Preschool Teachers' Perception of the Application of Information Communication Technology (ICT) in Taiwan

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Abstract: The aim of this study is to explore preschool teachers' perception of the application of information communication technology in Taiwan using qualitative methodology in the form of interpretive phenomenology. Snowball sampling was used to select fourteen preschool teachers from public preschools. The data was collected from fourteen preschool teachers using one-to-one, semi-structured in-depth interviews, each of which lasted for one to two hours based on the guidelines for semi-structured interviews. The interviews were taped, recorded, and transcribed for the main textual analysis, which was based on a thematic analysis. Five themes were identified: (1) a formative and explorative growth process, (2) information devices: at once plentiful and limited, (3) decisions between control and freedom, (4) parent-teacher communications, and (5) trend-driven resource integration. Suggestions and implications for the utilization of ICT in classroom practice and its implementation in the curriculum are discussed.

Keywords: preschool teacher; Information Communication Technology (ICT); interpretive phenomenology; thematic analysis

1. Introduction

To date, a growing awareness has been paid on the sustainable development agenda that was recently approved by the U.N. General Assembly. One of the major aspects is to improve learning and outcomes around the world for the next 15 years lead by Sustainable Development Goal 4 (SDG4). A quality education is the foundation of sustainable development, and therefore of the Sustainable Development Goals. As Target 4.2 of SDG4 stated, it targets for 2030 call for ensuring that "all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education". In today's world, that cannot happen without access to ICTs. The declaration emphasizes the potential of ICT to contribute to achieving the Education 2030 goals [1–3]. Much attention has been paid to the adoption of ICT in various educational institutions [4–11]. The term Information Communication Technology (ICT) is broadly known as a form of technology used for creating, displaying, storing, manipulating, and exchanging information [12–14]. In terms of the use of ICT as a teaching and learning tool in early childhood education, Chen [15] observes that "most Taiwanese preschool teachers ignore the advantages of Internet-based applications because their work mainly involves caring for young children; as a result, they have neither the time nor energy to access the Internet to improve their professional development" (p. 2672). Especially, the Early Childhood Education and Care Act consolidated the education and care of young children ages 2–6 under a single administrative system since 2012 in Taiwan. We have limited

understanding of the ways in which preschool educators use ICTs as part of their pedagogical practices under this new administration. In response to these challenges, since teachers are the ultimate users of ICT in an educational context, their perspective has a significant impact on the success of ICT-enhanced education. Yet, despite the extensive literature that is related to using ICT in the learning environment, it is apparent that there are few studies based on determining preschool teachers' attitude toward implementing ICT in the classroom [15,16]. Therefore, the aim of this study is to investigate preschool teachers' perception of the application of ICT in Taiwan.

The research design and the mechanisms used to collect and analyze the data are described in Section 3 of this paper and Section 4 contains the results of the study, while Section 5 is devoted to a discussion of those results and some conclusions.

2. Literature Review

A great many researchers define ICT as a tool that provides multiple opportunities for teachers to enhance their performance in early childhood practices [16–24]. Apart from the successful implementation of ICT in various course subjects [25–30], it is also suggested in previous studies that some factors impede the implementation of ICT for teaching and learning, such as a negative attitude toward the influence of technology, the lack of internet access and technological facilities and equipment, the poor condition of the existing physical infrastructure, and teachers who are underqualified to implement and use ICT technologies [17].

Choosing an appropriate ICT tool is not an easy task, since it must be selected to meet specific curriculum objectives. Utilizing ICT in teaching involves four stages: (1) discovery, (2) learning how to operate it, (3) understanding how and when to use ICT, and (4) specialization [7,17]. Lim and Tay [21] suggest there are four types of ICT tools: (1) information tools (e.g., resources available on various websites, (2) situated tools (e.g., games, simulation, or virtual reality), (3) construction tools (e.g., learners can use social networking applications for reflection), and (4) communication tools (e.g., email, Instagram, or mobile messaging apps). Previous authors in the literature propose that ICT can be a predominant and flexible means of teaching and learning, but, like any other tool, care and experience are essential to use it appropriately [31–36].

