Asia-Pacific Edu Res
https://doi.org/10.1007/s40299-017-0366-x

REGULAR ARTICLE

Towards Improving Kindergarten Teachers' Practices Regarding the Integration of ICT into Early Years Settings

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Abstract There is mounting evidence that information and communication technology (ICT) has the potential to support children's development and early learning when used effectively, appropriately, and intentionally. In an attempt to improve teachers' performance in integrating ICT into early learning, this study was designed to examine the effect of ICT training programmes on teachers' perceptions and practices by integrating ICT into early learning settings. It also explored the types of ICT practices that teachers implement in their classrooms. Additionally, it sought to identify the obstacles faced by teachers when they attempt to integrate ICT into their teaching practice. The study used a case study approach, comprising two sources of information: interviews and classroom observations utilised before and after the training programme. Results revealed that the ICT integration training programme had an impact on teachers' perceptions and practices as it increased teachers' awareness and understanding of the value and applications of ICT tools in children's learning. Teachers' practices have positively changed because of using ICTs and the training programme helped teachers improve the quality of their ICT practices. Finally, the training programme was beneficial in reducing the obstacles which were hindering the integration of ICT into teaching practices. The study highlights the need for more and better ICT training programmes for early childhood teachers so as to increase the successful integration of ICT within early years settings.

Keywords Kindergarten teachers' practices · Information and communication technology (ICT) · Early childhood teacher education · Kindergarten children · Early years settings

Introduction

Today's young children are growing up in a wireless world and immerse themselves in new technologies in unprecedented ways (Berson and Berson 2010). Indeed, now more than ever, young children are seeing, from an early age, the importance that the adults in their lives place on information and communication technology (ICT) tools (Parette and Blum 2013). As ICT tools have become woven into our everyday life, ICT integration in today's early childhood classrooms has become commonplace (Puerling 2012). True ICT integration not only means using computers and software in children's classrooms, but also employing all of the technological tools designed specifically for children including Internet, digital data network, TVs, DVD players, satellites, tablets, digital cameras, multi-touch mobile devices, computers, interactive websites graphics and office applications, as well as many other devices, anytime and anywhere (Simon and Nemeth 2012). These technology tools can be used "as an end in itself (discovering how it works), as well as a means to an end (exploring role play, solving problems)" (Epstein 2013).

Research has indicated that integrating ICT into the early childhood curriculum may produce positive changes in young children's development in varied areas—whether these be physical, cognitive, social, emotional or related to

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Published online: 03 January 2018

language development (Kerawalla and Crook 2010; Simon and Nemeth 2012). For instance, ICT can support children's social interaction (Lim 2012), develop their early reading behaviours (Amendum et al. 2011), improve their cognitive abilities (Nir-Gal and Klein 2004), improve their writing and communication skills (Anderson et al. 2008), and potentially change their approaches to learning (Downes 2002).

Many educational systems are now focussing on the development of policies for ICT integration into curricula and teaching practices in general, particularly in early years education (Ihmeideh 2009). These policies require a comprehensive system capable of preparing teachers to integrate ICT into their teaching practice and mediate its use and impact. In light of this, training is essential to provide teachers with opportunities to learn about effective, appropriate, and intentional use of ICT in their teaching practice (Puerling 2012). The area of this study is integrating ICT into early years education and it aims to (1) examine the effect of ICT training programmes on the perspectives and practices of teachers when it comes to integrating ICT into early learning; (2) identify the types of ICT activities and practices used by teachers after the implementation of ICT; and (3) explore the obstacles faced by teachers when integrating ICT into their teaching practices.

ICT Integration into Early Years Education

In 2012, the National Association for the Education of Young Children (NAEYC) and Fred Rogers Center for Early Learning and Children's Media published the position statement, *Technology and interactive media as tools in early childhood programs serving children from birth through age 8*. The statement stressed that there is increased interest in how practitioners may meaningfully integrate instructional technology into planned classroom activities and its impact on children's learning (NAEYC & Fred Rogers Center 2012). Indeed, many have noted that the use of technology tools and integration practices has proliferated (Simon and Nemeth 2012). This is, however, very important for any educational system because, as stated by NAEYC & Fred Rogers Center (2012), ICT integration into the environment, curriculum, and daily routines can help teachers use technology thoughtfully and appropriately. Indeed, this can also subsequently enhance early childhood practice and help educators make and sustain home–school connections.

According to Donohue (2015), when technology and digital media are integrated into classroom practices, educators need to think about technology across the curriculum throughout the day—not technology as a separate activity. Early childhood teachers should be encouraged to integrate ICT into teaching and learning experiences while also expanding the array of choices already found in the classrooms (e.g. hands-on activities, blocks, manipulatives, and other materials). Integrating ICT into teaching practices requires teachers to have information and resources related to the nature of ICT tools and the implications of their use with children (NAEYC and Fred Roger Center 2012). These teachers must also decide when, how, why, and what technology is most appropriate and effective for the children in their classrooms. For instance, Simon and Nemeth (2012) suggested several steps which should be followed to integrate technology and digital media into teaching practices effectively, appropriately, and intentionally: a) infuse ICT tools into many learning centres in the class and offer them as choices with clear objectives; b) use software and applications that help children meet curriculum learning objectives, achieve programme and state standards, and lead to deeper learning experiences; c) balance teacher-facilitated technology activities with those that are child initiated and independent; and d) extend the learning children's initiative during choice time by offering technology as an option to enhance their experience.

In the USA, Parette and Blum (2013) introduced a technology integration framework (see Fig. 1). The framework included three stages: Expect it, Plan it, and Teach it. This framework is based on best practices in early years education, current understanding of young children's curriculum, and the emerging role of technology in today's classroom settings. "Expect it" refers to the selection of standards and learning objectives, which should be connected with a curriculum before any instructional activity is considered. "Plan it" relates to the development of engaging learning activities supported by technology. This stage comprises three steps (Tech it, Arrange it, and Check it), which allow teachers to select technology, decide on instructional strategies, and identify how to assess child performance. When teachers make decisions regarding Expect it, Arrange it, and Check it, they should have a clearly planned lesson that integrates technology, and this is found in stage three, "Teach it".

Despite its importance in promoting teaching and learning, integrating ICT into teaching practices cannot be accomplished without establishing training programmes to improve teachers' knowledge, skills, and experience, all of which are essential when it comes to selecting, using, integrating, and evaluating ICT in early childhood settings (Donohue and Schomburg 2015). As one educator urged, if teachers were to have access to ICT integration training programmes, they would be more likely to integrate technology into their early childhood programmes, and vice versa (Simon and Nemeth 2012).

