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A Qualitative Inquiry into ICT Use for Early Numeracy Development Among Children in TASKA in Kempas Indah, Johor Bahru

(Satu Kajian Kualitatif tentang Penggunaan ICT dalam Perkembangan Numerasi Awal dalam Kalangan Kanak-Kanak di TASKA di Kempas Indah, Johor Bahru)

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ABSTRACT

ICT has the ability to assist young children in their early numeracy learning by means of interactive and engaging learning activities. Yet, there has been only limited research carried out on how ICT is used to support early numeracy development among children aged 0 to 4 years in TASKA settings. The purpose of this study was to investigate the views of early childhood teachers regarding the use of ICT in promoting early numeracy development among children in TASKA and to determine the difficulties they encountered when incorporating ICT into their early numeracy teaching. A qualitative case study approach was used in a TASKA situated in Kempas Indah, Johor Bahru, Johor, Malaysia. The group being studied consisted of TASKA teachers who work with children from 0 to 4 years of age, and four teachers were selected on the basis of specific inclusion criteria. Data were gathered through face-to-face, semi-structured individual interviews using an interview guide that included 15 open-ended questions. Each interview lasted about 15 to 20 minutes and was recorded audio-wise with the participants' permission. The interview data were transcribed exactly as they were and analysed by hand using thematic analysis. This analysis resulted in two main themes and six sub-themes. The first theme was Teachers' Perspectives on ICT Use for Early Numeracy Development and had three sub-themes, namely: ICT as a complementary approach to early numeracy learning; ICT to enhance children's engagement and learning. Teachers' choice and use of ICT tools and experiences. The second theme, "Challenges in Integrating ICT for Early Numeracy Development," was divided into three sub-themes: problems in classroom management and children's access to ICT; concerns regarding the use of ICT and lack of infrastructure, resources, and institutional support. The results indicate that if ICT is purposefully and developmentally used with teacher support, it is believed to be useful in supporting early numeracy learning and in engaging children. The results also show that the proper use of technological resources, teacher competence, appropriate classroom management, and institutional support are important in order to integrate ICT effectively. ICT can be a supportive strategy to support early numeracy development in TASKA if it is neatly woven into play and hands-on activities and teacher-child interaction.

Key Words: Teacher's Perspectives; ICT Integration; Early Numeracy; TASKA Teachers; Technology Challenges; Qualitative Study; Thematic Analysis

ABSTRAK

Teknologi maklumat dan komunikasi (ICT) boleh membantu pembelajaran numerasi awal kanak-kanak dengan memberi pengalaman pembelajaran yang interaktif dan menarik. Namun, kajian tentang penggunaan ICT untuk menyokong perkembangan numerasi awal kanak-kanak berumur 0 hingga 4 tahun di TASKA masih sedikit. Kajian ini bertujuan meneroka pandangan pendidik awal kanak-kanak tentang penggunaan ICT dalam menyokong perkembangan numerasi awal di TASKA dan mengenal pasti cabaran dalam menggabungkan ICT dalam pengajaran numerasi awal. Kajian ini menggunakan reka bentuk kajian kes kualitatif di TASKA di Kempas Indah, Johor Bahru, Johor, Malaysia. Populasi kajian terdiri daripada guru TASKA yang mengajar kanak-kanak berumur 0 hingga 4 tahun. Empat orang guru TASKA dipilih secara persampelan bertujuan mengikut kriteria inklusi yang ditetapkan. Data dikumpulkan melalui temu bual individu separa berstruktur secara bersemuka menggunakan protokol temu bual dengan 15 soalan terbuka. Setiap temu bual berlangsung kira-kira 15 hingga 20 minit dan dirakam dengan kebenaran peserta. Data temu bual ditulis semula secara verbatim dan dianalisis secara manual menggunakan analisis tematik. Hasil analisis memberi dua tema utama dan enam subtema. Tema pertama ialah Perspektif Guru tentang Penggunaan ICT untuk Perkembangan Numerasi Awal dan mempunyai tiga subtema, iaitu: ICT sebagai pendekatan pelengkap kepada pembelajaran numerasi awal; ICT untuk meningkatkan penglibatan dan pembelajaran kanak-kanak. Pilihan dan penggunaan alatan dan pengalaman ICT oleh guru. Tema kedua, "Cabaran dalam Mengintegrasikan ICT untuk Perkembangan Numerasi Awal," dibahagikan kepada tiga subtema: masalah dalam pengurusan bilik darjah dan akses kanak-kanak kepada ICT; kebimbangan mengenai penggunaan ICT dan kekurangan infrastruktur, sumber dan sokongan institusi. Keputusan menunjukkan