3. Methods

3.1. Research Design

Since the purpose of this study is to understand the circumstances of on-site teachers in public preschools in Taiwan, a large sample multivariate statistical study was considered to be inappropriate to answer the research question, which calls for an interpretive phenomenology analysis (IPA) [37,38]. Public kindergartens are either affiliated with primary schools or are operated by the local government in Taiwan. An IPA is a qualitative approach that is deemed to be much more suitable to conduct a detailed examination of individuals' personal lived experience. Larkin, Watts, and Clifton [37] explains that IPA is used to understand participants' lived experiences in order to describe and interpret what a topic is like for them within the social, cultural, and theoretical contexts. In other words, it offers an interpretative account of what it means for the participant to have such concerns within their specific settings. Smith [38] suggests the following guidelines for judging the quality of IPA studies: (1) having a clear focus that provides detail of a specific topic, (2) the analysis should be descriptive and interpretative and consist of both convergence and divergence in themes, and (3) manuscripts should be carefully created to account for these principles. It is an explicitly interpretative approach where researchers wish to observe the participants trying to make sense of what is happening to them [37,38].

Four participants known to the researchers were interviewed first and then the snowball sampling technique was used to recruit more teachers from public primary school-affiliated preschools in other Taiwanese counties and cities as interview subjects. The interviews were conducted between the 1 November 2017 and 21 February 2018. Fourteen teachers (one male and 13 female) currently working

in kindergartens affiliated with public primary schools in Taiwan were interviewed (as shown in Table 1). Field notes were taken immediately after the interviews. A semi-structured interview protocol was used as a reference for the interviewer, but the actual interview process was conducted as an open-ended interview to reveal unintended categories and themes. The protocol questions were largely divided into three groups: (1) basic demographics and organizational details, (2) status of current/past/future ICT projects with which they were involved, and (3) issues and challenges in ICT implementation processes. The interviewees were often asked subsequent questions to examine their perspective in depth. A single interview session with each subject lasted for approximately one hour, with multiple contacts and interviews being completed for each subject based on the needs of the research. The interviews were conducted via face-to-face meetings, the instant messaging app, LINE, and calls via FaceTime, and they were recorded for the entire duration with the permission of the subjects and then transcribed verbatim for the analysis.

Table 1. Demographic and background characteristics of participants.

ID	Education	Age	Experiences/Years	Location	Position
A	B.A.	41–45	10	Taipei	Teacher
B	M.A.	41–45	22	Kaohsiung	Administrator/Teacher
C	M.A.	46–50	23	Changhua	Teacher
D	M.A.	36–40	17	Yilan	Teacher
E	B.A.	51–55	5	Nantou	Teacher
F	B.A.	21–25	2	New Taipei	Administrator/Teacher
G	M.A.	41–45	10	Taitung	Administrator/Teacher
H	B.A.	31–35	6	Pingtung	Administrator/Teacher
I	M.A.	41–45	6	Taichung	Teacher
J	B.A.	26–30	2	Tainan	Administrator/Teacher
K	B.A.	26–30	4	Taoyuan	Teacher
L	B.A.	36–40	12	Keelung	Teacher
M	M.A.	26–30	1	Penghu	Administrator/Teacher
N	B.A.	26–30	5	Miaoli	Administrator/Teacher

3.2. Data Analysis

The interviews were transcribed verbatim into a word processing document by the third author, after which these verbatim transcripts were read by the other two authors read and revised, where necessary, based on the field notes that were taken during the interviews. This process yielded 18 transcripts and a total of 500 pages. A thematic analysis was used to analyse the data. The first stage of the thematic analysis involved reducing the data to identify major clusters, which were labelled as categories, and grouping related passages of relevant text together to form a category. NVivo 10 was used to search, code, and label the themes. The sample transcripts and research results were dispatched to two administrators at the three preschools studied, who acted as external consultants to ensure that the ensuing discussion notably improved the understanding of the data. Three researchers carefully reviewed the transcripts and produced separate lists of themes and categories. NVivo version 10 (www.qsrinternational.com), a qualitative data analysis (QDA) computer software was used to analyses the data. Consequently, the three lists were merged into one by comparison and rigorous discussions. Finally, an agreed list containing sixteen different categories and five themes was developed. Thick descriptions, peer debriefing, and member checks were triangulated to support the trustworthiness of the findings.

4. Results

Five themes and 16 categories were identified in the findings of the Interpretive Phenomenology Analysis (see Table 2).

Table 2. Results of thematic analysis.