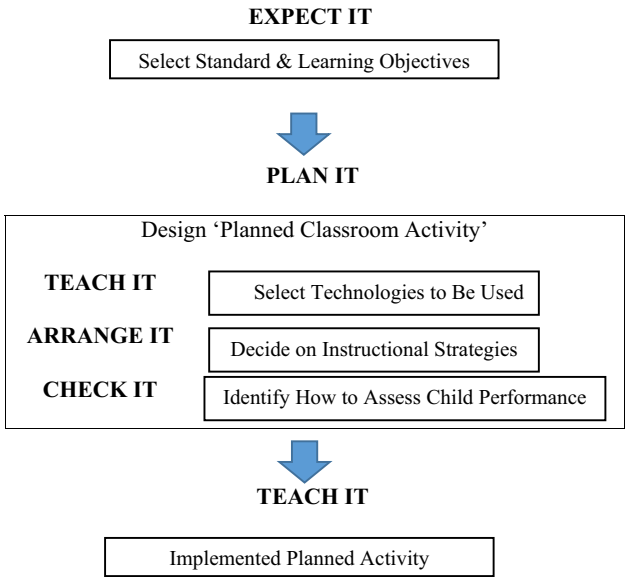

Fig. 1 The Expect it–Plan it–Teach it technology integration framework Reproduced with permission from Parette et al. (2013)

Training in ICT

The success of ICT implementation in any classroom is down to the teacher. Because of the ubiquitous presence of new technological tools, teachers today must change the way they use classroom materials with young children (Jackson 2011). This, however, means that establishing training programmes on how to integrate ICT into learning and teaching is the top priority in any educational system. The training on ICT integration is needed as it influences teachers' performance in teaching practices (Nalugon and Nuqui 2015).

The position statement of NAEYC & Fred Rogers Center (2012) stressed that training for early childhood teachers should focus on providing them with technology knowledge, proficiency, and digital literacy grounded in the principals of developmentally appropriate practice, so that they can select, use, evaluate, and interact with technology for the classroom. According to the views of Simon and Nemeth (2012), every teacher who intends to implement technology tools needs training, support, and resources, as well as time to slowly adapt to the changes, and to be successful. Training teachers on how to integrate ICT into teaching and learning ought to emphasise the fact that ICT should not replace the traditional materials used in early years education. Simon and Nemeth (2012, p. 16) argued that "with the appropriate training and support, technology tools can and should be a part of your classroom toolkit right alongside with the playdough, blocks, and prop boxes".

Ongoing professional development programmes should also provide early childhood educators with access to resources and online links, videos, and a professional community of practice, so that they can demonstrate, share, and discuss practical examples and applications of technology tools (NAEYC & Fred Rogers Center 2012). The Early Childhood Good Practices guide prepared for the Qatari context suggested that for teachers to use ICT effectively, appropriately, and intentionally, they must provide a wide range of different forms of ICTs in the learning environment and create opportunities for children to become familiar with them. These teachers must also develop adequate technological competence and motivation to use ICT with young children.

Plowman and Stephen (2005) identified a number of ways in which teachers provide guidance to children when they are interacting with the computer, such as explaining how to use software, suggesting alternative actions, moving children to an appropriate level of difficulty, offering remedial assistance, and sharing pleasure in features such as animation. Roscorla (2013) added more roles for teachers in today's digital age, including: deciding which technology tools are the most effective and appropriate for the individual child, the content area, and the classroom context.

Research in early childhood technology has emphasised the importance of sufficiently understanding attitudes towards and beliefs regarding ICT (Ertmer and Ottenbreit-Leftwich 2010); ICT expertise, and skills (Bingimlas 2009); professional development and training (Pelgrum 2001); and how teachers support children's learning through the use of ICT (Donohue 2015). Therefore, increasing knowledge and understanding of the integration of ICT into the learning process is an essential part of early childhood teacher education programmes, since it affects the learning experiences of young children (Kerawalla and Crook 2010). In this context, the International Society for Technology in Education (ISTE) identified standards for assessing teachers' skills and knowledge in the digital era, including: (1) facilitate and inspire student learning and creativity; (2) design and develop digital-learning experiences and assessment; (3) model digital-age work and learning; (4) promote and model digital-age citizenship and responsibility; and (5) engage in professional growth and leadership (ISTE 2008, p. 2). To achieve long-term continuous development for teachers, the educational system should build the capacity of teachers in ICT integration into the teaching and learning process (Waitayangkoo 2009).

Obstacles Hindering the Integration of ICT in Education

Integrating ICT into learning and teaching is one of the most hotly debated issues in the field of early childhood education (Ihmeideh 2009). Researchers have found that ICT integration into learning and teaching encounters many difficulties, known as "obstacles". Lack of teachers' competence was found to be the main obstacle hindering ICT integration (Becta 2004). Other obstacles were reported in a recent study conducted by Nikolopoulou and Gialamas (2015), who indicated that lack of funding, lack of technical and administrative support, and inadequate training opportunities were the main barriers when it came to using computers in early childhood settings in Greece. Ihmeideh (2009) examined barriers standing in the way of technology use in Jordanian pre-school education and found that lack of software, funds, time, and technology skills were the main barriers.

In the context of an Australian kindergarten class, Turbill (2001) found that kindergarten teachers faced certain barriers that hinder their ability to integrate technology into their curriculum, such as lack of time, scarcity of software, and lack of understanding when it comes to the possible uses of technology in the early years setting. Researchers observed many obstacles facing ICT integration, such as an insufficient number of computers, teachers' lack of knowledge/skills, difficulty integrating into instruction, scheduling computer time, insufficient peripherals, and not enough copies of software (Pelgrum 2001). In China, Liu and Pange (2015) studied the barriers affecting ICT integration into teaching practices from the perspective of early childhood teachers. They found two types of barriers: (1) first-order barriers, such as lack of hardware (laptops, notebooks, and computers), lack of teaching content and material, as well as lack of pedagogical models were perceived as the main barriers by teachers; and (2) second-order barriers, including lack of teachers' interest, and lack of teachers' support were perceived as the least significant barriers. Other obstacles were also found in the Southeast Asia context. For example, Mutohar (2012) found that ICT integration in education in Indonesia still faces major barriers because of the absence of ICT national standards, ICT financial policies, and the lack of professional development. In addition, Umar and Abu Hassan (2015) conducted a study to assess Malaysian teachers' level of the use of ICT in classrooms and found the teachers' levels of ICT integration were at a low level due to lack of training.

