across different sociocultural contexts and paid little attention to the potential digital divide between those with ICT access and competencies and those without (Pasnik & Llorente, 2012). Furthermore, general observations about preservice teachers’ preferences and perceptions towards technologies have not considered the fact that preservice teachers’ experiences with ICT are varied and influenced by many complex multiple factors, such as social-cultural contexts, educational systems and individual’s self-confidence (Lim, Yan, & Xiong, 2015).

Preservice teachers’ perspectives and practices are influenced by national initial teacher preparation policies, curriculum and assessment procedures, professional training, practicum environment, as well as their own educational experience (Hu & Yelland, 2017). The research to date is Western-centric, which may not represent teachers’ views in a culturally different context. Social context is important in determining human’s thinking and activities (Blanch, 1990) as cultural influences and social relationships shape how people perceive the world and implement practices within it. Thus, any understanding of preservice

EC teachers' attitudes and intentions regarding young children's use of ICT should consider their specific social, historical and cultural contexts.

ICT Education in China

China has been actively facilitating the use of ICT in teacher education to harness its potential for innovative learning and teaching in the 21st century. In 2004, the central government issued *Educational Technology Competency Standards for Primary and Secondary Teachers (Trial)* and require teachers to effectively integrate ICT into their curriculum. The Standards (Ministry of Education, 2004) state 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, but does not specifically refer to EC teachers' ICT competencies. Accordingly, the *Early Childhood Teachers Professional Standards* (Ministry of Education, 2012) only briefly state EC teachers should develop modern technology knowledge to some extent as a general knowledge required for their profession. It is worth noting that ECE in China is non-compulsory education and educational resources such as technology infrastructure are generally scarce at both national and the local levels. This is because the central government focuses on nine-year compulsory education (six-year primary and three-year middle school education) when allocating the education budget (Zhu, 2009). Due to the Chinese policy preference, EC teachers receive relatively limited support in developing their professional knowledge and skills to harness technology potential to enhance children's learning and development.

The Standards (Ministry of Education, 2004) set the tone for teachers' ICT training and professional development in terms of objectives, content and assessment, but the government has no specific guidelines for preservice teacher education (Lim et al., 2015). Therefore, teacher education institutions have autonomy and flexibility in implementing educational technology programs to develop preservice EC teachers' ICT competencies (Lim

et al., 2015). A common approach adopted by most teacher education institutions is to provide computer foundational courses for preservice teachers to learn basic computer skills and then offer them advanced courses to learn to design and to implement technology-supported lessons and activities (Han & Wang, 2010). Notably, there is no explicit reference to EC teachers' ICT competencies in the Chinese documents and as a result, teacher education institutions may not emphasize the importance of developing preservice EC teachers' ICT competencies. However, with social-economic changes and development in China over the last two decades, ICT has been introduced into many ECE settings, especially in major cities and EC teachers are increasingly expected to be able to use technology to innovate curriculum and improve ECE quality (Guo, Qian, Wang, & Zeng, 2006; Shanghai Education Commission, 2002). It is therefore urgent for EC teachers to develop appropriate knowledge and skills in harnessing the potential of ICT for their everyday work with young children.

Research Method

This study is one part of a mixed method research project involving a questionnaire and interviews. The paper reported here aimed to examine preservice EC teachers' attitudes and intentions related to young children's use of ICT in a Chinese northwestern city. The targeted participants in this research were preservice teachers enrolled in ECE programs at a local university. Three research questions were framed to guide the development of research instruments and data collection.

- What are preservice EC teachers' attitudes toward young children's use of ICT?
- What are preservice EC teachers' intentions about supporting young children's use of ICT?
- What factors influence preservice EC teachers' attitudes and intentions regarding young children's use of ICT?

The questionnaire adopted in this study was designed by Dong (2014) for studying in-service teachers' perceptions and pedagogical practices in her doctoral study. The original questionnaire investigated preschool teachers' perceptions of young children's use of ICT and measured the frequency of their pedagogical strategies to support children's ICT use. Considering Chinese preservice EC teachers' limited practical experience in the field, the researchers modified Dong's questionnaire to examine preservice EC teachers' attitudes towards young children's ICT use and to explore their intentions regarding supporting children's ICT activities in their future practices.

