

Early childhood development teachers' perceptions on the use of technology in teaching young children



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Background: Although technology plays a significant role in the development and learning of young children, early childhood development (ECD) practitioners are often under-informed and lack confidence in using information and communications technology (ICT).

Aim: Understanding ECD teachers' acceptance of technology usage is crucial to the implementation and integration of ICT resources. This study examines the perceptions of ECD teachers regarding the use of technology in South Africa's early childhood classrooms.

Setting: A sample of eight Grade R teachers was conveniently and purposefully selected from inner-city ECD centres in Pretoria, South Africa.

Methods: A qualitative research methodology was used. Data were collected by using semi-structured interviews and classroom observation. This study is grounded in the extended technology acceptance model.

Results: It was found that the teachers understood the advantage of technology incorporation in early childhood education and also have a positive mind-set about the use of ICT in teaching and learning in early years. However, the acceptance level of ICT use by these teachers appear to be low because of barriers such as poor parental and school support towards technology use, lack of technological resources, teachers' poor knowledge and lack of practical training on the use of developmentally appropriate technology for children as claimed by the teachers.

Conclusion: Despite this positive belief and attitude towards ICT use for supporting playful learning and child's development in young children outside the classroom, teachers are less inclined to using ICT in teaching and play activities in their classrooms.

Keywords: science; technology and mathematics (STEM); ECD teachers; young children; information and communications technology (ICT).

Introduction

The increased rate at which technology has become ubiquitous in many aspects of our daily existence has brought an enormous shift in the way an individual learns. Education sectors across the globe, particularly in developing countries such as South Africa, are increasingly emphasising the importance of developing children's digital literacy as a crucial 21st-century skill required in the current and future digitised world. According to the Institute of Medicine and National Research Council (2015), human development makes us realise that learning begins in children from birth. This implies that events in early childhood play a critical role in shaping the educational outcome for the duration of a child's life. In the light of this, early childhood education (ECE) is regarded as the critical stage where young children obtain the advanced mental, moral, physical, social, communication, emotional, spiritual and human capital development needed before entering into primary school (Atmore 2019; Republic of South Africa 2015).

However, young children in South Africa continue to face many challenges and barriers to quality ECE because of issues such as poverty and inequality that appear to lower a child's level of educational attainment (Atmore 2019; Atmore, Van Niekerk & Ashley-Cooper 2012; Mbarathi, Mthembu, & Diga 2016). This leads to a child's lack of preparation for formal schooling at the foundation phase level. The form and essence of this lack of preparation are brought to sharp relief by the poor performance and low competence level of learners in science, mathematics and language in the foundation phase (Human, Van der Walt & Posthuma 2015). The achievement scores of South African learners in science and mathematics at national and international studies indicate the need to optimise the potential of technology to develop students' understanding,

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stimulate their interest and increase their competency in mathematics, science and language in the early years (Visser, Juan & Hannan 2019).

The need for enhancing teacher's use of technology in teaching young children is faced with many noticeable challenges of integrating educational technology at the classroom level despite positive gains (Johnson et al. 2016). According to the findings of Miller (2018), use of interactive technology in the form of educational apps as part of play-based learning experience with kindergarten children improves their ability to create abstract ideas and helps enhance the development of inquiry practice and language abilities. The use of technology in education continues to provide better opportunities for improving children's cognitive development and active participation in play and school activities required for the development of fundamental 21st-century skills (Hsin, Li & Tsai 2014; Miller 2018; Yelland 2011). Although playtime practices and physical objects are crucial in the cognitive development of a child, staying abreast with current technology is also often seen as an important element in today's digital literacy (Yelland 2011). Young children are known to become naturally curious about everything as they try to find out how things work around them. Consequently, through studying issues around them and learning how to solve problems, young children grow as learners.