Based on the existing literature, it is clear that more research needs to be carried out to explore the effect of training programme on the perspectives and practices of teachers. In Qatar, it seems that the types of ICT activities and practices used by teachers after the implementation of ICT have not been considered and the obstacles faced by teachers when integrating ICT into their teaching practices have not been identified; as a result, a deeper investigation, through a case study, into the integration of ICT into early years settings is top priority at this time. In answering this call, this present study was designed and carried out.

Study Context

Qatar's educational reform initiative started in May 2001, with the aim of improving the quality of teaching and learning processes during all stages, including early years. Following the initiation of the educational reform, early childhood education has grown substantially, resulting in the development of strategies to support this area of education (Supreme Education Council 2009). One of these strategies is the integration of ICT into early years education. In 2007, the Ministry of Education and Higher Education (MOE) (known previously as the Supreme Education Council) introduced *The Early Years Education Good Practice Guide and Foundation Curriculum* in Qatari independent schools. Indeed, this guide supports the use of ICT in teaching and learning, from Pre-K2 through to Grade 2. Despite these reforms and the increased interest in ICT integration, there remain few guidelines and instructions related to teachers' standards or practices that help make ICT integration possible in teaching and learning.

Through their involvement in general professional development programmes, the authors have noticed that kindergarten teachers face challenges when it comes to technology implementation. The most important challenge is the lack of teachers' technology skills in general, but more particularly their lack of knowledge and experience regarding best practice for ICT integration into children's early learning.

Little is known about kindergarten teachers' levels of training and/or access to technology, thus making it difficult for them to integrate ICT into teaching and learning. As such, careful consideration must be given to in-service teacher training programmes for kindergarten teachers, so that they can become acquainted with the important role of ICT in pre-school settings and learn how to select, use, integrate, and evaluate technology tools effectively, appropriately, and intentionally.

The study presented here aims to explore the effect of an ICT training programme on the perspectives and practices of kindergarten teachers when it comes to ICT integration into children's early learning. More specifically, the study's research questions are as follows:

- What is the effect of a basic ICT training programme on the perspectives and practices of kindergarten teachers about using technology in teaching young children?
- What are the types of ICT practices used by kindergarten teachers following ICT implementation?
- What are the obstacles faced by kindergarten teachers when integrating ICT into their teaching practices?

Significance of the Study

A key aspect of Qatar's educational reform initiative, "Education for a New Era", is to improve the quality of teachers and school leaders. This study is significant because it is an attempt to explore, develop, and improve kindergarten teachers' practices through technology skills. The study contributes to the production of knowledge and information regarding the integration of ICT practices in Qatari early years education. Indeed, this will support future development in the usage of ICT in early years settings in Qatar.

This research is in line with the Qatar national development strategies 2011–2016, which addressed a number of essential core training issues, one of which was integrating ICT into educational and administrative processes (The Qatar General Secretariat for Development Planning. 2011). In addition, it coincides with Qatar's vision for 2030, namely to make the greatest use of ICT in enhancing and supporting education. The results of this study are intended to help provide decision-makers and curriculum designers in the MOE with valuable information regarding the status of ICT in Qatari kindergartens. It will achieve this by identifying factors that influence the implementation of ICT in early years education. It provides information about practitioners' readiness and capacity to use ICT in their practices. Indeed, this information will enable policy makers to be aware of the areas where ICT abilities and the preparedness of practitioners require improvement. It will also serve as a foundation for a dialogue on the feasibility of adopting ICT in early childhood education (ECE) and facilitating the access of children to ICT so as to improve their learning.

Methods

Due to a lack of research on technology implementation in Qatari early years education, a case study approach was considered adequate for an exploratory study of the current research. A case study approach is deemed appropriate when the researcher wishes to carry out an in-depth investigation using different sources of data (Feagin et al. 1991).

Participants

The study sample consisted of three kindergarten teachers from different Qatari kindergartens. They were purposefully selected. Purposeful sampling is widely used for the richness of qualitative data. As urged by Patton (2002, p. 230), "The logic and power of purposeful sampling lie in selecting information-rich cases for study in depth….. *Studying information*-rich cases yields insights and in-depth understanding rather than empirical generalizations." The selection criteria for the participating kindergartens teachers were as follows: (1) they have access to ICT in their kindergarten settings; (2) they are in close proximity to the researchers; and (3) they are willing to voluntarily participate in the study and attend workshop training in ICT implementation. The participants had received no previous training in technology and their ages ranged from 22 to 30 years old. The study used pseudonyms for the kindergarten teachers so as to keep their identities anonymous. Table 1 summarises the characteristics of the study's participants.

Research Instruments

Two research methods, namely interview and classroom observation, were utilised in this study, and both were conducted pre- and post-training intervention. The purpose of using interviews in the study was to explore participants' perspectives and practices of ICT integration before and after the implementation of an ICT training programme. In addition, the interviews were helpful in identifying the types of ICT practices used by teachers as well as more thoroughly exploring the obstacles that hinder the integration of ICT in teaching practices. A semi-structured interview was used and included nine questions (see "Appendix"). The face and content validity of the interviews were evaluated by a number of experts, including university teacher educators specialising in early childhood education and instructional technology in three different institutions.

The observation used in this study was unstructured and descriptive, as this provides more flexibility when compared with other observation methods. In the view of Simpson and Tuson (1995), observing without a schedule is an important research tool, as the observation process is addressed with as open a mind as possible in terms of what is happening. The purpose of using observation in the study was to explore teachers' use of ICT in their classrooms and types of technology implementation before and after intervention.