bahawa jika ICT digunakan secara sengaja dan perkembangan dengan sokongan guru, ia dipercayai berguna dalam menyokong pembelajaran numerasi awal dan dalam melibatkan kanak-kanak. Keputusan juga menunjukkan bahawa penggunaan sumber teknologi yang betul, kecekapan guru, pengurusan bilik darjah yang sesuai dan sokongan institusi adalah penting untuk mengintegrasikan ICT dengan berkesan. ICT boleh menjadi strategi sokongan untuk menyokong perkembangan numerasi awal di TASKA jika ia dijalin dengan kemas dalam aktiviti permainan dan amali serta interaksi guru-kanak.

Key Words: Perspektif Guru; Integrasi ICT; Numerasi Awal; Guru Taska; Cabaran Teknologi, Kajian Kualitatif; Analisis Tematik

INTRODUCTION

In early childhood settings, numeracy refers to the mathematical principles that children learn as a result of their play, the various routines they follow and the activities that are guided for them. The main numeracy concepts include number sense, operations, patterns and sequencing, measurement, geometry, classification and sorting, and simple statistics and data handling. Early numeracy is especially important in the first years of life since it is at this stage that children start to build up their basic understanding of numbers. A longitudinal study found that the number sense children had at 12 months old was a predictor of their mathematical skills by the age of four, thus showing how important early numerical development is for later mathematical learning (Decarli et al., 2023). At this age, children start to form an understanding of numbers and mathematical relationships as they count objects while playing, compare sizes, sort materials, recognise patterns and explore shapes and spaces. These experiences also contribute to the development of children's cognitive skills, their problem-solving abilities, logical thinking and their capacity to make links between mathematical ideas and their surroundings. Early numeracy should therefore not be seen as merely preparation for formal mathematics but should be regarded as an essential element of young children's general learning and development. It is important for learning because numeracy forms the basis of future academic achievement not just in mathematics but in all areas of learning (Syarifatunnida et al., 2024).

The utilization of ICT in early childhood education (ECE) has received a lot of attention as a medium to support young children's learning and development. Recent studies show that technology has been more integrated into early childhood instruction, yet its educational benefits are contingent upon the technologies chosen and ways in which they are integrated into the teaching and learning process (Paul et al., 2023). A systematic review of technology integration in early childhood education classrooms revealed that digital technologies can be integrated into instructional activities to scaffold children's learning across various domains of childhood development; however, the pedagogical context in which technology is integrated in the classroom is important (Paul et al., 2023). ICT, if used appropriately, can offer children interactive, visual, auditory, and engaging learning experiences that can supplement play-based and hands-on experiences when used under the guidance of teachers. Children can learn to explore, communicate, make connections, and develop cognitive skills in meaningful ways with digital content as a result of these experiences. Benguye (2024), for instance, explored the integration of ICT in early childhood education to develop literacy and numeracy skills for young children, and observed that the implementation of ICT in early childhood education was hindered by teachers' competency in using ICT, availability of ICT tools and resources, and lack of clear guidelines for using ICT effectively in early childhood education. If used appropriately and guided by teachers, ICT can offer children learning opportunities through interaction, visual, auditory, and engaging experiences that can be used in conjunction with play-based and hands-on learning experiences.