The use of numerous technical tools, including software and interactive media, creates additional capacity for early childhood teachers to maximise opportunities for developing cognitive, behavioural, cultural, physical and emotional growth of young children as they learn about the world around them (Bolstad 2004). However, in the context of this study, the term 'young children' is synonymous with children aged from zero to 6 years and in particular references the 'dearth of research into the digital play experiences of children aged 0–5 years' (Plowman, McPake & Stephen 2008). Information and communication technology (ICT) includes various mobile and desktop systems, as well as interactive toys (O'Hara 2011), and world wide web-enabled technology that act as outlets for the consumption on interactive media and related popular culture by young children (Gutnick et al. 2011).

Following the Department of Basic Education Policy dialogue (2014) on the implementation and incorporation of ICT resources in every school in South Africa (Department of Telecommunications and Postal Services 2016), there are still major problems regarding early childhood development (ECD) teachers' experiences on the use of ICT tools such as the level of technical knowledge, availability of software, implementation of curriculum, administration and infrastructures that could impede the realisation of the possible use of ICT (Meyer & Gent 2016). Nevertheless, given the comprehensive literature relating to the use of ICT in education, it is evident that few studies (Liu, Toki & Pange 2014; Masoumi 2015; Yurt & Cevher-Kalburan 2011) focussed on evaluating the behaviour of ECD teachers towards the use

of ICT in teaching and learning in the early years. Despite advances in technological devices, most ECD centres still perceive the use of ICT to be designed strictly for administrative and management purposes (Al Rub 2015; Palaologou 2016). Thus, research affirms the insufficient incorporation of technology into the delivery of early childhood curricula (Edwards 2013; Parette, Quesenberry & Blum 2010). Poor or no inclusion of ICT into early childhood curricula may be caused by ECD teachers' assumptions regarding the usage of technology in teaching young children. There is, therefore, a need to investigate how ECD teachers perceive the use of new technology in teaching young children. Thus, this study focusses on achieving the following objectives:

- Determine the perceptions of ECD teachers on the use of technology in teaching young children.
- Identify ECD teachers' attitude and behaviours towards the use of technology in teaching young children.
- Detect factors hindering the usage of technology in teaching and learning in the early years.

The researchers were therefore motivated by the following research questions:

- What are the perceived beliefs of ECD teachers regarding the use of technology in teaching young children?
- What attitudes and behaviours do ECD teachers display towards the use of technology in teaching young children?
- What barriers do ECD teachers perceive as obstacles that prevent them from using technology in teaching young children?

Literature review

Information and communications technology in the early years

The use of ICT in early learning offers opportunities for metacognition and creative development with young children and provides supports to improve the learning and play experience of children (Fleer 2004; Howard, Miles, & Rees-Davies 2012). In addition, Berris and Miller (2011) claim that using ICT in early childhood classroom helps to improve children's self-directed learning, self-esteem and their fine and motor skills. Studies also indicate that using digital tools in ECE reinforces professional learning and development of practitioners, as well as relationships and collaboration between early childhood centres, parents and important stakeholders linked to ECE (Bolstad 2004; Howard et al. 2012). According to Gjelaj et al. (2020), the proper and effective integration of digital technologies in early childhood classroom can empower children by granting them a voice they have never had before. This implies that the use of ICT tools also open new pathways for alternative social interactions and change the learning relationships between children and teachers (Luna Scott 2015).

The use of technology in ECE is regulated in Europe, by using the structure of Developmental Appropriateness of

Technology in Early childhood (Siraj-Blatchford & Siraj-Blatchford 2006; Siraj-Blatchford & Whitebread 2003). This structure sets out nine parameters to assess the suitability and practice of technological devices in early childhood. Thus, using technology in early childhood settings is expected to be educational, stimulating and focussed on encouraging teamwork. It must also foster inclusion, support play-based pedagogy, hold the child in charge, be straightforward and informative, avoid aggression or stereotyping, encourage parental participation, improve knowledge and safety concerns, and develop awareness and safety issues (Siraj-Blatchford & Siraj-Blatchford 2006; Siraj-Blatchford & Whitebread 2003). For example, research acknowledges the use of digital stories in creating interactive lessons and improving children's motivation, engagement, attitudes, attention and language skills during language lessons (Girmen & Kaya 2019). However, there are various concerns surrounding the nature and nurture of technology that children are exposed to in society. In this regard, studies suggest that children younger than the age of two should not have screen time because of smartphone addictions, children between the ages of two and five should spend up to an hour daily and children over the age of five should spend about 1–2 h daily on digital devices (American Academy of Paediatrics 2001; Australian Department of Health 2014; Lauricella, Wartella & Rideout 2015). Conversely, research reports that pre-schoolers exceed these suggested screen time regulations, particularly because of the invention of touchscreen tablets (Neumann 2015). Thus, the successful adoption and utility of ICT in ECE are expected to be guided by the goals and requirements specified by the Department of Basic Education and Social Development as well as 21st-century learning outcomes for young children.