Table 1 Characteristics of the study's participants

Teacher	Years of teaching experiences	Highest qualifications	Training courses in ICT	ECE-related certificate
Kaltham	5	B.A	No	No
Lolwoah	10	Diploma	No	Yes
Alhanouf	3	B.A	No	Yes

Data Collection

After receiving research ethical approval from the institutional review board (QU-IRB), official approval was obtained from MOE to carry out this study. The researchers visited the three kindergartens involved in the study, met teachers, and explained to them the aims of the research. The participants were assured that confidentiality and anonymity would be guaranteed, and their consent to take part in this study was obtained. Two research assistants were recruited. They had been trained by the authors on how to ask the research questions. At the beginning of the 2015–2016 academic year, the three teachers were observed on three occasions and were interviewed by the research assistants before the implementation of the training programme. Following this, the teachers attended four workshop-training sessions (12 h) on integrating ICT into early learning. The training programme was designed in collaboration with The TEC Center: Technology in Early Childhood at Erikson Institute—Chicago, Illinois, USA. The workshop training sessions consisted of the following seven themes:

- The concept of ICT, its importance, and its impact on children's development and learning.
- Technology knowledge, skills, and experiences that result in confidence and competence.
- Early childhood technology teaching strategies.
- Evidence-based practices and examples of effective ICT tools and practices.
- Hands-on opportunities to implement ICT activities in teaching practices.
- Examples of effective technology integration framework (e.g. Expect it, Plan it, and Teach it).
- Challenges in integrating ICT into learning and teaching.
- Follow-up ICT activities and practices.

The first author delivered himself the training programme for kindergarten teachers. After the workshop, training sessions were implemented and teachers were encouraged to implement their training when conducting real-life practices. After 2 weeks, each teacher was post-observed three times by two research assistants. Post-workshop interviews with the three teachers were conducted by the same two research assistants. All interviews were conducted in the kindergarten teachers' room. With the permission of the participants, every conversation was audio-recorded for transcription and analysis at a later time. The duration of the interviews varied from 25 to 40 min.

Data Analysis

This case study utilised the qualitative data analysis technique. Each interview was transcribed precisely by the researchers. Similar ideas were identified and grouped into categories. Following this, the categories were re-grouped into larger ones and merged into various themes, with quotes used to illuminate the findings. With regard to the results obtained from classroom observation, the researchers transcribed each lesson observed. All findings from each observation were grouped and categorised. Following this, the researcher processed the data and analysed it according to certain steps related to the research questions. The results of the interviews and classroom observations were combined to improve the validity and reliability of the research (Hendricks 2009).

Results

The Effect of the ICT Training Programme

The first question of the study was to examine the effect of an ICT training programme on the perspectives and practices of kindergarten teachers regarding ICT integration into children's early learning. To achieve this objective, kindergarten teachers were observed and interviewed at their respective schools before and after the intervention training programme.

Interview Findings

During the interviews, kindergarten teachers were asked about their perspectives on: (1) the value of ICT integration into early years settings when it comes to the development of children's learning and well-being; (2) the role of teachers and children when implementing ICT into teaching practices; and (3) their understanding of how to integrate ICT into teaching practices.

Before the intervention training programme, the results showed that kindergarten teachers emphasised the value of using ICT in early learning settings, as children live in a technological environment. However, the teachers were unable to provide evidence regarding how ICT can promote children's development and learning. Furthermore, two teachers considered ICT tools to be limited to the use of computers, tablets, or similar electronic devices in classrooms. Alhanouf stated:

> Technology is important for young children's learning. Children discover it at home before they reach school-age. I am not sure exactly how technology affects children's development but I think it can have educational benefits for preschoolers. I usually allow my children to enter the computer center and play computer games… I noticed that children love playing computer games.

It was also found that all teachers placed more emphasis on the role of teachers in using technology with young children. The three teachers mentioned that teachers should introduce ICT to children and teach them how to use it appropriately. They emphasised that using ICT should be fully supervised by teachers. With regard to children's role, the results showed that teachers viewed children as "passive users" who always need to model teachers' behaviour when using technology tools. For instance, Kaltham felt that children are too young to start using ICT alone without strict supervision from teachers. She wants children to listen to teachers' instruction while using technology, and to repeat after her. Alhanouf viewed children as technology oriented and stated that their familiarity with technology was vital in today's world. She emphasised drill and practice strategy when using technology. Lolwoah also indicated that the role of children is to act as they are asked to. She stated:

> I explain to children at the beginning of the year what they should do when they hear certain music on computers for instance. With time, they get used to it.

With regard to kindergarten teachers' understanding of how to integrate ICT into teaching and learning, the results of the pre-intervention training programme interview showed how all teachers mentioned that ICT integration should take place in the classroom (mainly in the computer corner) where children sit in front of computers and complete, individually, activities assigned to them by teachers. For instance, Kaltham believed that technology should only be incorporated into the classrooms in short bursts, as children need to do hands-on activities with real materials, which (in her opinion) are better than just sitting in front of screens. Lolwoah pointed out that teachers should have a clear and written plan regarding when and how to use technology with young children. Indeed, she was unsure as to whether integrating ICT into teaching practices should take place during most classroom activities or only in the computer corner. She pointed out that teachers should use technology with caution and never use it without approval from the principal and MOE. However, Alhanouf believed that integrating ICT into early years practice should be introduced gradually, as most of the curriculum activities are not prepared and designed to be implemented by using ICT. She was keen to talk about this issue:

> ICT integration is not our priority in the kindergarten where I am teaching since we still implement new curriculum and this curriculum lacks ICT activities. We have an interactive whiteboard in the class. In every morning lesson, I display new thing on the screen to children. In addition, we provide computer corner with some play-based activities related to literacy and numeracy.

Following implementation of the intervention training programme, the results indicated that teachers continue to place more emphasis on the importance of ICT integration into early learning. It is interesting to mention that teachers have become more comfortable and knowledgeable about ICT and its value to children's learning and development. The three kindergarten teachers understood the benefits of the theoretical background introduced in the training programme regarding the value of ICT for children's development and learning. For instance, Kaltham showed great awareness of the ICT tools and the ways in which each tool can serve a certain level of children's growth. Lolwoah was able to give a detailed account of the role of ICT in promoting children's language skills, social skills, cognitive development, and school readiness.

Classroom Observation Findings

Prior to the implementation of the intervention training programme, technology tools were implemented in the classrooms of two teachers, and these teachers were observed at a minimum level. In Alhanouf's classroom, children had to sit on the "morning circle" (the day's first activity) for 40 min of daily interactive whiteboard. The teacher presented children with certain words and pictures related to the unit theme. Most of these activities were like worksheets. She allowed children to use the computer corner for only 5 min to copy the letter of the unit using Microsoft Win Word Software. At the beginning, all children have participated in these activities, but after a while only a few children completed them. She was also observed asking children to sing along with recorded digital songs and to repeat them.