The questionnaire mainly consists of three parts, including 30 closed questions and one open question. Closed questions and rating scales generate an overview of preservice EC teachers' attitudes and intentions. The open question provides further insights into participants' perspectives on the use of ICT in ECE. To ensure clarity, the modified questionnaire was sent to five local preservice teachers and one fellow researcher for testing and reviewing prior to the administration of the study. Based on their responses, three questions were reworded for accuracy and one question was removed to avoid repetition. Subsequently, the final questionnaire was developed and then made available online through the survey platform, [surveymonkey.com](https://www.surveymonkey.com), as the online mode of administration is a common way of studying university students.

The broad definition of ICT listed at the beginning of the article was also provided to respondents to help participants understand the term. The first part was the demographic information of the participants, including their backgrounds and ICT experiences with 13 questions. These questions were sought to ask the participants' age, degree enrolled, practicum time, the duration for and frequency of using ICT, and ICT training as well as their confidence in using ICT and knowledge of ICT policies and research.

The second section used a modified Likert scale of six response categories from “strongly disagree” to “strongly agree,” asking for preservice teachers’ views on young children’s use of ICT. 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).

The international literature on the role of ICT, in particular, the most frequent topics and heated debates on the effect of ICT for early learning and development (House, 2012; Hsin et al., 2014; Kerckaert et al., 2015; Plowman, McPake, & Stephen, 2012) was used to guide question design. Due to a strong emphasis of five learning and developmental areas (wellbeing, language, society, science and arts) in the Chinese ECE policies and curriculum (Ministry of Education, 2012a), the questionnaire also seeks to explore preservice EC teachers’ attitudes towards the impact of children’s use of ICT in these key educational areas. A total of nine items for measuring preservice teachers’ attitudes towards young children’s use of ICT are listed in Table 1 below.

Table 1

Items for the Scale of Preservice teachers’ Attitudes

Nine Statements Rated for Measuring preservice teacher’s Attitudes
Young children’s use of ICT can benefit their future learning or work.
Young children’s use of ICT is harmful to their social development.
Young children’s use of ICT can benefit their language development.
Young children’s use of ICT can develop their scientific and discovery ability.
Young children’s use of ICT can harm their wellbeings, such as shortsightedness and obesity.
Young children’s use of ICT can develop their mathematics skills.
Young children’s use of ICT can reduce their hands-on experience and physical activities.
Young children’s use of ICT can develop their artistic abilities.
Young children’s use of ICT can cause the issue of addiction to digital games.

The third part of the questionnaire investigated whether preservice teachers have intentions to support children’s ICT activities in their future practices. Research shows that many in-service EC teachers rarely used active and responsive pedagogical approach to support children’s ICT use due to various barriers, such as little pedagogical understanding of ICT integration or misconception of children’s ICT use (Blackwell et al., 2014; Dong & Newman, 2018; Plowman & Stephen, 2006). Dong and Newman (2016, 2018) further revealed that EC teachers were concerned about children damaging ICT and unsure about the educational aim of children’s ICT use, as a result, these teachers did not encourage and support children’s ICT activities with a range of teaching strategies. However, teachers’ participation, interaction, and guidance have been considered to be effective approaches to supporting children’s ICT activities (Dong & Newman, 2018; Plowman & Stephen, 2007). Thus, it is important to investigate whether preservice teachers have intentions to use these pedagogies to facilitate children’s ICT use and identify factors that might influence their intentions. The following eight items were designed to examine preservice teachers’ intentions in Table 2.