ICT can also be used to support early numeracy development by using opportunities to engage children in interactive and developmentally appropriate ways to explore numbers, counting, shapes, patterns, classification, and simple problem-solving. A systematic review of educational technology in early mathematics education revealed that the use of technology is evidence-based to help develop young children's mathematical competencies if it is implemented by teachers who provide adequate support, and that learning environments are structured appropriately (Verbruggen et al., 2021). Likewise, Thian Jia Ling and Mohd Matore (2021) revealed that studies on ICT and mathematics education reveal that ICT technology can present opportunities for learners to learn mathematics through interactive and diverse representations. Children can learn numbers, shapes, and patterns through interactive digital activities and experiences where they play. In the case of digital counting games, for instance, the way that the children are asked to count objects, match numerals to sets of objects, and recognise quantities can support their number sense. Interactive shape activities can help introduce geometry to children, helping them identify, match and

manipulate circles, squares and triangles. Likewise, digital patterning activities can be used to develop children's knowledge of patterns and sequencing by having them recognize and repeat a basic pattern of colour, shape, sound, or objects. ICT can also be used for classification and sorting when children group objects through use of interactive applications based on colour, size, shape, etc. These ICT-supported activities can, with suitable teacher direction, offer opportunities for children to revisit mathematical concepts frequently and have their ideas immediately clarified. Importantly, research indicates that teacher support when using technology is a significant factor that is correlated with the effectiveness of technology for early mathematics learning (Verbruggen et al., 2021). Hence, for young children, digital experiences must be incorporated in the right pedagogical interaction, not just in independent interaction with digital devices. ICT can be used to provide a point of entry for questioning, discussion, exploration, and further mathematical hands-on activities. Hence, ICT can be used to enhance the opportunities available to young children to access and engage with mathematics concepts in an interactive and meaningful way as part of play-based learning.

The part played by teachers in the effective integration of ICT in early numeracy learning is of critical importance. Instead of just using digital tools, teachers are facilitators that manage how children interact with educational applications, interactive games and multimedia resources to help develop counting skills, number recognition, patterns, and simple problem solving skills. This role can be explained by Vygotsky's Sociocultural Theory that focuses on the social, communicative and tutorial aspects of children's learning and development. Children's learning in ICT-supported numeracy activities can be scaffolded by the teacher modelling the use of ICTs, asking questions, giving prompts and support when children get stuck. They can provide support for the child and allow him/her to undertake numeracy tasks that they are not yet able to do on their own, in line with the concept of the Zone of Proximal Development (ZPD). For instance, while counting objects during a digital counting activity, a teacher could ask a child to count with him or her, have him or her point to the numeral, and slowly fade away as the child begins to count independently and with more self-assurance. In recent studies of technology use in early mathematics education, the role of teacher support in technology-related learning activities is also emphasized (Verbruggen et al., 2021). Therefore, ICT is used as a mediation tool in the learning process and the interaction and scaffolding of the teacher are still significant in developing children's mathematical understanding. Specific studies of early childhood mathematics teachers also highlight the role of teachers' beliefs and perceptions in the use of digital tools in mathematics learning (Alsaeed & Aladil, 2024). Recent research also indicates that early childhood teachers' attitudes, technological skills, and knowledge are significant factors to consider when integrating digital technologies into early childhood education (Valdez & Mendoza, 2024; Merjovaara et al., 2024). Thus, ICT should not be considered a substitute for the teacher, but rather a facilitator of children's learning, if used with proper pedagogical guidance and social interaction.

Besides the sociocultural approach, the successful incorporation of ICTs could be addressed in terms of teachers' technological, pedagogical, and content knowledge. Technological Pedagogical Content Knowledge (TPACK) suggests that knowledge of how to use technology tools, coupled with knowledge of how to integrate these tools into pedagogical approaches and subjects, is necessary for effective technology integration. Pedagogical knowledge involves knowing how to use the technologies, and pedagogical content knowledge involves knowing how to use developmentally appropriate technologies to teach the concepts of mathematics that are expected to be learned by children. Studies that specifically looked at the relationship between TPACK and ECTs revealed that there were significant relationships between TP, P, and technological knowledge, indicating that it is not enough just to have technical knowledge for effective technology integration (Luo et al., 2022). Likewise, Lim et al. (2024) concluded that the technology integration courses might enhance the technological, pedagogical, and content-related knowledge of preservice early childhood teachers. How these forms of knowledge are integrated is an especially significant issue in TASKA, as young children need learning experiences that are appropriate to their developmental level and are embedded within play, exploration, routines, and social interaction. Teachers' attitudes toward ICT, technological knowledge, and teaching experiences have also been linked to the use of technology in activities in the classroom (Yang & Dong, 2024). Therefore, the knowledge of teachers regarding technology, pedagogy, and the confidence to use it, as well as understanding its role in teaching and learning a particular numeracy concept, may affect the integration of ICTs in the classroom.