With regard to the observation of Lolwoah's classroom, it seemed that this teacher rarely used technology in her teaching practices, although her class had a computer corner. She was observed using a computer to show the children movies related to the concepts being introduced (e.g. shapes). Children were not offered the opportunity to engage with any kind of technology tool.

Kaltham was observed allowing children to use the classmate (computers) in the classroom to write/copy letters related to the unit. Children in Kaltham's classroom were observed using computers individually and were given detailed instruction by the teacher regarding how to complete the task appropriately. Her use of computers was just a replication of existing practice. It is possible that, had Kaltham not been able to access computers, the children would have been exposed to these equally existing activities.

Following implementation of the intervention training programme, observations revealed that the three kindergarten teachers integrated ICT tools into their teaching practices to varying degrees. The following section describes each teacher's classroom after incorporating ICT into the classroom practices.

Alhanouf

The observation results showed that Alhanouf was able to appropriately use ICT in her teaching practices. Both observers strongly agreed that Alhanouf was aware of how to involve children in the technological activities. She integrated ICT into her daily activities. Moreover, as well as implementing technology inside the classroom, she also integrated ICT during outdoor activities (e.g. taking photos with children of plants and flowers). The researchers also noted that Alhanouf used different types of ICT activities, such as individual activities (e.g. recording voice via tablet computers), small group activities (e.g. reading stories using a talking pen), and whole class activities (i.e. pointing to maps presented on Google Earth using the interactive whiteboard). Observations revealed that she implemented ICT during most of her daily schedule activities. She was clearly aware of her new role in integrating ICT into children's activities, as she encouraged children to use technology independently and to express their thoughts while using ICT tools.

Lolwoah

This teacher integrated technology into some of her indoor activities. She made a number of changes to her plans and started relying on e-stories during her story time activity. Lolwoah was observed implementing technological toys in different learning corners. For instance, she put a machine in the science corner and placed a talking bear toy in the library corner. In addition, both researchers noticed that, when using technology, Lolwoah gave more time and attention to the children than before and encouraged them to work collaboratively while using ICT tools (e.g. technology toys, computer games). Although she had neither an ECE-qualification nor previous training, she exhibited an expert level of knowledge when dealing with the children and using technology. She was willing to gain knowledge of new skills so as to increase the level of technology integration with children. For instance, Lolwoah prepared a video on 3D shapes with different colours and presented the video; she asked the children to sit in pairs and to use laptops to identify shapes and colours from the video.

Kaltham

The post-intervention observation results indicated that Kaltham was willing to use ICT in her classrooms, but only to a minimal degree. She had difficulty in adapting to the changes, as ICT is still not a part of her teaching practice. Children were observed watching YouTube videos and singing along with the number song. When it came to using the computer corner, it was found that Kaltham encouraged the children to use the computers collaboratively. Before the training programme, each child in her classroom should sit alone while using technology. However, after the intervention she allowed two children to sit together and encouraged them to work collaboratively while using the computers. Although observations revealed that she tried to implement ICT in her classroom, she seemed to lack the skills needed to implement ICTs appropriately. For instance, Kaltham used the classmate computers and asked two children to use them before passing them to another table. Those using classmate computers got lost and did not know what to do or how to get back to the programme the teacher had loaded for them.

Type of ICT Practices Implemented by Kindergarten Teachers

The second question of the study was to identify the type of ICT, ICT activities, and practices used by teachers. Before and after the implementation of the training programme, the teachers were asked about ICT tools, activities, and practices implemented during teaching and learning. Table 2 summarises the results.

The results shown in Table 2 reveal that teachers increased the number of different ICT tools and activities used after the implementation of the ICT training programme. Before the intervention programme, teachers would utilise computers, interactive whiteboard, data show,

Table 2 Type of ICT tools, activities, and practices implemented in teaching and learning

Teacher	Before intervention			After intervention		
	ICT tools	ICT activities	ICT practice	ICT tools	ICT activities	ICT practice
Alhanouf	Computer, interactive whiteboard	Songs, Arabic literacy, Arabic numeracy	Drill and practice, discussion	Computer, interactive whiteboard, digital camera, tablet, printer, talking pen	Songs, Arabic literacy, Arabic numeracy Outdoor activities, social studies, science, religion, E-stories	Discovery, discussion, role play
Lolwoah	Computers, television	Songs, English literacy, English numeracy	Drill and practice, modelling	Computer, tablets, technological toys, printer, data show, TV	Songs, English literacy, English numeracy, Science, E-stores, meantime	Discovery, cooperative work
Kaltham	Computers, data show	Music, English literacy, English numeracy	Drill and practice	Computer, data show, tablets, printer	Music, English literacy, English numeracy, science	Drill and practice, discussion, peer tutoring

and TVs. However, after the intervention programme, teachers started using different types of ICT while working with children, including digital cameras, tablet devices, talking pens, and technological toys. With regard to the ICT activities, the three teachers also increased the number of different ICT activities used in their classrooms to include more topics such as social studies, religion and stories. It was also interesting to note that one teacher used ICT in her outdoor activities, while another teacher implemented ICT during mealtime. In terms of the ICT practices used in the classrooms, the results demonstrated that some teachers replaced their existing strategies and instead implemented ICT activities, including more child-centred technology activities (e.g. discovery, cooperative work, peer tutoring, role play). There was also a balancing of teacher-facilitated activities with child-initiated activities.

The Main Obstacles Facing ICT Integration

The third question of the study was to explore the obstacles faced by teachers when integrating ICT into their teaching practices. The teachers were asked to indicate whether they consider each of the following to be major obstacles affecting ICT integration in their teaching practice before and after the training programme. The question was to be answered on a ten-point Likert ("low" = 0 to "high" = 10) scale. Figures 2 and 3 summarise this result.