Table 2

Items for the Scale of Preservice EC Teachers’ Intentions

<u>Eight Statements Rated for Measuring Preservice EC Teachers’ Intentions</u>
I will encourage young children to use ICT in educational environments.
I will teach young children basic ICT knowledge and skills.
Using ICT with young children is time-consuming, therefore will not actively explore ICT with young children.
I will participate in children’s ICT activities and interact with them actively.
I think that ICT is not appropriate for young children, therefore I will stop them using ICT.
I do not know how to guide young children’s use of ICT, therefore I will not guide their use of ICT.
I am worried that children would damage ICT and cause trouble such as repairing, therefore, I will limit their use of ICT.
I do not understand the educational aim of using ICT, therefore I will not support their use of ICT.

Research Population

The targeted population was 732 preservice teachers enrolled in the early childhood education program and they were mainly from diverse ethnic backgrounds (e.g. Han, Hui and

Yi minorities) in northwestern China. Notably, socioeconomic status and high technology development in northwestern regions are traditionally slower than that of coastal provinces (Sun, 2013). The participants were provided with a link to the online survey by a university administrative staff and they were given three weeks to complete the online questionnaire with a reminder on the first day of the third week to increase the response rate. The participants were clearly informed throughout the study that participation in this research is completely voluntary and they could withdraw their participation at any time without any reason.

A total of 410 preservice teachers responded to a questionnaire, providing a 56.1% response rate with 96.3% of the participants being female. Nearly all the participants (99.7%) were between 18-24 years old and most (78.5%) had less than a half year of practical experience in childhood educational settings. In terms of age, these preservice teachers belong to a digital generation. More than half of the participants (66.3%) were undertaking bachelor's degree studies (4-year educational program) and a third of the teachers (33.7%) were studying towards professional teaching diploma (3-year educational program). The first-year newly enrolled preservice teachers were participating in Chinese traditional university military exercises program at the time of conducting this study and they were trained in the university by army soldiers to increase their physical fitness for university studies. Thus, no first-year preservice teachers were recruited for the study.

Data Analysis

The quantitative data were analyzed using Statistical Package for Social Sciences (SPSS). First, a series of analyses were undertaken to describe the preservice teachers' backgrounds and their ICT usages. Relationships and differences between preservice teachers' demographic backgrounds and their attitudes and intentions were presented using cross-tabulation, 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.

Second, scales were developed to measure the scale of preservice teachers' attitudes and intentions regarding children's use of ICT. Descriptive information was calculated for the scales: means, standard deviations and reliability. The internal consistency of a set of items was measured and overall the reliability for attitude and intention scales was relatively high with 0.79 and 0.83 respectively. Finally, 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. Items that were phrased in a negative manner were subsequently re-coded to make the scales read in the 'positive' direction, lower scores, therefore, reflecting negative or less positive perceptions. The mean scores were calculated for each scale, which provides an overall picture of the participants' responses.

Results

Preservice Teachers' ICT Training and Experience

The participants were asked "Do you own any ICT devices, such as computers and use them daily?" and "How much time do you use ICT devices every day?" About a third of the participants (30.3%) reported that they owned ICT devices and used them every day.

Most participants spent less than two hours on ICT use daily as shown in Table 3.

Table 3

Preservice Teachers' Reported Daily ICT Using Time

Daily ICT using time	Frequency	Percentage
Less than one hour	187	45.9
1-2 hours	129	31.5
More than 2 but less than 4 hours	71	17.4
More than 4 but less than 6 hours	11	2.7
More than 6 hours	9	2.2
Missing	3	0.7
Total	410	100

Half of the participants (52.2%) viewed themselves as new ICT users while 42.3% of them ranked their ICT skills as emerging. In terms of computer use specifically, slightly more than a third of them reported they were new computer users with less than a year experience and almost one third had used computers for 1-3 years as shown in Table 4.

Table 4

Preservice Teachers' Reported Years of Using Computer

Years of Using Computer	Frequency	Percentage
Less than one year	157	38.5
1-3 years	123	30.1
More than 3 but less than 6 years	77	18.9
More than 6 but less than 10 years	36	8.8
More than 10 years	15	3.7
Missing	2	0.5
Total	410	100

In general, the majority of the participants reported they have some confidence or their confidence in using ICT was increasing. In contrast, a small percentage of them (7.6%) indicated that they had no confidence at all and a few (5.4%) felt very confident. On average, these participants had a low frequency of using ICT for their learning and practicum in ECE settings. Many of them (79.8%) reported that they rarely or sometimes had used ICT for their own learning and practicum.