Although ICT can be a potentially effective tool in early numeracy teaching, there are several challenges to its effective use in early childhood settings. Many early childhood centres do not have sufficient technological equipment and materials like computers, tablets, projectors, and reliable Internet connections that are needed to facilitate the effective use of ICTs in teaching and learning activities (Twagilimana et al., 2025). Apart from infrastructural constraints, teachers could also have difficulties in terms of technological knowledge, pedagogical knowledge of ICT, and self-confidence in the use of technology for classroom

activities. According to Husin et al. (2024), teachers encountered challenges in terms of limited technological knowledge, pedagogical knowledge of ICT, and confidence in using technology tools in an educational activity. The issues of whether and how to provide technology and the kinds, uses and ways of integrating it into children's developmental and learning needs are especially significant in early childhood settings. Inadequate resources and lack of teacher competence can result in inconsistent use of ICT or use for entertainment only instead of a structured learning tool. Hence, it is important to understand the problems being faced by the teachers in order to find out how to make better use of ICT in early numeracy learning.

This is especially significant in the context of TASKA in Malaysia, focusing on the early developmental years of children (0-4 years) and where learning is deeply rooted in play, routines, exploration, and interaction. While older children in formal preschool contexts might require ICT integration, the contextual design needs to be mindful of the developmental nature of the children, attention span, evolving communication skills, and their motor skills, as well as the need for active and social learning experiences in TASKA. Early childhood education research highlights that the integration of technology should be addressed in the context of children's developmental attributes and the pedagogical environment in which digital technologies are implemented (Paul et al., 2023). Therefore, the appropriate ways in which ICT can be integrated with the curriculum in older preschool children may not be directly transferable to children aged 0-4 years. The challenge for TASKA teachers is to identify how digital devices can be integrated effectively into play and routines, social interaction, and developmentally appropriate learning experiences.

The use of ICT in early childhood education has been the subject of much attention, but research that focuses in particular on the use of ICT to support early numeracy development of children 0-4 years in TASKA environments is relatively scarce. Much of the recent early childhood digital pedagogy research has revealed significant differences in the ways in which technology is being used and the evidence for the need to develop a better understanding of how teachers, children and technologies participate in various pedagogical contexts (Li et al., 2026). Current studies on educational technology and early mathematics have demonstrated its potential for young children's mathematical learning, but most of these studies have been conducted with preschool-age children and formal education environments (Verbruggen et al., 2021). Likewise, the majority of systematic reviews of technology integration in early childhood education have focused on the general role of digital technologies in various learning areas and not on the use of ICT-supported numeracy education among children ages 0-4 years (Paul et al., 2023). In addition, the current debates on ICT integration tend to be on the impact of ICT on children's learning, and less information is available about teachers' perceptions of, or practical experiences with, the integration of ICT for early numeracy learning, and the practical difficulties that might make the integration difficult. This is an important research gap since numerical skills are known to be developed in the early years and relate to future mathematical development (Clements & Sarama, 2021). Concurrently, the use of ICT for this age group might be affected by the teachers' technological knowledge, pedagogical strategies, self-confidence, professional development, and the availability of appropriate technological resources (Luo et al., 2022; Valdez & Mendoza, 2024). However, the general potential of ICT needs to be transcended, and in-depth insights into the actual attitudes and experiences of teachers, who have to introduce ICT in the learning of young children, need to be explored. Hence, the present study aims at examining the attitudes of ECEs towards the use of ICT in early numeracy support among children in TASKA and what challenges they encounter in the process of incorporating ICT in early numeracy teaching.

1. Objective 1: To explore early childhood teachers' perspectives on the use of ICT in supporting early numeracy development among children in TASKA.
2. Objective 2: To identify challenges faced by early childhood teachers when integrating ICT into early numeracy teaching in TASKA.