Before the intervention, teachers rated the obstacles at high levels. For instance, lack of programmes, lack of

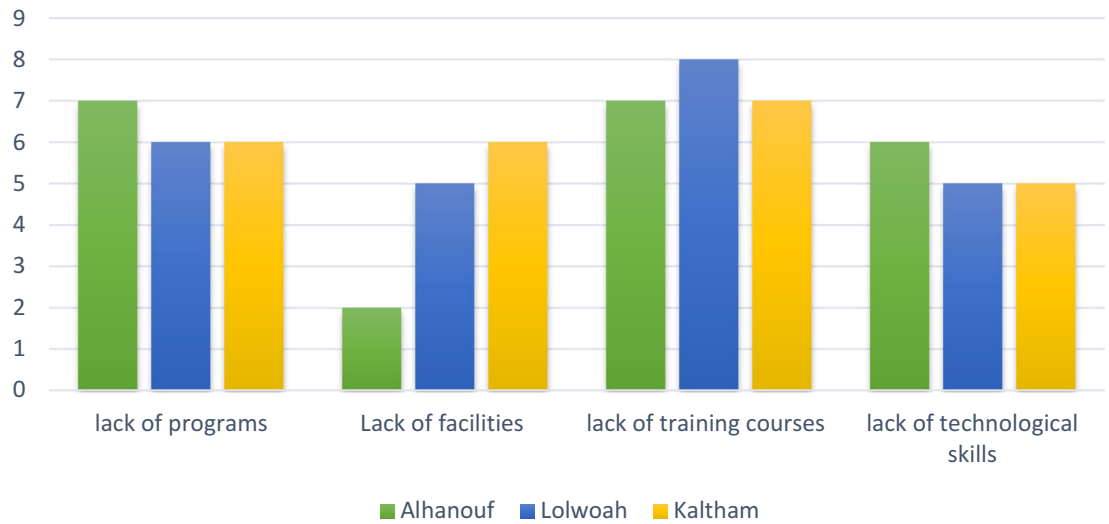

Fig. 2 Teachers' perspectives of the main ICT integration obstacles before the intervention

training courses, and technological skills were the main obstacles faced by the three teachers. As shown in Fig. 2, a "lack of training courses" was rated the highest (from 7 to 8 out of 10). This was followed by "lack of programmes" and "lack of technological skills", which were rated from 6 to 7 and 5 to 6, respectively. Last comes a "lack of facilities", which was rated from 2 to 6. Moreover, these obstacles were evidently observed prior to the implementation of the training, as teachers observed rarely integrate ICT into their teaching practices. In addition, teachers interviewed before the intervention training programme reported that ICT programmes and technological tools are not always available in their kindergartens. This is well illustrated in the following responses:

> Lolwoah: The problem for not implementing ICT here is that we do not really know how to integrate it in our classrooms effectively.
> Alhanouf: The curriculum we implement in our kindergarten does not require using technology in the classroom. In addition, we do not have ICT programmes in Arabic to support our work with children.

After the implementation of the training programme, teachers felt as though these obstacles presented a lower level of difficulty. As shown in Fig. 3, a "lack of technological skills" was rated the lowest (from 2 to 3 out of 10), followed by a "lack of training courses" which had rating from 3 to 3. Last comes "lack of programmes" and "lack of lack of facilities", which were rated from 2 to 4 and 2 to 6, respectively.

Moreover, teachers reported that they did not face challenges through ICT integration into teaching practices. Alhanouf stated:

> I realised how to use technology effectively. The training was helpful in determining how to find appropriate software application and make use of our existing ICT tools (e.g. printers, scanners, digital cameras) into our practices.

Results revealed that lack of facilities was viewed by one teacher (Kaltham) as a main problem even after the implementation of the training programme. Kaltham summed up this view by stating:

> The problem that I face is that my kindergarten is not equipped with technological tools. I found in this training programme many helpful insights on how to make ICT possible in our classrooms. Unfortunately, this could not work with me because of lack of facilities.

Discussion

Most of the general themes arising from recent research regarding the impact ICT integration into early years learning indicated that technology plays a crucial role in improving children's learning, abilities, and lives (Donohue 2015; Parette and Blum 2013; Puerling 2012; NAEYC & Fred Rogers Center 2012; Simon and Nemeth 2012). The responsibility of integrating ICT into early years learning falls on the shoulders of teachers. The aim of this study was to introduce an ICT training programme to explore its effects on teachers' perspectives and practice regarding the integration of ICT into early years education. Another goal was to identify the types of ICT practices implemented in early years settings. The study relied on a case study approach, and more specifically interviews with, and observation of, three kindergarten teachers who volunteered to participate in this study.

The Effect of the ICT Training Programme

The results indicated that, following the implementation of training workshops, kindergarten teachers became aware of the importance of ICT in their teaching practices. Their perspectives on the integration of ICT into their classroom activities partly changed. This result is due to the fact that the teachers, who had not previously attended ICT training programmes, were exposed to a training programme which offered helpful insights into the importance of ICT and its types and practices. This result is consistent with the work of many researchers who pointed out that teachers can adopt changes in their beliefs and practices if they receive ICT training, support, and resources (Donohue and Schomburg 2015; Puerling 2012; Simon and Nemeth 2012).

The results gleaned from the interviews and observations have established that the implementation of an ICT training programme offered the teachers an opportunity to improve their technological skills and integration practices, while also helping them to increase their knowledge of ICT's benefits for children. The reason for this progress is likely due to the fact that teachers were motivated to change their traditional teaching practices, as they found ICT beneficial for their practice. This training programme was based on ICT hands-on activities and developmentally appropriate practices in the field of early childhood technology (e.g. child-centred activities) (Simon and Nemeth 2012). These practices were research based and recommended by many early childhood technology researchers (e.g. Epstein 2013; Parette and Blum 2013; NAEYC & Fred Rogers Center 2012).