The participants were asked, “Over the past three years, have you participated in any ICT professional learning and training programs?” The participants in this study (72.4%) had reported that they experienced ICT training over the last three years. Their previous ICT training has been revealed to be significantly related to their confidence and skills in using ICT for professional learning and practicum, based on the results of chi-square tests at the .05 level. There was a significant difference in the preservice teachers' reported confidence ($X^2(3, N = 408) = 13.21, p = .001$) and ICT skills ($X^2(3, N = 410) = 13.09, p = .001$) between the participants with and without ICT training. The participants who had experienced ICT

training generally felt more confident in using ICT for their own learning and practicum than those without this experience.

Preservice Teachers' Attitudes Towards Young Children's Use of ICT

A total of 409 participants gave their responses to the items constituting the attitude and intentions scales as one participant did not respond to the scales. The mean of attitude scale was 3.59, with a moderately low standard deviation of 0.48. About three quarters (45.5%) of the participants had moderate positions between tending to disagree and tending to agree. This group was ambivalent about the value of ICT for young children.

Approximately 8.3% responded to the open-ended question and about 3% of them mentioned their concerns over the effects of ICT on children's health such as eye vision, as commented by participant B.

Young children's use of ICT has both positive and negative effects. Need to manage their watching time. The time should be short to avoid affecting children's health. (Participant A)

Time on computer use should be controlled to protect [children's] eyes. (Participant B)

Preservice Teachers' Intentions to Support Young Children's Use of ICT

This scale had a mean of 4.30 and its standard deviation was 0.58. Only a few participants (9.8%) indicated that they had low intentions to support young children's ICT use. On the contrary, nearly 36% of the participants reported that they would have intention to support young children's ICT use in ECE settings. These participants had higher intentions to support young children in the process of their ICT activities. However, half of the preservice teachers' (54.2%) responses were between tending to disagree and tending to agree, indicating that they were unsure about their pedagogical practices in children's ICT activities.

Factors Influencing Preservice Teachers' Attitudes and Intentions

Preservice teachers' early childhood practicum time. Analysis of variance (One-Way ANOVA) was used to determine whether there were significant differences in responses to the scales among the participants with different practicum time in ECE. Although there were no statistically significant differences in the preservice teachers' attitudes between group means, there were significant differences between these preservice teachers' intentions, $F(2, 405) = 5.65, p < .001$, as shown in Table 5. The strength of the relationship, as indexed by η^2 , was .03 (a small effect size). Note that the η^2 calculation represents: 0.01 small, 0.06 medium and 0.14 large. A Scheffe test was conducted but no significant difference among groups was found.

Table 5

Preservice Teachers' Total Practicum Time in ECE

Scales	Total Practical Time	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>F</i>	<i>Sig</i>
Preservice teachers' Attitudes	Less than a half year	322	3.58	0.47	.05	.95
	A half year to one year	60	3.61	0.57		
	More than a year	27	3.59	0.47		
Preservice teachers' Intentions	Less than a half year	321	4.35	0.57	5.65	.00
	A half year to one year	60	4.18	0.60		
	More than a year	27	4.03	0.56		

Preservice teachers' frequency of ICT use for professional learning and practicum. There was a total of four groups for rating the frequency of ICT use: Rarely, Sometimes, Often and Always. Note that the group who reported always used ICT was low ($N = 3$), therefore this group (named Always) was removed when comparing the differences between groups. The One-Way ANOVA test shows the participants with different frequencies of using ICT had statistically significant differences in their intentions to support children's ICT activities, $F(3, 404) = 7.45, p < .001, \eta^2 = 0.02$ (a small effect size), but no

significant relationship with their attitudes toward young children’s use of ICT. Table 6 demonstrates the mean differences, SD, F-ratio and P value in terms of the preservice teachers’ responses to the attitudes and intentions scale. Further, a Scheffe test showed no significant differences among groups.