Integration of information and communications technology in early childhood education

Technology is now considered a major force of change that has allowed children to be connected to the world of internet, social media and the use of digital devices at a very young age. Thus, the increasing use of digital devices by young children implies that careful consideration must be given to the issue of integrating technology in ECE, as tablets and touchscreens are becoming more economically affordable and easily accessible (George 2014; Rideout & Katz 2016). In this regard Berris and Miller (2011) claim that most parents and educators seem to recognise the importance of technology in educating young children. Although teachers view technology as an inevitable part of learning for children, some of them still disagree about the use of technology in preschools because they want children to play predominately outside (Berris & Miller 2011). Nevertheless, research emphasises the increasing importance of introducing and using technology in early childhood learning environment, especially for children who have little or no access to technology at home (O'Rourke et al. 2004). Thus, the success and failure of integrating technology into ECE depend mainly on the teachers (Al Rub 2015).

According to Edwards (2013), there are various reasons for not integrating ICT into early childhood curricula. Most of the time, the reasons are attributed to teachers' inadequate knowledge about how to use technology with young children (Chen & Chang 2006). However, occasionally, there is an argument on whether technologies are appropriate or not in ECE (House 2012). It is therefore required that ECD teachers need to know how to use technology in teaching young children to enhance child development and growth holistically (Mohammad & Mohammad 2012). Although simply presenting ICT in education is not enough, ECD teachers must be capable and educated to suitably integrate ICT into their education practices (Koehler, Mishra & Cain 2013).

Barriers to using information and communications technology in teaching young children

Research claims that many ECE teachers struggle with adapting to modern and innovative pedagogical approaches because of their inherent convictions and beliefs (Peterson et al. 2018). In this light, the literature indicates that the incorporation of technology into teaching and learning is usually influenced by the perceptions and technological abilities of teachers (Hew & Brush 2007; Pelgrum 2001). Although teachers' beliefs often impede their practical use of ICT in the classroom (Al Rub 2015; Pelgrum 2001), teachers' convictions about the importance of ICT are relevant in pedagogical reasoning for teachers (Harris et al. 2017; Webb & Cox 2004). Although the integration of ICT into ECE is increasingly gaining significance because of its potential to support early learning and development, many teachers tend to struggle to incorporate technology into their classroom practice (Ihmeideh 2009; Nikolopoulou & Gialamas 2015). Therefore, it is argued that when teachers consider emerging technologies as not useful for teaching, learning and/or playing in a preschool environment, they become reluctant and/or unable to meaningfully use ICT for effective learning and play in early years (Nikolopoulou & Gialamas 2015).

There are various other reasons for the lack of usage of ICT in the ECE, such as culture, government policies, funding, inequalities and lack of adult guidance. For example, research indicates that if adult supervision is lacking when a young child uses digital devices, the child can become addicted and may require therapy (Ward 2013). This was also noted in the Healthy Active Kids South Africa report (Draper et al. 2014), which revealed that South African children are less involved in physical activities because of the number of hours they spend in front of screens. This implies that children's uncontrolled access to technological resources might be one of the factors limiting ICT use in South African schools with ECD centres. However, it is argued that many children do not have access or exposure to digital technologies because of inequality, poverty, cultural and economic limitations (Edwards 2013). Thus, the judicious use of developmentally appropriate technologies in early years becomes important in providing opportunities for children to understand how to

effectively use and engage in the teaching and learning process with emerging technologies. In addition, using ICT in early childhood classroom provides teachers with opportunities to learn and explore new ways of teaching young children, as well as stimulate teachers' view about learning and development of young children.