METHODOLOGY

The study adopted a qualitative case study approach to understand teachers' experiences, perspectives, and practices in using information and communication technology (ICT) to enhance early numeracy learning for children (aged 0-4) in TASKA settings. A qualitative approach was deemed to be appropriate for the study, due to the aim of gaining an in-depth understanding of teachers' experiences and perspectives within their natural educational context. A case study design was adopted by the researcher to study the integration of ICT in early numeracy in a specific TASKA context of Kempas Indah, Johor Bahru, Johor.

The study was conducted in TASKA located in Kempas Indah, Johor Bahru, Johor, Malaysia. Children aged 0-4 were the study population for the teachers in TASKA in the selected study location. Based on the inclusion criteria, four TASKA teachers were purposively selected from this population for the study. The selection of participants was based on a purposive sampling technique, and the selection was based on experience and knowledge in the use of ICT in teaching and learning activities for young children. Four TASKA teachers

participated in the study. Participants were invited to be part of this study if they met the following inclusion criteria: (i) being currently working as TASKA teachers, (ii) serving children aged 0-4 years, (iii) experience in using ICT in their teaching and learning activities, and (iv) willing to participate voluntarily in this study. The selection of this population was also appropriate to the purpose of the study because the teachers of the TASKA have interactions with young children in planning and implementing learning activities; thus, they have experiences and views about the use of ICT to help young children develop their early numeracy. The purposive sampling technique was suitable because the subjects of this study were people who had first-hand experience and knowledge about the phenomenon studied. The study did not aim to represent the statistical range of teachers' experiences and perspectives, but instead, to get rich and relevant descriptions.

Semi-structured individual interviews were used to gather data. The researcher designed an interview protocol based on the research purpose and introduced literature regarding the integration of ICT and early numeracy development in ECE. The interview protocol was then piloted with early childhood education experts and research methodology experts to check the validity and relevance of the interview questions and to ensure they reflect the research goals. The experts' feedback and suggestions were taken into consideration and integrated into the questions in the interview instrument to make the questions clearer and more appropriate before the data were collected.

A set of 15 questions was developed for this interview protocol, structured in two themes. Constructs were: (i) Teachers' view of using ICT for early numeracy learning, (ii) how and what teachers use as ICT to support early numeracy, and (iii) challenges in integrating ICT in early numeracy learning. The questions were open-ended to allow participants to elaborate on their experiences, practices and opinions. For further clarification and elaboration from the participants, probing questions were used when necessary.

Interviews were conducted one-on-one, face-to-face with each participant. The interviews were about 15-20 minutes in length. The researcher informed the participant about the aim and method of the research and sought informed consent before each interview. All interviews were audio-recorded with the participation of the persons interviewed to accurately capture the participants' responses. Interviews were carried out in either Malay or English as preferred by the participants. Follow-up and probing questions were also used where necessary to clarify participants' responses and to elicit further details about their experiences. All the recordings were transcribed verbatim after interviewing and analysis.

To ensure rigour, trustworthiness was addressed through credibility, transferability, dependability and confirmability. Credibility was established by expert protocol validation and iterative reviews of the transcript. Codes were checked against the raw text and were continuously compared to minimise bias. Transferability was enhanced through detailed documentation of the institutional setting, participant criteria, and data collection procedures. Reliability was ensured through detailed notes of transcripts, coding schemes, and analytic decisions. Confirmability was maintained by ensuring that all the generated themes were directly based on the participant excerpts.

Data analysis followed Braun and Clarke's thematic analysis framework, consisting of six phases: (1) data familiarization, (2) initial code generation, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the final report (Naeem et al., 2024). Transcripts were read repeatedly to identify recurring patterns. Open codes were generated manually in Microsoft Word and grouped into broad sub-themes, which were further synthesized into primary thematic categories corresponding to the research objectives. The finalized thematic structure was supported using representative participant excerpts.

Ethical standards were strictly observed throughout the project. Participation was voluntary, and participants were informed of their right to withdraw at any stage without penalty (Mirza et al., 2023). Participant identities were protected using pseudonyms (Participant 1 to Participant 4). All raw audio files, transcriptions, and qualitative matrices were kept strictly confidential and accessible only to the research team.