Themes	Categories
1.　A Formative and Explorative Growth Process	(1) Tireless Self-Growth (2) Time-Constrained Professional Discussions (3) Boundless Effects of Social Media
2.　Information Devices: At Once Plentiful and Limited	(4) Basic and Necessary Information Devices (5) Stifling and Restrictive Budget Control (6) Resources from Primary Schools as Sufficient Backup (7) Selfless Contribution
3.　Decisions between Control and Freedom	(8) Flexible Curriculum Planning (9) Limitless Possibilities for Self-Learning (10) Profound Effects of Bringing Your Own Device (11) Professional Attitude to Uphold Principles
4.　Parent-Teacher Communications	(12) Traditional Face-to-Face Meetings and Technological Media (13) Parent-Teacher Communication and the Impact of Technology
5.　Trend-Driven Resource Integration	(14) Efficiency-Boosting Word Processing (15) Repetitive, Onerous Administrative Tasks (16) Continuously Updating Information and Media

4.1. Theme 1 A Formative and Explorative Growth Process

4.1.1. Category 1: Tireless Self-Growth

According to the results, the interviewees' training background and whether they had attended ICT-related courses during teacher training had absolutely no bearing on their perception of the application of information and communication technology (ICT). Preschool educators that were trained before the internet became popular had attended few ICT-related courses during training, but since then, various ICT-related courses had been provided:

> "I have taken related classes, which included . . . Introduction to Technology Education, in which we were taught how to produce e-books and how to use PowerPoint presentations to make picture books . . . The teacher wanted us to convert them onto a computer so that they were part of an e-book".

All 14 interviewees spontaneously mentioned that, after becoming an official teacher, it had been important to continue to attend training sessions that were offered by departments of education at city and county-level and learn from other preschool educators. The most direct and effective response methods were to participate in teacher training during summer and winter vacations and at weekends.

4.1.2. Category 2: Time-Constrained Professional Discussions

Because of the busy and heavy workload of teaching and caring for an entire assigned class, preschool teachers have limited time to discuss and share teaching experiences with each other, even with co-workers at the same school:

> "In terms of exchange of information, it is usually with the other two teachers in the same class. We discuss the theme before the class starts and while the theme is ongoing. When I run into problems when teaching or problems with students, I will discuss them. The school also arranges teachers' meetings and we also have course development meetings".

Between spending time with friends and acquaintances, preschool educators often use free time to exchange information on educational resources with each other.

4.1.3. Category 3: Boundless Effects of Social Media

During the interviews, each teacher indicated that the social networking apps, LINE, Facebook, and Instagram are common social networking resources that are used by preschool educators, with Line being the most popular and most frequently used:

"I use LINE the most because it is more private. I use LINE most often to paste and send web links to information. Information used for school meetings are posted to LINE chat groups two days prior for consolidation and organization. Administrative material for the school is stored on NAS, and some is stored on Google Cloud to be freely downloaded".

The next social networking site favored by preschool educators is Facebook:

"Peers, in other words, my partners and teachers from different schools would introduce more social networking sites to me. For example, Facebook is actually a very good channel for external learning".

Many interviewees mentioned that Pinterest offers rich resources that can be used for classroom decoration and other aesthetic-related areas:

"The most used is the app called Pinterest. It does what is called photo sorting. Pinterest can inspire me with this type of interactive sharing or active receiving of information and other related things. I personally link to education and the arts a lot in terms of early education and I come up with a lot of ideas".

4.2. Theme 2 Information Devices: At Once Plentiful and Limited

4.2.1. Category 4: Basic and Necessary Information Devices

The basic information devices needed and used in preschool classrooms do not vary widely between schools:

"We preschool educators really need video recorders and cameras and also audio recorders and we have a CD stereo recorder in the language zone".

4.2.2. Category 5: Stifling and Restrictive Budget Control

Despite being located in different cities and counties, preschools are all restricted by budget controls because of their public nature and they cannot procure limitless needed resources. In addition to the basic information and communication equipment that are supplied on the establishment of the school, the major source of funding is an application for school and classroom environment and equipment improvement; hence, sources and usage of funds are constrained. All fourteen subjects indicated that there is no allowance for ICT software, hardware, and equipment in the regular budget. If there is a need for them, an environment improvement plan must be submitted. The items can be procured after the funds have been approved and transferred. This is sporadic in nature:

"No! We don't have any so-called budget for procuring software and hardware. Computers are purchased based on environment and equipment improvement and it's irregular! After the first successful application, you won't be given any more in the near future".

4.2.3. Category 6: Resources from Primary Schools as Sufficient Backup

Since some of the public preschools are affiliated with the public primary school in Taiwan, the organization and compensation of these preschool teachers are integrated with the primary school division, as are class fees. Hence, a need for ICT software and hardware equipment is often supported by primary school administration that is based on location and organizational convenience:

"I think the benefit of a primary school-affiliated kindergarten is the information team leader for the primary school division. When we need information-related equipment, for example, desktop computers or a projection screen, or other information-related equipment, we find our information team leader as quickly as possible to help us to acquire it".