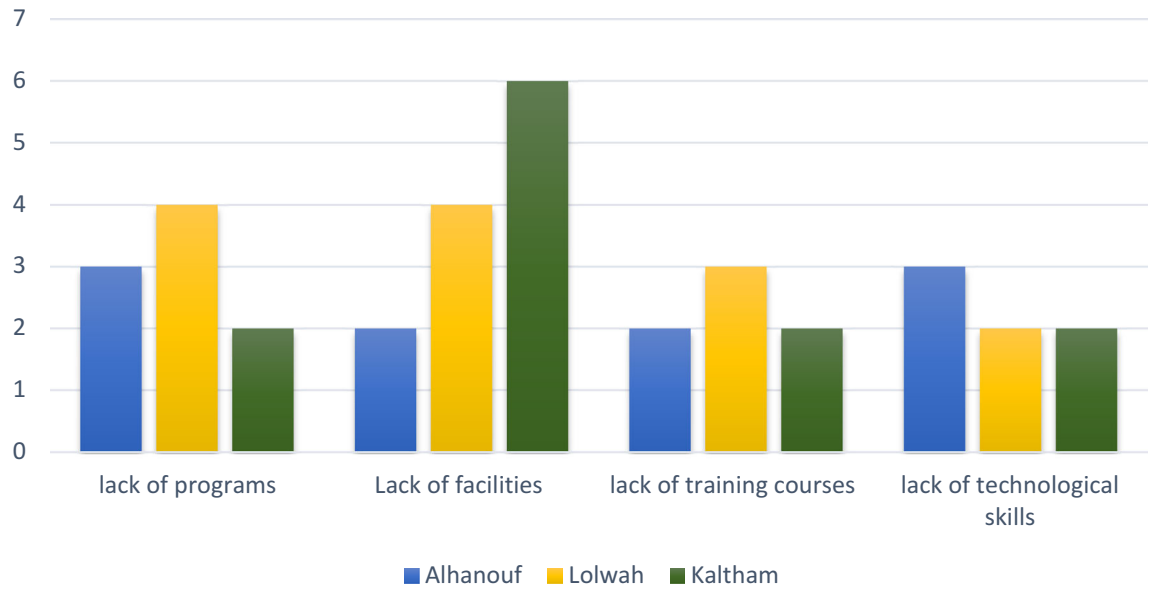

Fig. 3 Teachers' perspectives of the main ICT integration obstacles after the intervention

Type of ICT Practices Implemented by Kindergarten Teachers

The results indicated that the teachers employed various ICT tools and activities during their practices, including a diverse range of ICT devices, applications, and activities. Indeed, this is due to the fact that, prior to the training intervention, the teachers were unaware of ICT tools and how they work. For instance, teachers did not know that ICT could include printers, scanners, smart mobiles, etc. Technology tools must no longer be referred to as just computers (Simon and Nemeth 2012). After the intervention training programme, the teachers tried to use more devices and applied what they had learnt during training in their actual practices. The training programme was beneficial in terms of changing teachers' ICT practices. According to NAEYC & Fred Rogers Center (2012), good training programmes should provide teachers with knowledge, proficiency, and digital literacy grounded in the principles of developmentally appropriate practice.

The Main Obstacles Facing ICT Integration

The results demonstrated that the obstacles reported by teachers before the intervention training workshops were reduced in terms of level. This is a direct result of the training programme. The programme was helpful in overcoming barriers such as lack of technological skills and lack of training and facilities. This result is consistent with the work of Ihmeideh (2009), who indicated that in-service teacher training programmes are vital in terms of tackling barriers that hinder the implementation of technology in early years education. Against this background, teachers still face obstacles with regard to facilities, largely due to budget limitations and equipment issues. Although the training programme provides teachers with some suggestions regarding how to overcome obstacles related to facilities, the obstacle itself is out of teachers' hands, and support is needed from decision makers in the early years settings. This result is similar to the work of Nikolopoulou and Gialamas (2015) who found that lack of funding and technical support were the main barriers facing early childhood settings teachers when they attempted to use technology.

Conclusion and Implications

The results suggest that the training programme has an impact on teachers' perceptions and practices when it comes to the integration of ICT into learning experiences. The application of the training programme helped the teachers to develop an awareness of the value of ICT and its types. It also allowed them to increase the ICT activities implemented in their classroom, to improve the quality of their ICT practices, and to reduce the obstacles faced. Several conclusions and implications can be derived from this study. The most important conclusion is that teachers need to be supported and provided with adequate training courses/programmes, workshops, seminars, and step-by-step guidance on integrating ICT into learning experiences Indeed, this will provide them with opportunities to learn

about effective, appropriate, and intentional use of ICTs. These teacher preparation and professional development programmes should increase teachers' awareness of their critical role in integrating ICT into early years settings and mediating its use and impact.

More importantly, what this study shows is that there was an obvious improvement in teachers' performance following the implantation of the ICT integration programme. Policy makers at the Ministry of Education and Higher Education need to rethink its policies and strategies to extend ICT integration into classroom practice and to help teachers make informed decisions about how to support learning through ICT. This is not only important because of ICT's widespread use in our technological era, but also because of its effectiveness in the learning and teaching processes. This is an important step towards improving teachers' ICT practices. However, at this point, it is also vital to mention that this study does not suggest that ICT should be used throughout the classroom and throughout the day, nor should it be deemed as a replacement for the materials and activities used by teachers in their classroom practice. Instead, ICT should be considered as an addition to the full range of sensory experiences and choices that are already established in the classrooms (e.g. hands-on activities, blocks, manipulatives, and other materials).

Further studies are necessary to investigate the effectiveness of ICT integration programmes in aiding children's development and learning. Additional research must be conducted to determine principals', children's, and parents' perspectives on ICT integration into teaching practices. Moreover, another recommendation is flow-up research on the changes in perspectives and practices for teachers who have completed training programmes on ICT integration. Since this case study includes a small number of teachers, it would be difficult to generalise its results, as they clearly do not mirror the whole population of Qatari teachers. This is the only limitation of the present study. Thus, the present study may be replicated with a large population from different regions in Qatar and other countries. This study could be a guide for the international audience interested in the Qatar and Gulf States culture as a possible place for academic and educational endeavours. Finally, we hope that this study might provide valuable information for policy makers in the Ministry of Education and Higher Education regarding the integration of ICT into early years education, thus leading to its continuous improvement and development.

Acknowledgements This report was made possible by an Internal Grant # [QUUG-EDU-EDU-14/15-1] from the Office of Academic Research (OAR) at Qatar University. The statements made herein are solely the responsibility of the authors. We would like to thank the director of Erikson Institute's Technology in Early Childhood (TEC) Center, Chicago, Illinois, USA, Dr. Chip Donohue, and his team for assisting with preparation of the ICT training programme and instruments implemented in this study.

Appendix: Semi-Structured Interview Protocol

Do you use ICT in your kindergarten, school, or center?

☐ Yes ☐ No

Have you attended any in-service courses and/or training courses related to the implementation of ICT in early Years education?

☐ Yes ☐ No

Do you think using ICT in early years education is important for young children? And why?

Do you think that children are able to use technology and learn from it at this early stage?

What is your own understanding of integrating ICT into the process of learning and teaching?

What ICT tools, activities, and practices do you use in your teaching practices?

Can you tell me how you implement ICT in your teaching practices?

Through integrating technology into education, what are your main roles, and what are the child's roles?

Can you please indicate whether you consider each of the following to be major obstacles affecting ICT integration in your teaching practices?

- Lack of facilities
- Lack of programs
- Lack of training programs
- Lack of funds
- Lack of technological skills

In addition, please rate each of the above mentioned-obstacles from 0, indicating "low" to 10, indicating "high").