FINDINGS AND DISCUSSION

Thematic analysis generated two overarching themes addressing the research objectives: (1) teachers' perspectives on ICT use for early numeracy development, and (2) challenges in integrating ICT in TASKA. These main themes comprise six sub-themes detailing the qualitative findings.

THEME 1: TEACHERS' PERSPECTIVES ON ICT USE FOR EARLY NUMERACY DEVELOPMENT

SUBTHEME 1.1: ICT AS A COMPLEMENTARY TOOL FOR EARLY NUMERACY LEARNING

Participants viewed ICT as a supportive pedagogical tool rather than a replacement for hands-on early childhood teaching. Teachers reported that technology is only

educationally valuable when combined with adult interaction, physical tools that can be manipulated, and tactile learning experiences. They noted that hardware alone does not generate math learning; its efficacy relies entirely on intentional instructional integration.

Participant 1 noted:

> *"ICT is essential but not important because if give too much may make children addicted. So need to depend on the situation and must be suitable to use the ICT in classroom."* (Participant 1)

This statement implies that teachers have a conditional attitude towards ICTs and recognise their necessity. Take a balanced approach to screen time and over-stimulation risk. Teachers see themselves as active moderators who will take charge of screen time in accordance with toddler needs.

Similarly, Participant 2 added:

> *"Yes because in our daily life, we also attach with technology tools. So if children can learn using technology in TASKA, it can make them familiar with it and the lesson can be more effective."* (Participant 2)

This means that teachers see digital devices as being part of a child's everyday life in the modern world. Digital media knowledge is seen as useful in the context of meaningful classroom experiences activity. But practitioners countered that technology should be used to enhance, not substitute for, physical exploration and social bonding.

The results were consistent with the findings of Dong and Mertala (2021), which noted the importance of digital media in ECE as an addition to tangible learning modalities. Active participation in ICT by TASKA teachers relies on the idea of being a facilitative tool and not a stand-alone teaching method.

SUBTHEME 1.2: ICT AS A MEANS OF ENHANCING CHILDREN'S ENGAGEMENT AND LEARNING EXPERIENCES

Teachers said that digital media are good at attracting and maintaining toddlers' attention. The excitement created by visual animations, audio cues, and interactive graphics was applauded, and children showed greater involvement when learning to count and make patterns in the early counting and patterns lessons.

Participant 3 stated:

> *"Yes, it also has an impact because when we show videos, children can watch while counting. Children are usually more interested in technology, so it can have a positive effect on their learning."* (Participant 3)

The teacher's response indicated that the teachers had ideas about engagement beyond the children watching a screen. Videos, in their experience, were used in conjunction with numeracy activities, as opposed to being a stand-alone digital resource; it is a component of specific counting activities. This demonstrates agreement that ICT had a more tangible impact when digital content was connected to a clear learning objective. Simply 'using technology' is not the same as children 'developing numeracy' skills. Rather, teachers' experiences indicated that when the children were motivated to use ICTs, it became meaningful. They interacted with digital content and were actively involved in the numeracy activity.

Participant 4 observed:

> *"I can see that children are interested because there are sounds, songs, and moving pictures, which make them more excited to learn."* (Participant 4)

This finding suggests that teachers believed that the multimedia features of ICT were useful to attract and maintain children's attention. The learning process seemed to be more interesting with audio, songs, movement, and visual components than activities involving only static materials. However, the teachers' responses also indicate that these features should not be used just to engage children. To support early numeracy development, ICT must be intentionally linked to mathematical concepts and mediated by teacher interaction. Thus, sounds, songs and visuals are more valuable when teachers use them in a purposeful numeracy activity, not as an end.

This finding is similar to the statement by Param (2024) that Malaysian preschool teachers had positive perceptions of the use of digital technology in enhancing children's engagement and interactive learning. A similar view was found for the TASKA teachers in the present study. However, their responses also indicated that children's engagement was more meaningful when ICT was used in conjunction with teacher-guided numeracy activities. Thus, the effectiveness of ICT might depend not only on the multimedia features but also on the way the teacher integrates these features into the learning experience.