4.2.4. Category 7: Selfless Contribution

Unlike the teachers in kindergartens that are affiliated with public elementary schools mentioned in category 6, other public preschool teachers explained that there are insufficient available ICT resources. Since they are responsible for teaching and caring for assigned classes, when there is a need for classroom resources that cannot be met by timely procurement based on a limited budget, private purchases by teachers naturally become the workaround for selfless preschool educators who are passionate about teaching. For example:

> "Cameras tend to be purchased more often than not out of our own pockets. Because one camera isn't enough, we often buy them using our own money so that we can use them ourselves at school. Yes, we mainly buy cameras and bring other things, like laptops, from home".

4.3. Theme 3 Decisions between Control and Freedom

4.3.1. Category 8: Flexible Curriculum Planning

Without the existence of textbooks and examination schedules, the entire process of planning the preschool curriculum is extremely important from preparation before the class to developing the main topic during the class, to summarizing the conclusions after the class.

> "When preparing the class, most Word documents and also PowerPoint presentations, web resources, or e-books can be accessed through Facebook on a fan page about professional preschool development guidance or the app, Pin. We refer to these materials".

Thematic instruction is widely employed in preschool on-site teaching settings and ICT is extensively used in group activities in the teaching environment:

> "Back then our courses coincidentally involved walking around the neighborhood. We'd enter my address first and the little yellow person would be pulled in. Then they'd see the outside of my house, and the kids would be very interested. We'd visit everyone's house one by one . . . You can see everyone's house on the computer without actually heading out".

All fourteen interviewees indicated that their classrooms have learning areas. Some teachers provided ICT resources in the learning area for the children's usage (see Figure 1):

> "We give the kids things that they can operate, for example, CD players, MP3 players. When we spend time in the learning area, the kids can operate these and software and hardware. MP3 equipment is free and we put headphones on kids so that two of them can listen at the same time".

Figure 1. Using Information Communication Technology (ICT) resources for teaching and learning.

4.3.2. Category 9: Limitless Possibilities for Self-Learning

The proliferation of technologies also has a significant impact on how families educate children and offers infinite possibilities. Families' ability to provide resources often has a profound influence on preschoolers' learning and development:

> "One kid's father used a tablet for stargazing. By using the tablet to drag an apple into the human's mouth, you can see the way the digestive system works. We'd tell the parents through the contact book that they could download this app themselves and do it in real life. All the kids loved it".

4.3.3. Category 10: Profound Effects of Bringing Your Own Device

The interviewees consistently indicated that they rarely, even almost never, allowed preschoolers to operate ICT on their own in an on-site teaching environment, mainly to protect the developing of their vision:

> "Currently, in preschool education, when kids are at school, they almost never touch any 3C software (i.e., 3C products refer to computers, communications (often referring to mobile phones), and consumer electronic products) in order to protect their eyes, so we avoid using 3C, 3C products. But it is relative because, they come into contact with a lot of 3C products at home. As far as we know, they're mainly videogames and television".

When preschoolers have grown accustomed to audio-visual stimulation, it is difficult to attract their attention using preschool activities and courses. As the interviewees mentioned, most preschoolers use 3C products to view videos or play games at home. Most parents perceive 3C products as babysitters.

4.3.4. Category 11: Professional Attitude to Uphold Principles

However, preschool educators who uphold their professional principles do not make compromises as bringing their own devices becomes increasingly widespread. Instead, they prefer to guide preschoolers on track for sound development:

> "Kids spend too much time on devices at home, so I don't want to provide them with these kinds of things. I hope to weaken their effect. So I have almost never let kids use or touch my electronic devices for the past couple of years".

(see Figure 2)

Figure 2. Using traditional paper and pencil activities for learning.

4.4. Theme 4 Parent-Teacher Communications

4.4.1. Category 12: Traditional Face-to-Face Meetings and Technological Media

The most basic and traditional communication methods between parents and teachers, such as contact books, phone calls, and face-to-face meetings, are still the most accepted among preschool educators today:

"Most parents drop off and pick up their kids, and we see them at drop-off or pickup. If we don't see them, we call them by phone. We only use contact books when phone calls are inconvenient. These three methods are the main ones. I think contact books in a written form are more appropriate if a message needs to be communicated to the class".