Table 6
Preservice Teachers’ Frequency of ICT Use and Their Attitudes and Intentions

The frequency of ICT Use		<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>F</i>	<i>Sig</i>
Preservice teachers’ Attitudes	Rarely	88	3.53	0.46	2.45	.06
	Sometimes	238	3.58	0.48		
	Often	80	3.64	0.51		
Preservice teachers’ Intentions	Rarely	87	4.06	0.60	7.45	.00
	Sometimes	238	4.35	0.54		
	Often	80	4.42	0.59		

Preservice teachers’ ICT professional learning or training. An independent sample t-test was used to explore differences in attitudes and intentions for the participants with or without ICT training in the previous three years. Approximately 72.4% of participants ($N = 297$) had reported that they experienced ICT training over the last three years while 27.6 % of the participants ($N = 113$) had no such experience. The results show significant differences in attitudes, $t(407) = 2.17, p = .03$, Cohen’s $d = 0.17$ (a small effect size) and intentions, $t(406) = 3.61, p = .00$, Cohen’s $d = 0.40$ (a small effect size) between the participants who had ICT professional training and those without such experience. In general, the teachers with ICT training had slightly more positive attitudes ($M = 3.61, N = 297, SD = 0.48$) toward the value of ICT for young children than those without this experience ($M = 3.50, N = 112, SD = 0.47$). Similarly, the participants with ICT training ($M = 4.36, N = 297, SD = 0.56$) had stronger intentions to encourage and support children’s ICT use than those who had no ICT training ($M = 4.13, N = 111, SD = 0.60$).

Preservice teachers' ICT skills. There were four levels for rating skills in using ICT: None, Novice, Emerging and Proficient. The group who reported they were proficient in using ICT was small ($N = 5$), therefore this group (named Proficient) was removed when comparing the differences between groups. One-Way ANOVA test shows the level of ICT skills reported had significant relationships with their attitudes toward the role of ICT for young children, $F(3, 405) = 3.84, p < .001, \eta^2 = 0.04$ (a small effect size), and their intentions to support young children's use of ICT, $F(3, 404) = 5.33, p < .001, \eta^2 = 0.03$ (a small effect size), as presented in Table 7. Further, a Scheffe test was used and did not show significant differences among groups.

Table 7

Preservice Teachers' ICT Skills & Their Attitudes and Intentions

ICT Skills		<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>F</i>	<i>Sig</i>
Preservice teachers' Attitudes	None	16	3.53	0.48	3.84	.01
	Novice	213	3.54	0.45		
	Emerging	175	3.63	0.51		
Preservice teachers' Intentions	None	16	3.99	0.62	5.33	.01
	Novice	212	4.24	0.55		
	Emerging	175	4.39	0.58		

Preservice teachers' confidence in using ICT. The preservice teachers' reported confidence has no significant relationship with their attitudes towards the value of young children's use of ICT, whereas it has a statistically significant link with their intentions to support young children's ICT activities, $F(3, 403) = 9.32, p < .001, \eta^2 = 0.07$ (a medium effect size). The Scheffe test further reveals that the participant who reported their confidence was increasing ($M = 4.45, N = 166, SD = 0.55$) or felt very confident with ICT use ($M = 4.47, N = 22, SD = 0.80$) were significantly different from those who had no confidence in using ICT ($M = 4.03, N = 31, SD = 0.65$) as shown in Table 8.

Table 8

Preservice Teachers' Reported Confidence in Using ICT

	Confidence Level	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>F</i>	<i>Sig</i>
Preservice teachers' Attitudes	Not confident at all	31	3.58	0.44	1.39	.24
	A bit confident	188	3.54	0.50		
	Increasingly confident	166	3.64	0.47		
	Very confident	22	3.65	0.44		
Preservice teachers' Intentions	Not confident at all	31	4.03	0.65	9.32	.00
	A bit confident	188	4.19	0.53		
	Increasingly confident	166	4.45	0.55		
	Very confident	22	4.47	0.80		

This is in line with a survey of Greek in-service EC teachers revealing a significant link between confidence and their intentions to integrate ICT (Nikolopou & Gialamas, 2009), which indicates that those participants with higher confidence in using ICT for their professional learning or practicum are expected to use pedagogies to support children's ICT use.