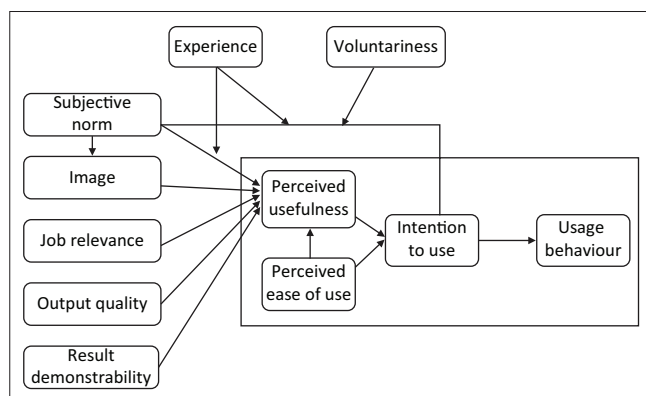
Theoretical framework

There is a growing recognition of ICT usage as an indispensable resource for improving the quality of education in South Africa. However, understanding ECD teachers' beliefs, capabilities and behavioural intentions towards ICT use becomes essential in promoting quality ECD programmes in South Africa. This study is grounded in the extended technology acceptance model (TAM) as depicted in Figure 1 (Venkatesh & Davis 2000).

The extended Technology Acceptance Model (TAM 2) was a modification of Davis' (1989) TAM model. According to Venkatesh and Davis (2000), TAM claims:

[T]hat an individual's behavioural intention to use a system is determined by two beliefs: perceived usefulness, defined as the extent to which a person believes that using the system will enhance his or her job performance, and perceived ease of use, defined as the extent to which a person believes that using the system will be free of effort. (p. 187)

However, it is believed that an individual's action is a result of premeditated behaviour informed by factors such as cognitive reflections, norms, attitudes and beliefs (Argyris & Schön 1997). This could imply that the attitude of the user highly determines the purpose of using technology. Research has also shown that the attitude of teachers towards technology affects their utility and incorporation of technology as a pedagogical tool in the early years (Baş, Kubiak & Sünbül 2016). In this regard, TAM 2 posits the possibility of determining external factors such as social influence, users' compliance, subjective norms, experience, voluntariness, image, job relevance, output quality and result demonstrability, on teachers' presumed utility, attitudes, beliefs and apparent ease of ICT use in early years.



Source: Venkatesh, V. & Davis, F.D., 2000, 'A theoretical extension of the technology acceptance model: Four longitudinal field studies', *Management Science* 46(2), 186–204. <https://doi.org/10.1287/mnsc.46.2.186.11926>.

FIGURE 1: Extended technology acceptance model.

In the context of this study, the behavioural purpose of technology use in ECE is discussed based on ECD teachers' state of mind towards using ICT for teaching and learning in early years, and how much they trust that using ICT will improve the quality of their work or the education received by young children. Besides, TAM 2 is used to provide a better understanding of factors that impact teachers' utility of technology in the early years of teaching young children. This would enable the various stakeholders to develop organisational strategies and structures that would improve the use of ICT in delivering quality ECE within the South African context.

Method

This study employed a qualitative research approach to address the research questions within the context of an interpretive model (Merriam & Tisdell 2015). A qualitative research approach has been chosen because the study's purpose has been to provide in-depth knowledge and rich explanations of ECD teachers' perceptions about the usage of technology in teaching young children in selected South African inner-city schools. Data collection techniques such as the individual semi-structured interviews and non-participant observation (see Appendix 1) were used to elicit relevant information from the participants about their perceptions on the use of ICT. Purposive sampling techniques were used to select four centres, and two ECD teachers from each selected centre were interviewed. These centres are expected to be located in the inner-city of Pretoria, registered with the South African government, and must have been in existence for minimum of 5 years. The teachers were also expected to have a minimum of 2 years' experience as an early childhood educator. The biographical information of the selected participants is reflected in Table 1. The playrooms of the centres were observed. The data were analysed by using content analysis.