References

Amendum, S., Vernon-Feagans, L., & Ginsberg, M. (2011). The effectiveness of a technologically facilitated classroom-based early reading intervention: The targeted reading intervention. *Elementary School Journal, 112*(1), 107–131.

Anderson, R., Grant, M., & Speck, B. (2008). *Technology to teach literacy: A resource for K-8 teachers*. Upper Saddle River, NJ: Pearson/Prentice Hall.

British Educational Communications and Technology Agency (Becta). (2004). A review of the research literature on barriers to the uptake of ICT by teachers. Retrieved from http://www.becta.org.uk.

Berson, I., & Berson, M. (2010). *High-tech tots: Childhood in a digital world*. Charlotte, NC: Information Age Publishing.

Bingimlas, K. A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science & Technology Education, 5*(3), 235–245.

Donohue, C. (2015). Technology and digital media as tools for teaching and learning in the digital age. In C. Donohue (Ed.), *Technology and digital media in the early years: Tools for teaching and learning* (pp. 21–35). New York/Washington, DC: Routledge/NAEYC.

Donohue, C., & Schomburg, R. (2015). Teaching with technology: Preparing early childhood educators for the digital age. In C. Donohue (Ed.), *Technology and digital media in the early years: Tools for teaching and learning* (pp. 36–53). New York/Washington, DC: Routledge/NAEYC.

Downes, T. (2002). Children's and families' use of computers in Australian homes. *Contemporary Issues in Early Childhood, 3*(2), 182–196.

Epstein, A. S. (2013). Using technology appropriately in the preschool classroom. *Highscope*, *28*(1), 2–19. Retrieved from http://www.highscope.org/file/NewsandInformation/extensions/extensions/extvol28No1_low.pdf.

Ertmer, P., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education, 42*(3), 255–284.

Feagin, Joe R., Orum, Anthony M., & Sjoberg, Gideon (Eds.). (1991). *A case for the case study*. Chapel Hill, NC: The University of North Carolina Press.

Hendricks, C. (2009). *Improving schools through action research: A comprehensive guide for educators*. Upper Saddle River, NJ: Pearson.

Ihmeideh, F. (2009). Barriers to the use of technology in Jordanian pre-school settings. *Technology, Pedagogy and Education*, *18*(3), 325–341.

International Society for Technology in Education (ISTE). (2008). *The standards for teachers*. Washington, DC: ISTE.

Jackson, S. (2011). *Learning, digital media, and creative play in early childhood. Spotlight on digital media and learning* (blog), March 24. Chicago, IL: MacArthur Foundation. Retrieved from http://spotlight.macfound.org/featured-stories/entry/learning-digital-media-and-creative-play-in-earlychildhood.

Kerawalla, L., & Crook, C. (2010). Children's computer use at home and at school: context and continuity. *British Educational Research Journal, 28*(6), 751–771.

Lim, E. (2012). Patterns of kindergarten children's social interaction with peers in the computer area. *International Journal of Computer-Supported Collaborative Learning, 7*(3), 399–421.

Liu, X., & Pange, J. (2015). Early childhood teachers' perceived barriers to ICT integration in teaching: A survey study in Mainland China. *Journal of Computers in Education, 2*(1), 61–75.

Mutohar, A. (2012). *Identifying and bridging the gaps of ICT integration in primary and secondary education in Indonesia*. Unpublished M.A. Dissertation, The University of Texas at Austin, USA.

NAEYC & Fred Rogers Center for Early Learning and Children's Media. (2012). Technology and interactive media as tools in early childhood programs serving children from birth through age 8. Joint Position Statement. Washington, DC: NAEYC. www.naeyc. org/content/technology-and-young-children.

Nalugon, L., & Nuqui, A. (2015). Influence of information and communication technology utilization on teachers' performance: towards enhancing technology-driven schools. *Journal of Business & Management Studies, 1*(1), 1–9.

Nikolopoulou, K., & Gialamas, V. (2015). Barriers to the integration of computers in early childhood settings: Teachers' perceptions. *Education and Information Technologies., 20*(2), 285–301.

Nir-Gal, O., & Klein, P. (2004). Computers for cognitive development in early childhood: The teacher's role in the computer learning environment. *Information Technology in Childhood Education Annual, 16,* 97–119.

Parette, H., & Blum, C. (2013). *Instructional technology in early childhood: Teaching in the digital age*. Baltimore, MD: Brookes.

Parette, H. P., Peterson-Karlan, G. R., Blum, C. (2013). Integrating technology in early childhood classrooms. In H. P. Parette & C. Blum (Eds.), *Instructional technology in early childhood: Teaching in the digital age* (pp. 29–50). Baltimore, MD: Brookes.

Patton, M. (2002). *Qualitative evaluation and research methods*. Thousands Oak, CA: Sage.

Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers & Education, 37*(2), 163–178.

Plowman, L., & Stephen, C. (2005). Children, play, and computers in pre-school education. *British Journal of Educational Technology, 36*(2), 145–157.

Puerling, B. (2012). *Teaching in the digital age: Smart tools for age 3 to grade 3*. St. Paul, MN: Redleaf.

Roscorla, T. (2013). *How to prepare teachers for digital education* [Web log post]. Retrieved from http://www.centerdigitaled.com/news/How-to-Prepare-Teachers-for-Digital-Education.html.

Simon, F., & Nemeth, K. (2012). *Digital decisions: Choosing the right technology tools for early childhood education*. Lewisville, N.C: Gryphon House.

Simpson, M., & Tuson, J. (1995). *Using observations in small-scale research: A beginner's guide*. Edinburgh: The Scottish Council for Research in Education.

Supreme Education Council (SEC). (2009). *The Early childhood good practices*. Doha: SEC.

The Qatar General Secretariat for Development Planning. (2011). *Qatar national development strategy 2011–2016*. Doha: Gulf Publishing and Printing Company.

Turbill, J. (2001). A researcher goes to school: Using technology in the kindergarten literacy curriculum. *Journal of Early Childhood Literacy, 1*(3), 255–279.

Umar, I., & Abu Hassan, A. (2015). Malaysian teachers' levels of ICT integration and its perceived impact on teaching and learning. *Procedia—Social and Behavioral Sciences, 197*(25), 2015–2021.

Waitayangkoo. (2009). *ICT professional development of teachers in Thailand: The lead-teacher model*. Bangkok: ICT in Education, UNESCO.