SUBTHEME 1.3: TEACHERS' SELECTION AND INSTRUCTIONAL USE OF ICT TOOLS

Participants used a range of electronic devices such as tablets, desktop computers, PowerPoint slides, YouTube channels, Twinkl platforms, and certain educational apps. The choice of the tools was influenced by their accessibility in practice, usability, age appropriateness, and their relevance to the curriculum.

Participant 2 explained:

> *"Powerpoint and twinkle. Especially Twinkle apps are very fast as I no need to search more deeper in order to start my lesson. The tools are IPad/tablet because handheld and children can easily access."*
> (Participant 2)

This response indicates convenience and accessibility were a factor in the teacher's selection of digital resources. Teachers might use familiar and readily available platforms, which would result in a reduction in preparation time and make it easier for them to use ICT in their activities. The teachers' mention of handheld devices also highlights the importance of the type of technology used. For instance, tablets may be given to the children, and they will be able to interact with the digital resources while learning. Therefore, the availability of digital tools did not appear to be the only factor influencing the choices teachers made, as the practicality and accessibility of the tools were also factors.

Participant 3 shared:

> *"The most suitable application is mostly YouTube because it is easy to search and most of the content is related to children's learning. It is also user-friendly."*
> (Participant 3)

The answer also indicates that teachers favoured resources which were easily accessible and simple to use online. It suggests that they use ICT as a tool that is limited not just by their teaching goals, but also by practicalities. Teachers were able to use digital resources more readily and easily when they were available and accessible, making it easier for them to incorporate these into their day-to-day teaching. In this context, teachers appreciated the simplicity and ease of the resources to embracing the use of ICT in their teaching more regularly.

Participant 4 highlighted developmental suitability:

> "Suitable game applications that are appropriate for children's age." (Participant 4)

Based on these answers, teachers mentioned three main aspects that they considered when choosing and using ICT: accessibility, ease of use, and suitability for young children. The findings indicate that the inclusion of ICT in TASKA, thus, was not limited to access to digital devices. Teachers also needed to think about the appropriateness of digital resources to children's developmental levels and how such resources might be integrated into early numeracy activities in a meaningful way. This points to the role of teachers in determining the appropriateness of digital resources and their integration into daily learning experiences.

THEME 2: CHALLENGES IN INTEGRATING ICT FOR EARLY NUMERACY DEVELOPMENT

SUBTHEME 2.1: CLASSROOM MANAGEMENT AND CHILDREN'S ACCESS TO ICT

The technology did increase engagement but also created challenges for classroom management. Behavioural control problems, such as difficulty in taking turns or sustained attention, were common when excitement levels were high.

Participant 1 noted:

> *"When children see the technology tools, they feel too excited and lost control (class management)."*
> (Participant 1)

The operational challenge, it turns out, is that the high stimulation that makes electronic devices attractive can also interrupt classroom routines. Teachers should deal with child enthusiasm through behavioural management.

Resource limitations further complicated classroom dynamics. Participant 4 reported:

> *"The challenge is children tend to compete with each other, and they feel that there is not enough access to the technology."* (Participant 4)

Often there was conflict between children because they did not have devices. Screen sharing is a turn-taking exercise and consistency is important; it's not something that toddlers are adept at sharing and controlling emotions with.

Participant 3 highlighted the multi-tasking demand:

> *"Children sometimes lose focus, and it can be challenging to manage both the children and the technology tools. It is also difficult to keep them interested in doing activities together."*
> (Participant 3)

The challenge for teachers, then, becomes integrating technology and also having to manage their toddlers' behaviour, attention, and teaching objectives.

SUBTHEME 2.2: CONCERNS ABOUT EXCESSIVE TECHNOLOGY USE

Participants expressed concerns about excessive use of the screen and the possible dependency of young students. Teachers recognised the importance of educational opportunities whilst highlighting the need to regulate exposure to digital media. Participant 1 mentioned that it might be addictive and emphasized the need to use screen media selectively according to the needs of daily teaching.

This concern is based on teachers' awareness that use of technology reduces opportunities for physical activity, social communication, and tactile exploration. Position papers from the National Association for the Education of Young Children (NAEYC, 2012) and guidelines from the World Health Organization (WHO, 2019) echo practitioners' concerns by suggesting limits on passive screen time and greater amounts of active, interactive physical play. Teachers state that "moderation is a part of ensuring that technology is a helpful tool, rather than a controlling force."