4.4.2. Category 13: Parent-Teacher Communication and the Impact of Technology

Preschool educators love to communicate by LINE:

"They all have Line. Sometimes there have been situations, for example, when a child was sick, or showed certain behavior at school and I didn't see the parent that day, I probably used LINE to communicate with them".

However, a few of them had a different opinion of LINE:

"In terms of parent-teacher communication, I avoid using LINE as much as possible because I think it's a form of textual description that could inevitably cause misunderstanding".

Fan pages are novel parent-teacher means of communication:

"We have our own fan page so that many people know about our preschool! It has a good effect on our admissions".

4.5. Theme 5 Trend-Driven Resource Integration

4.5.1. Category 14: Efficiency-Boosting Word Processing

The efficiency of traditional word processing is continuing to increase aided by computers, mobile phones, and other technological tools.

4.5.2. Category 15: Repetitive, Onerous Administrative Tasks

The delivery and return of official documents is one of the most burdensome administrative tasks for public primary school-affiliated preschools:

"Whether it is official documents for the school or the department of education, many platforms and notifications must be done on computers. If all this information can be integrated electronically, it can lighten the workload of administrative tasks for teachers".

Each year's signup, enrolment, and lottery for student spots puts frontline teachers under heavy pressure (see Figure 3).

Figure 3. Recruitment and enrolment using the traditional method.

The interviewees also mentioned that digitalization is an important item that urgently needs to be integrated (see Figure 4).

Figure 4. Digitalization of recruitment and enrolment.

4.5.3. Category 16: Continuously Updating Information and Media

Since ICT media is continuously updated, the on-site teaching environment must also keep pace with the times to increase efficiency and deliver better quality.

5. Discussion and Conclusions

5.1. Discussion

5.1.1. Enabling Teachers Using ICT Applications

The "knowledge sharing" strategies that are used by preschool teachers mainly consist of participating in learning sessions outside the school on their own, attending seminars held within the school, and finally, everyday discussions with other teachers. The participants in this study use face-to-face and online communication in their own knowledge-sharing communities.

Today's preschool educators use social media extensively. The use of educational ICT media and learning tools enables educators to increase preschoolers' interest and motivation to learn, help them to build a rational link between logical understanding, emotional awareness, information collection, and organization using cognitive processes to solve problems in order to enhance their interest in learning about lively and highly interactive physical symbols. Teachers today can rapidly improve the basic teaching content, teaching methods, and technical capabilities in both formal and informal contexts.

5.1.2. Trends in Teachers' ICT Usage in On-Site Teaching Settings

From a practical perspective, the use of ICT to help preschoolers learn in today's on-site teaching settings is achieved with the use of audio-visual effects and highly interactive, diverse software, hardware, and media that can trigger their interest in learning, thereby guiding them to proactively learn and integrating their diverse learning experience. In addition, when preschoolers participate in learning activities that involve electronic picture books, most of the time they still follow the teaching strategies and plans developed by teachers. This emphasizes that preschoolers do not usually choose electronic picture books in their learning process, which is a fact worthy of on-site teachers' reflection.

The integration of ICT into teaching is a worldwide trend [39–42]. Although the appropriate use of ICT tools is challenging, concepts such as how to dress as quickly as possible during break time and how to smoothly organize articles of clothing in a fixed order can be grasped by preschool children and these concepts can be leveraged to teach them the use of simple algorithms to solve problems. In addition, computer programming is a universal language that can be learned even by four year-old children. This trend introduced by preschools and its benefits will be seen to grow in the future.

If teachers can make good use of ICT by integrating it into on-site teaching settings, rethink and adjust traditional reading models, provide preschoolers with diverse learning activities that can help them to positively develop high-quality literacy, and equip them with different abilities, such as learning a language and recognizing textual symbols and images based on various teaching strategies

that are suitable in different degrees, this will promote the development of reading comprehension and the awareness of phonetics, foster reading and writing abilities, and improve children's reading efficacy.