Discussion

The majority of the participants had a low level of positive attitudes toward the value of ICT for young children and particularly many maintained neutral stand towards the potential of ICT for early learning and development. The results of this study support previous data that in-service and preservice EC teachers were uncertain about the positive effects of ICT on young children (Dong & Newman, 2016; Lindahl & Folkesson, 2012; Preradović, Lešin, & Boras, 2017), but in contrast with other studies where in-service and preservice EC teachers expressed positive views about young children's use of ICT and think that technology can support children's learning (Brown, Englehardt, & Mathers, 2016; Gialamas & Nikolopoulou, 2010; Hernwall, 2016; Nikolopoulou & Gialamas, 2009, 2015).

About 70% of the participants reported that they did not own ICT devices and used them daily. Further, many of them (79.8%) reported they rarely used ICT for their learning and practicum. These findings align with previous research that preservice EC teachers' use

of ICT for learning and teaching is limited and they mainly used ICT for leisure and social communication (Konkkanen et al., 2016; Lei, 2009).

The participants in this study generally viewed ICT as screen-based technologies such as interactive whiteboards, tablets, and smartphones, which has been strongly shaped by their practicum experience and educational traditions (Dong & Mertala, 2019). They were reported as new ICT users and their confidence and skills in using ICT were developing. Although these participants were born after the 1990s, they do not fit the feature of ‘digital natives’ who would spend a significant amount of time using technologies every day (Lei, 2009). This provides valid evidence to challenge generation-related assumption about ‘digital native’ preservice teachers as naturally competent and confident ICT user and shows substantial variations in the extent to which preservice teachers have access to ICTs and are able to use them (Gudmundsdottir & Haltvik, 2018; Teo et al., 2016). However, this finding is in disagreement with other studies (Gialamas & Nikolopoulou, 2010; Manassis, 2013; Nikolopoulou & Gialamas, 2009) indicating new generation of preservice teachers who are much better acquainted with ICT use.

Notably, these participants came from north-western regions of China where overall socioeconomic status and high technology infrastructure in this region are lower than that of other coastal areas (Sun, 2013), which might contribute to their limited ICT experience. The preservice teachers’ limited ICT use raises concerns about a potential digital divide and equity among preservice teachers from different families and cultural backgrounds. This is because the differences in the availability of and access to ICT resources in Chinese preservice households and institutions do exist across families and contexts, especially in less developed regions (Wong, Ho, Chen, Gu, & Zeng, 2015). Although ICT and ICT skills become more prevalent and necessary that there continued to be a ‘digital divide’ between those with ICT access and skills and those without (Pasnik & Llorente, 2012).

The preservice teachers' less positive attitudes towards young children's use of ICT might also relate to their limited knowledge of the role of ICT. Although there is growing interest in the use of ICT in ECE internationally, most participants in this study were not informed by contemporary ICT research or policies in the field. Such finding reflects that research-based evidence on the potential of ICT in the early years has not been taught to or understood by this group of participants yet. This might be related to a lack of emphasis on developing EC educators' ICT competencies in Chinese educational policies (Ministry of Education, 2012b). As reviewed in the literature, the Chinese ECE system has not explicitly included the use of ICT in the early years to support ICT integration, as a consequence, initial teacher education programs are less likely to take active roles in preparing preservice EC teachers for technology use. However, the participants in this study were still enrolled in preservice teacher education and they might develop their skills and knowledge in integrating ICT in their further study.