Results and discussions

Findings from classroom observations were integrated with findings from teachers' interviews into a coherent whole. The interview data explained some of the findings that emerged from the classroom observation analysis. These findings are categorised in terms of three predetermined themes which are teacher's beliefs, attitudes and practice, and barriers to using ICT in early years' classrooms.

TABLE 1: Biographic information of participants.

Teacher (pseudonyms)	Age	Qualification	Years of teaching experience
Happy	43	Diploma in Human Resources Management	9
Halim	35	National Diploma in Educare (N4)	6
Fadwa	27	National Diploma in Educare (N6)	3
Kabelo	23	Bachelor of Education (Early Childhood Development)	2
Sinatu	32	Diploma in Grade R teaching	9
Numbelo	42	National certificate	6
Eva	53	National Diploma in Educare (N6)	20
Jaeger	60	Diploma in Primary Education	25

Beliefs concerning the use of technology in the early years

Data obtained in this study showed that sampled ECD teachers had a favourable view towards ICT usage in the early years' classroom. For example, teachers Halim and Happy indicated during the interview that using technology in early childhood classroom helps to promote a child's learning progress and makes learning more visible to the children. Teachers in this study further remarked that ICT usage in early years' classroom makes learning fun. Consequently, they view the use of ICT in classrooms as a significant tool in enhancing children's literacy skills. These notions are revealed in the following interview excerpts where teachers expressed their beliefs.

'Let's just say; it tends to guide them in knowing somethings. You know it provides different ways of learning, enhances their digital literacy abilities as well. It also enhances their ability to talk (singing), sound pronunciation and collaboration. More importantly is that it helps them to explore better ideas on what they and the teacher already know.' (Participant 3, Teacher, 07 February 2020)

'It helps them to easily know and pronounce for instance phonic sounds because they are listening to it and can pronounce it correctly unlike maybe when the teacher is doing them wrongly... So it becomes easy for them. Listening to audios also helps them to develop their language skills. I also believe using technology for these small children is good because teaching is boring when all you do is talk ... talk ... and talk. But sometimes when you engage these children in using videos or sounds, you realise it makes them engage and active in the classroom.' (Participant 8, teacher, 05 February 2020)

Furthermore, a favourable belief towards ICT usage in early years was revealed when participant 7 aptly expressed that:

'It is very important to start using ICT for teaching and learning in early years because we live in an era where technology is everything and these children are exposed to all sorts of technology. So as a school and a teacher, it is better to teach them the positive aspect of how technology is effective for their lives before they start getting a wrong idea of negative things that people are using technology to do.' (Participant 7, teacher, 05 February 2020)

This remark revealed that Eva could also be concerned about how commercial contents displayed on technologies influence young children negatively. These comments reflect how ECD teachers' beliefs relate to the importance and successful incorporation of technology use in the early years classroom, supporting the findings of Al Rub (2015) and Miller (2018).

Contrary to these positive beliefs, two of the teachers indicated that ICT usage in early childhood serves as a distraction. For instance, participant 6 indicated that:

'The screen is not good for the kids and besides most of what children do for instance reading and spellings on the screen is not in any way different from what teachers do in the class with them.' (Participant 6, teacher, 22 January 2020.)

Participant 5's views also coincide with participant 6's conviction that the use of ICT in early years interferes with

the quality of learning for a child. This was confirmed when she said:

'For young children, I see that they learn more one on one with a teacher. Now using technology ... I believe the children will zoom out at some point because all they will be doing is just staring at the screen and definitely, they will not learn anything. Another problem is when using technology to teach, such technology cannot identify or know if a child is having a problem or not ... but if it's a one on one thing with the teacher, he/she can see if a child needs help or not. So I don't support the use of technology for young children.' (Participant 5, teacher, 22 January 2020)

These findings also support the notion that the use of extraneous digital tools for young children distracts their attention from learning and also interferes with their comprehension (Radesky, Schumacher & Zuckerman 2015). However, further elaboration from these two teachers revealed that their teaching experience and school management influenced their beliefs on the negative impact of ICT usage in the early years. This was observed during the interview when participant 5 stated that:

'It was the principal that first informed us that using technology all the time will make them loose focus on the desired learning content, and, I started to realise that anytime we use technology in classroom, the children become more playful than usual.' (Participant 5, teacher, 22 January 2020)

In addition, the school management did not support any use of technology for teaching as the school's principal mentioned that getting any computer activities in the school is very difficult because it is unsafe, puts the children at risk and also costly for parents. Thus, the beliefs of teachers about using ICT with young children as presented in this study may probably characterise the nature of the attitude that is thought to instigate teacher's practices in young children's classrooms.

Attitudes and practices of teachers about information and communications technology usage in early years' classrooms

During the interview, teachers indicated that despite the positive belief towards ICT usage in early years, teachers are less inclined to enact ICT in their lessons, play or classrooms. For instance, the findings reveal that some of the teachers use their smartphones in preparing their lessons:

'Yes, I sometimes use my phone to plan my lessons. Maybe if I don't know the activities I want to do. I Google ideas or activities related to themes I am supposed to teach.' (Participant 4, teacher, 07 February 2020)

'I Google because the theme I teach usually goes with a song. I go online to look for songs that go with the theme I am teaching. I also go to the Internet café to print out pictures relating to the theme I am teaching and sometimes I use magazines to further enhance their understanding of key ideas I want to teach.' (Participant 3, teacher, 07 February 2020)

'I use my phone to check for information regarding the theme I want to teach, especially in cases where I don't have any material to use when I turn to Google for help. For example, whenever I teach phonics, I use the phone and/or laptop to download videos and audios that I use to teach them the sounds and each

TABLE 2: Types of information and communications technology tools used in early years' classrooms as reported in this study.

Technology	Number of teachers who use
Laptop	1
Computer	4
Television	5
Smartphones	5
Smart toys	4
Mp3 and CD player	3

time I play it for them, I see that they actively engage in the lesson.' (Participant 8, teacher, 05 February 2020)

Further to this, analysis of interview data and classroom observation reveals that participants who plan their lessons by using technology have a positive attitude towards using ICT tools such as smart toys, laptops, smartphones, computers, television, mp3 and compact disc (CD) players to enhance classroom pedagogy in early years as shown in Table 2.

The results illustrated in Table 2 indicated that five of the teachers use television and smartphones as ICT tools for teaching young children in early childhood classroom, four use computers and smart toys, three use Mp3 and CD players and laptop is used by one of the teacher.

Findings reveal that most of the teachers have easy access to ICT tools like smartphones, and they perceive their smartphones to be very easy to use for sourcing of information, as well as enhancing their teaching practice through planning, organising and effective communication of lesson content to children. For instance, this was observed during the interview when participant stated that:

'I find it very easy to use my smartphone since I can easily download any educational application or video or even sometimes Google for anything, I want to teach the children.' (Participant 3, teacher, 07 February 2020)

'Using my tablet phone has been very easy and helpful for me as a person. For example, I sometimes use this Bible application for kids in my class whenever I want to tell the children stories about morals and Bible characters. I allow them to sit in a circle on the floor then I place my tablet phone in the middle, so I connect the phone to a loud speaker device using Bluetooth so that everybody can listen to the story as they watch the video being displayed on the tablet. Then after listening story, I try to ask them one or two questions just to know if they were following the story and if they learnt anything from it.' (Participant 8, teacher, 05 February 2020)

This implies that teachers' attitude or behavioural intention to use certain kind of technology in the classroom is influenced or facilitated by their perceived ease of use of that specific technology, as discussed in the theoretical framework.