5.1.3. Eyesight Care Cannot be Overlooked

While the broad usage of information and communication technology is a trend of the times, it is very important to limit the amount of time that preschoolers spend using information and communication devices. Tablet computers have replaced television to become the next-generation electronic babysitters. It is worth noting that more than 80% of school children in Asian countries, such as Singapore and Taiwan, are near-sighted. Eighty-seven percent of high school children in Taipei, Taiwan, are near-sighted. According to Taiwan's Ministry of Education Document No. 1020018346 (https://www.hpa.gov.tw/Pages/List.aspx?nodeid=45) "Notes on the Use of Electronic Devices for Teaching in Primary Schools", "The use of electronic devices in teaching is not recommended for lower grade levels". The notes also clearly indicate that "electronic devices include projectors, electronic white boards, LCD monitors, mobile devices, etc". This advice is even more relevant for preschool children. Learning and behavioral issues as a result of overuse can be avoided if iPads and other electronic products are prevented from becoming e-nannies. Internet usage jumped from 62.7 percent in 2005 to 82.3 percent in 2017, owing to the ubiquitous use of mobile devices in Taiwan [43]. Accordingly, many young children have ample opportunities to access computers at home. They already have possessed various background knowledge related to ICT tools before they attend preschools in Taiwan. The results of this study have revealed the significance of preschool educators' attitude toward applying information and communication devices to teaching. The attitude of primary caregivers in Taiwan toward visual healthcare is positively and closely related to preschoolers' visual health behavior. Therefore, visual health is an important issue that cannot be ignored. Similar as Zomer and Kay's findings [30], the results of this study indicate that administrators and practitioners have debated whether preschoolers should use ICT in early childhood settings. However, the fact is that the question has shifted from whether ICT should be used at Taiwanese preschools to how it can be used adequately with proper national and institutional support.

Other countries around world are promoting Bring Your Own Device (BYOD) strategies [27]. This is different from the perspective of the interviewees in this study of children's usage of ICT in an on-site learning environment. However, the samples in this study were preschools and the subjects were teachers working on-site at public preschools with preschoolers being the target of on-site instructions. Hence, there should different controls on 3C products for preschool- and school-aged children, and perhaps BYOD is not applicable to preschool education. While research at home and abroad promotes BYOD policies, almost all the interviewees in this study expressed the opposite opinion. Perhaps the results of this study are contrary to those of others because of the preschoolers' young age and their inability to control their time, method of use, and viewing distance as compared to their middle- and high school counterparts. Therefore, ICT applications at the preschool stage should mainly be operated by the teacher and preschoolers' use should be limited to open use under the guidance of teachers and parents in order to protect the development of their vision, while also fulfilling their need for independent exploration.

5.2. Conclusions

In recent years, a flourishing internet and active internet communities have promoted on-site preschool educators' interest in learning ICT and raised their awareness of the diverse applications of ICT. The results of this study have demonstrated the pivotal role that is played by social media in these areas, including communication between teachers, the processing of administrative tasks, and parent-teacher communication. In summary, the usage of ICT in pre-schools is largely influenced by a number of political, economic, and pragmatic factors. The results suggest that ICT tools may improve teacher-to-teacher and teacher-parent communications. Although most of the young children have access to and use a wide range of technologies at home, the government authorities suggest that

preschool teachers need to safeguard the children's eyesight and do not recommend the use of ICT tools. The findings suggest that preschool teachers generally express favorable attitudes toward ICT applications in teaching and administration. Whereas, due to ICT's possible side effects on preschoolers, the teachers also present temperate attitudes and reservations. Another challenge pre-school teachers face is insufficient ICT resources in institutions (i.e., except those kindergartens affiliated with public elementary schools). Some participants explained that fewer up-to-date ICT-related courses are included in pre-service teacher education programs. It would have been more beneficial in practice if these courses were added or redesigned in the early childhood education curriculum. It is also imperative for teachers to rework their instruction practices and embrace the potential that ICT tools can provide. As the capability of ICT evolves, most of the participants agreed that early-childhood teachers need to continue to advance their knowledge of professional development and innovative technology, such as social media or interactive mobile apps. The way that teachers choose to use ICT tools with regard to technology and learning matters. Especially, it is important for preschool administrators and teachers to recognize what type of ICT tools to use, how to use the tools properly, and what kind of national and institutional support are available. ICT tools provide early childhood teachers with "alternate" means to prepare children to be technologically-literate digital citizens.

5.3. Limitation of the Study

Although this research has contributed important information to the current literature, it has several limitations. One such limitation is that our study had a female dominant sample, a typical characteristic of the teaching profile of preschools in Taiwan [19]. Nevertheless, it will be interesting to investigate if balancing gender in future research in other regions or countries with a different gender makeup would provide insights into the findings. It is worth noting that the purpose of this study is not to generalize, but to describe and interpret the phenomenon. A second limitation is that private pre-school teachers are not represented in this study and the third and final limitation is that the methodology adopted to complete the study relied heavily on the participants' ability to communicate their lived experience with moderate fluency. Some of the subtleties may have vanished since the analysis depends on a certain level of transparency in participants' message.

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