SUBTHEME 2.3: LIMITED INFRASTRUCTURE, RESOURCES AND INSTITUTIONAL SUPPORT

Beyond classroom management, there are also broader institutional, logistical and financial constraints for the use of ICTs on a regular basis. Due to a shortage of equipment, practitioners will need to bring their own equipment.

Participant 2 stated:

> *"The limitation is infrastructure not enough. I need to bring my own tools which are the laptop and projector."*
> (Participant 2)

The role of personal devices reveals a lack of systematic institutional support for an integrated use of ICT, which is more often dependent on individual teachers' rather than systematic institutional initiative.

Financial constraints were also highlighted by Participant 4:

> *"Government subsidies are needed so that private TASKA can afford to purchase technological teaching aids to support children's early numeracy learning."*
> (Participant 4)

Private TASKA centres are also more affected by limited funding. They have limited capacity to buy educational media and hardware that is suitable for their TASKA.

Participant 2 emphasized institutional hardware needs:

> *"I think need more support from the school, for example like interactive whiteboard as it is larger than tablet."*
> (Participant 2)

Plus, small tablet screens aren't ideal for sharing in group activities. Larger display units are thought of as more useful for group teaching, and more useful for only one group to view since they are not in competition.

It is evident from the accounts that willpower on the part of the teacher is not enough to fill the infrastructure gap. Institutional commitment, resources, hardware, and infrastructure are required to implement the integration of ICTs in sustainable ways (Ali et al., 2021; Gernail Singh et al., 2025).

CONCLUSION

This study investigated the perspectives and operational challenges faced by TASKA teachers in using ICT for the development of early numeracy among children aged 0–4 years in Kempas Indah, Johor Bahru. The findings suggest that teachers consider ICT a useful complementary tool when used purposefully alongside concrete manipulation, adult scaffolding, and play. Digital platforms increase children's engagement with audio-visual features; choice of tools depends on convenience, ease of use, and age-appropriateness.

However, integration is hampered by classroom management issues, device competition, concerns about too much screen time, and infrastructural deficiencies. Teachers often have to bring their own devices due to hardware shortages, indicating a need for systematic institutional support. Ultimately, efficacy depends on a balance of digital media with physical and social learning activities.

IMPLICATIONS FOR PRACTICE:

- Pedagogical Alignment: ICT tools should be selected to support specific numeracy goals (e.g., matching quantities, identifying shapes) and not for their novelty. They should always be used in conjunction with physical manipulatives and teacher questioning.
- Professional Development: Training efforts need to go beyond basic online literacy and emphasise pedagogical ICT integration, toddler behaviour

management during screen time, and effective activity design.

- Institutional Investment: TASKA admins should provide reliable hardware, communal display screens (e.g., interactive projectors), and stable internet access to reduce teacher burden and competition with devices.
- Policy Guidelines: Regulations for TASKA environments should establish explicit boundaries for toddler screen time, prioritising active, adult-facilitated, play-oriented digital experiences.

RECOMMENDATIONS:

1. Targeted Software Selection: Teachers should curate age-appropriate, objective-aligned numeracy applications that support active child participation.
2. Infrastructure Subsidies: Administrative bodies and policymakers should consider funding assistance for private TASKA centres to acquire updated technological teaching aids.
3. Practical Professional Workshops: Continuous professional development should provide strategies for managing classroom dynamics and turn-taking during technology tasks.
4. Structured Classroom Routines: Teachers should set clear screen-time limits and structure group usage to prevent behavioural disruptions and over-stimulation.
5. Broadened Research Scope: In the future, studies should involve larger numbers of participants, observations of classroom practices, and perspectives from school leaders and parents from various geographical areas to assess the long-term effect of ICT on numeracy outcomes in young children.

In summary, ICT can be a useful adjunct to the teaching of early numeracy in TASKA contexts when used with purposeful pedagogy, robust institutional support and interactive pedagogies. The balance between digital resources and hands-on, play-based experiences continues to be central to supporting young children's holistic development.

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