However, it was observed that available technologies such as television, media players and computers were positioned in a specific classroom in each of the schools, and teachers had to take their children to this particular classroom whenever they wanted to use the computer, media players or television. Thus, the time allotted to children in using these technologies

was monitored and managed by the teachers. It was found in this study that the teachers who enacted technologies for teaching and learning allowed the children to use such technologies once a week, particularly every Friday for a maximum period of about 30 min. This was also affirmed during the interview:

'There is a daily programme, so you don't use technology throughout the whole day. Technology is only used when teaching a specific concept and all focus or attention must be on that concept for the allocated time after which you stop using it. So basically, we use it within 30 minutes a week.' (Participant 1, teacher, 23 January 2020)

'For me, I use it when necessary, though not all the time ooo. I can say may be like 30 minutes every Friday.' (Participant 8, teacher, 05 February 2020)

'Based on the school's guideline, I allow the children to watch TV [television] and play with the available toys only on Friday afternoon. So you realise that they end up spending about 30 minutes or so using these tools before their parents or guardians come for them.' (Participant 4, teacher, 07 February 2020)

Furthermore, findings revealed that some of the teachers reduce screen time for children because of their years of teaching experience. This was noted when a teacher explained:

'Here, we use TV [television] like may be during the holidays where we have a holiday programme we do like a movie and we do that for just like about twenty to thirty minutes because we have observed that children can't seat for too long and like to be running around, so watching TV becomes quite boring for them. So it doesn't really work to have a TV or all these digital technologies in the crèche.' (Participant 5, teacher, 22 January 2020)

This shows that despite teachers' positive belief towards using technology in teaching young children, teachers are less inclined to enact ICT in their lessons, play or classrooms, suggesting that there is less exposure to technology use in educating young children (Lauricella et al. 2015). Although some of the teachers indicated during the interview that their place of work does not allow teachers to use phones during school hours, the findings from the observed lesson revealed how teachers use their smartphones to display pictures and rhymes for children during their lesson presentations. Teachers were also observed engaging children in using smart toys like building blocks and imaginative play toys with sounds to inspire creativity, critical thinking and coding abilities in young children during play-based activities.

Barriers influencing teachers' implementation of information and communications technology in early years

Despite participants' positive attitudes and beliefs about the use of ICT resources in teaching and learning, the findings revealed that teachers face many barriers in using these tools in teaching young children. Analysis of classroom observation revealed a lack of resources as one of the difficulties preventing ECD teachers from using technology in teaching young children. This was also evident in the interview responses of

participants as they described the obstacles that hindered the usage of technology in teaching children in the centres:

'The problem is I do not have enough training on how to use or assess appropriate technology for children of their age, plus we have problems with lack of resources in this school.' (Participant 3, teacher, 07 February 2020)

'The school is not providing ... so there is nothing we can do about it. Also, they need to show us how to use these new technologies to teach effectively. We need orientation.' (Participant 8, teacher, 05 February 2020)

'We do not have enough technological resources in this school, and there are no supports that I know of except that I involve myself in many readings related to the use of technology in teaching.' (Participant 4, teacher, 07 February 2020)

'Not all parents have the money to pay for teaching the children technology, i.e. not all parents are in support of using technology in school. We as a school also don't have the resources (technology) to teach with any kind of technology and the school also did not imbibe it as something compulsory. And if I may say, even the teachers are not adequately trained. We are not exposed to any kind of professional development programme here in the school, and we seriously need it as educators.' (Participant 7, teacher, 05 February 2020)

Moreover, evidence from the interview revealed that participants also expressed their discontent with poor parental and school support, lack of knowledge and professional training on how to use technology in teaching young children. The issue of knowledge and training was further emphasised when Halim indicated that:

'the major problem that hinders the use of technology in early childhood is that most of us teachers don't know how to use the technology for effective and developmentally appropriate teaching. So what most ECD centres do is that they invite an expert who comes to their school to do these computer classes for the children. And I feel that will not motivate teachers to learn how to effectively use technology with young children.' (Participant 2, teacher, 23 January 2020)

Teachers also feel that they are always unable to cover planned lessons when using technology. This is evident in the following interview excerpt:

'Sometimes when I start using the phone or computer to teach the children, I tend not to finish my work because in using technology I have to work with the children in groups so I realise that I don't finish teaching what I have planned to do with the whole class ... so some of them might go home without any knowledge ... then I have to start again the following day. So sometimes, using technology in class slows down my teaching.' (Participant 1, teacher, 23 January 2020)

Participants' response imply that implementing ICT in early childhood classrooms is limited by teachers' beliefs related to their didactical and pedagogical and children's developmental factors, as reiterated by Magen-Nagar and Firstater (2019). The findings from this study align to some extent with the extended TAM used as a theoretical guide to comprehend the beliefs, attitudes and external factors influencing teachers' intention and actual use of technology in teaching young children.