Though the participants held less positive perceptions of ICT use, they expressed much higher intentions to support young children's use of ICT. Considering that many in-service EC teachers rarely used pedagogical strategies to support children's use of ICT (Dong & Newman, 2018; Edwards, 2016; Plowman & Stephen, 2006), it is surprising that the participants indicated they would encourage and facilitate children's ICT activities. A possible explanation for this finding could be that participants, being distant from actual classroom practices or lack of sufficient teaching experience, do not consider possible future obstacles that might arise in everyday ECE practices (Hu & Yelland, 2017; Nikolopou & Gialamas, 2009). As the research shows that respondents are generally more likely to disagree with negative survey questions than to agree with positive one (Kamoen, Holleman, Mak, Sanders, & Bergh, 2017), the design of the five (out of eight) negatively worded statements might contribute to this finding too.

Indeed, many in-service EC teachers had experienced significant barriers for them to incorporate ICT into the classroom, such as inadequate ICT resources and inappropriate software for young children (Dong, 2016b; Leung, 2012), as well as little pedagogical understanding about how to support young children's meaningful use of ICT (Blackwell et al., 2014; Dong & Newman, 2018; Plowman & Stephen, 2006). Such an explanation could be supported by an inverse relationship between the preservice teachers' intentions and the duration of their ECE practicum. This indicates that the expression of high intentions by the participants does not necessarily mean that they would support children's ICT use in their future classrooms. For this to happen, preservice teachers also need to develop appropriate pedagogical knowledge and skills for ICT integration.

Among all the identified factors, ICT training plays a crucial role in influencing the preservice EC teachers' own ICT use and their attitudes and intentions, as well as in developing preservice EC teachers' capability of integrating ICT into teaching and learning. (Gudmundsdottir & Haltvik, 2018; Lim et al., 2015). Globally, many EC teachers' are still not required to use ICT in ECE in many countries (e.g. Turkey, Croatia and Greece; Preradović et al., 2017), therefore there is limited attention to developing their ICT competencies through systematic ICT professional learning and development. Notably, inadequate opportunities for preservice and in-service EC teachers to access ICT training seem common as many researchers have reported the same issue (Chen & Chang, 2006; Dong, 2016a; Kerckaert et al., 2015; Plowman et al., 2012). In China, although EC teachers were starting to be expected to use ICT and develop modern technology, ICT training or professional development is mostly available for primary and secondary teachers (Ministry of Education, 2004, 2012b). In response to the ubiquitous presence of ICT in the early years, it is timely for the Chinese policymakers to develop specific policies that recognize the role of ICT in ECE and emphasize the importance of enhancing EC teachers' ICT competencies.

Recommendation

Given the uniqueness of the sample and small effect sizes, it is not our intention to generalize the findings here but to provide an overall picture of preservice EC teachers' attitudes and intentions in one place and time. Although the results reported here are local and unique, they can be drawn on by readers to examine their own situations. This local contextual knowledge contributes to the general knowledge base and informs future research.

The results have implications for initial teacher education programs in China and somewhere else with similar situations. First, as this generation of preservice teachers is not a homogeneous group with the same technology experience, they might have different ICT access and experiences prior to their initial teacher education, as evident in the research (Hu & Yelland, 2017; Lei, 2009; Mertala, 2018). Accordingly, ICT training programs for participants during their teacher education phase could identify their existing ICT competencies and provide appropriate levels of ICT training to meet preservice teachers' different learning needs. Second, EC teacher preparation programs should reflect the changing nature of young children's living environments and provide a comprehensive analysis of the effect of ICT on young children's learning and development to inform future teachers' practices. Last but not the least, initial teacher ICT training programs need to focus on enhancing their pedagogical knowledge and skills in ICT integration and enable them to explore the possibilities and flexibilities of maximizing the potential of ICT for young children (Hu & Yelland, 2017).

Limitations

This study has several limitations. First, first-year students were not included in the population who might have different experiences on the use of ICT for professional learning or practices as senior students. Second, the sample size and its origin from one region do not allow for broad generalizations. However, the findings are useful for EC teacher educators,

policymakers and researchers. Third, the method of using a self-reported questionnaire does not allow researchers an in-depth understanding of the participants' experiences. Moreover, the small effect sizes could limit the strengths of some claims such as the impact of ICT professional learning and training on preservice teachers' intentions. Thus, we further collected qualitative data through interviews with participants to enrich the findings related to their perspectives and experiences.

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