Recommendations and conclusion

With today's frequent use of ICT among children of all age groups and the uprisings advancement of ICT practices in education, the implementation of ICT to support teaching, learning and other cognitive activities, as well as the development of children's literacy skills, becomes very important in promoting quality ECE in registered ECD centres within the South African context. This study contributes to the knowledge base research in understanding issues that control teachers' intentions to use ICT in teaching and learning, and how to evaluate the effectiveness of implementing ICT to promote quality ECE in South Africa. The results reveal how teachers' beliefs regarding ICT use for children and their perceived ease of use of accessible ICT tools greatly influenced their attitude in terms of behavioural intention and actual ICT usage in ECE. The findings revealed that technology usage for teaching young children in the sampled schools was strictly monitored by the ECD teachers and limited to a maximum of 30 min per week. However, it was also found that the teachers' lack of technology-based pedagogical knowledge, limited technology resources in the workplace, as well as the lack of parental support and school policy, were major barriers to teachers' active use of technology in teaching young children. In the light of this, the identified barriers could hinder the promotion of children's digital literacy skills in early childhood classroom.

It is therefore recommended that training support and pedagogical orientation should be provided for early childhood teachers to enable them to address constraining factors influencing the effective integration of ICT use in teaching and learning in early years. In addition, Universities and colleges offering ECE qualification should include modules on the development and integration of digital tools for grade R classes and ECE groups. Policymakers, school governing body and parents should be actively involved in the provision of ICT tools and maintenance of organisational structures that support teachers' use of ICT in ECE. This will contribute to the development of young children's basic ICT knowledge and literacy (reading, writing, numeracy, science and digital) skills, enabling South African children to model their literacy skills at a very young age and develop a strong positive attitude towards technology use as they progress to become digitally literate.

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Authors' contributions

A.A.O. conceived the study and suggested the concept. A.A.O. and A.A. developed the protocol and performed the data collection. A.A. assisted with the protocol submission and attended to the literature review of the article. A.A.O. performed data analysis and assisted with the interpretation. Both authors contributed to the Introduction, Discussion and concluding sections.

Ethical consideration

The authors confirm that permission to conduct this study was first obtained from the school principals and informed consent was then sought from participating teachers.

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Data availability

Data sharing is not applicable to this article as this was not negotiated in the informed consent and permission to conduct the study.

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Appendix 1

Interview schedule

Bio data information

Age –

Qualification –

Years of experience in early childhood sector –

Gender –

1. What do you understand as ICT?
2. What is your opinion regarding the use of ICT in teaching and learning in the early years?
3. Describe the ICT equipment available for teaching and learning in your school?
4. Explain how you use ICT tools (like phones, tablets, desktop, television and smart board) in teaching and learning in your school?
5. Do you use technology in preparing your lesson plan, if yes how? Explain how you use technology in preparing your lessons.
6. Describe the benefits of integrating use of ICT in teaching and learning in the early years?
7. Explain the challenges that hinder the use of ICT in teaching and learning in the early years?
8. What are the support system (training) available for the use of ICT in teaching and learning in the early years?
9. How frequent do you use ICT equipment in teaching and learning young children in your school?

Non-participant observation schedule

The following questions will be used as a guide when observing the participated centres so that I do not deviate from the focus of the study:

1. What ICT learning instruments or materials are available for the young children in the classroom? -----

2. How developmentally and age appropriate are the available ICT equipment used? -----

3. What conditions are the ICT equipment? -----

4. How do teachers used ICT equipment in teaching young children? -----

5. What strategies do teachers employ in using ICT to teach young children? -----

6. Does the technology employed support play-based learning? -----

NB: Take pictures of available ICT resources and usage by teachers if present.